

Itron, Inc.

REVISED TEST REPORT TO 104631-4

ORRNC
Model: RN-EGM

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.207 & 15.247
(DTS 902-928MHz)

Report No.: 104631-4A

Date of issue: April 6, 2022

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



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

Test Certificate # 803.01

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

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

Representative: Jay Holcomb
Customer Reference Number: 224127

REPORT PREPARED BY:

Darcy Thompson
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 104631

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

January 5, 2021
January 5 – 8 and 18, 2021

Revision History

Original: Testing of the ORRNC, Model: RN-EGM to FCC Part 15 Subpart C Section(s) 15.207 & 15.247 (DTS 902-928MHz).

Revision A: To replace 15.207 AC Conducted Emissions data.

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.
 Canyon Park
 22116 23rd Drive S.E., Suite A
 Bothell, WA 98021

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 (DTS 902-928MHz)

Test Procedure	Description	Modifications	Results
15.247(a)(2)	6dB Bandwidth	NA	Pass
15.247(b)(3)	Output Power	NA	Pass
15.247(e)	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	Pass

NA = Not Applicable

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

Device	Manufacturer	Model #	S/N
ORRNC	Itron	RN-EGM	335579339

Support Equipment:

Device	Manufacturer	Model #	S/N
Antenna	PCTEL	BOA9022NM-ITR	181489
Laptop	Dell	Latitude E6400	DQ8W1M1

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	DTS
Operating Frequency Range:	903.2-926 MHz
Modulation Type(s):	OFDM
Maximum Duty Cycle:	Assume 100% as worst case
Number of TX Chains:	1
Antenna Type(s) and Gain:	Omnidirectional / 2.6dBi
Beamforming Type:	NA
Antenna Connection Type:	External Connector (Professional Installation)
Nominal Input Voltage:	115VAC Nominal (85-264VAC supported)
Firmware / Software used for Test:	BrtLoader v4.8.5.4 Certification GUI vUpdate2 Test FW11.0.51.1 GEN5EGM_REL1_BETA

EUT and Accessory Photo(s)



EUT



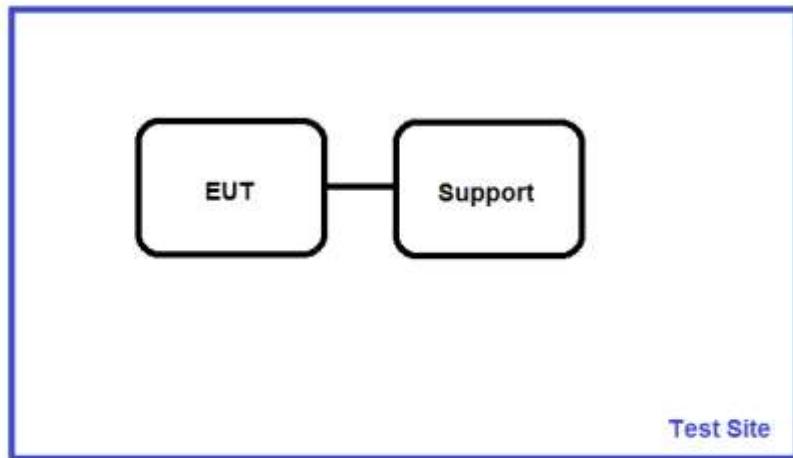
Accessory

Support Equipment Photo(s)



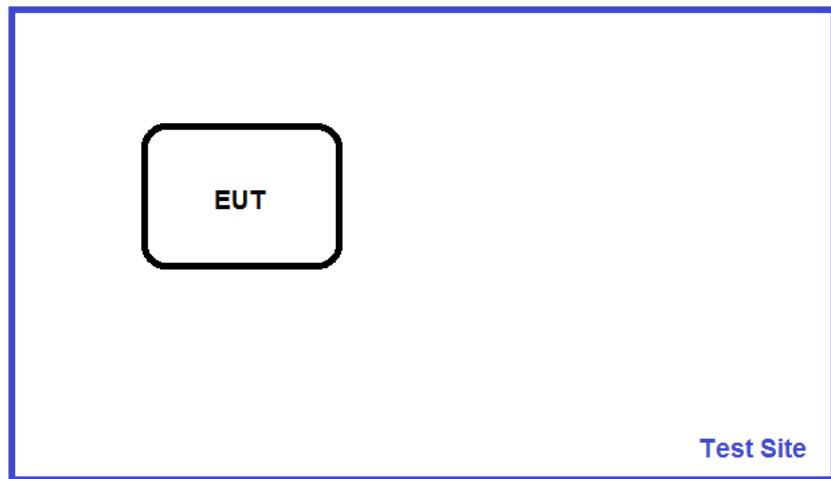
Block Diagram of Test Setup(s)

Test Setup Block Diagram



Conducted

Test Setup Block Diagram



Radiated

FCC Part 15 Subpart C

15.247(a)(2) 6dB Bandwidth

Test Setup/Conditions			
Test Location:	Bothell Lab Bench	Test Engineer:	M. Harrison
Test Method:	ANSI C63.10 (2013), KDB 558074 v05r02:04/02/2019	Test Date(s):	1/5/2021
Configuration:	1		
Test Setup:	The equipment under test (EUT) is placed on the tabletop. The output of the EUT is connected to the spectrum analyzer using a coaxial cable and attenuator. The EUT is transmitting at its rated output power.		

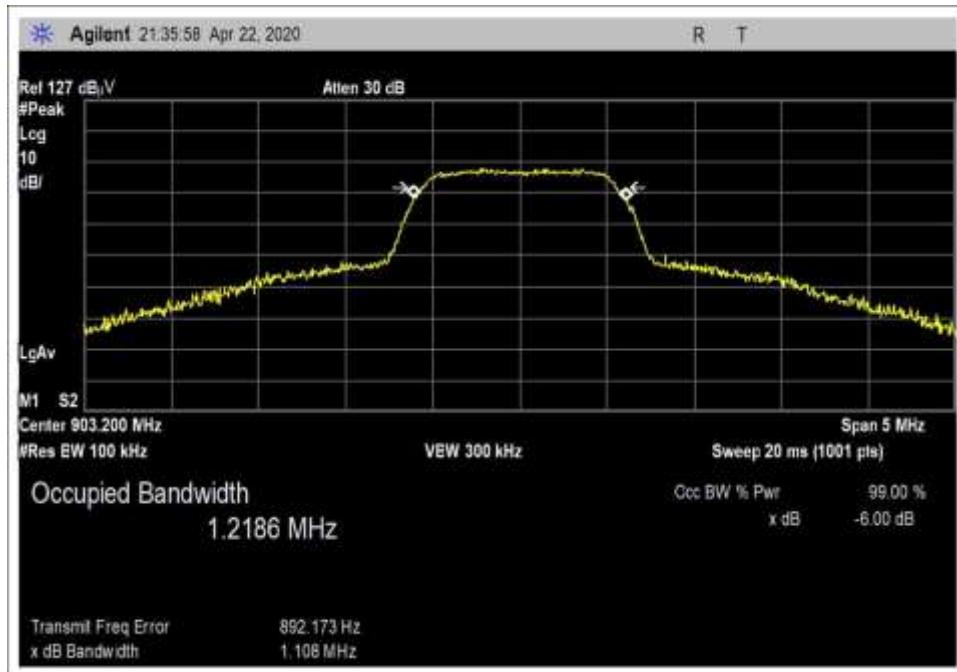
Environmental Conditions			
Temperature (°C)	22	Relative Humidity (%):	41

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02872	Spectrum Analyzer	Agilent	E4440A	11/18/2019	11/18/2021
P05748	Attenuator	Pasternack	PE7004-20	3/4/2020	3/4/2022

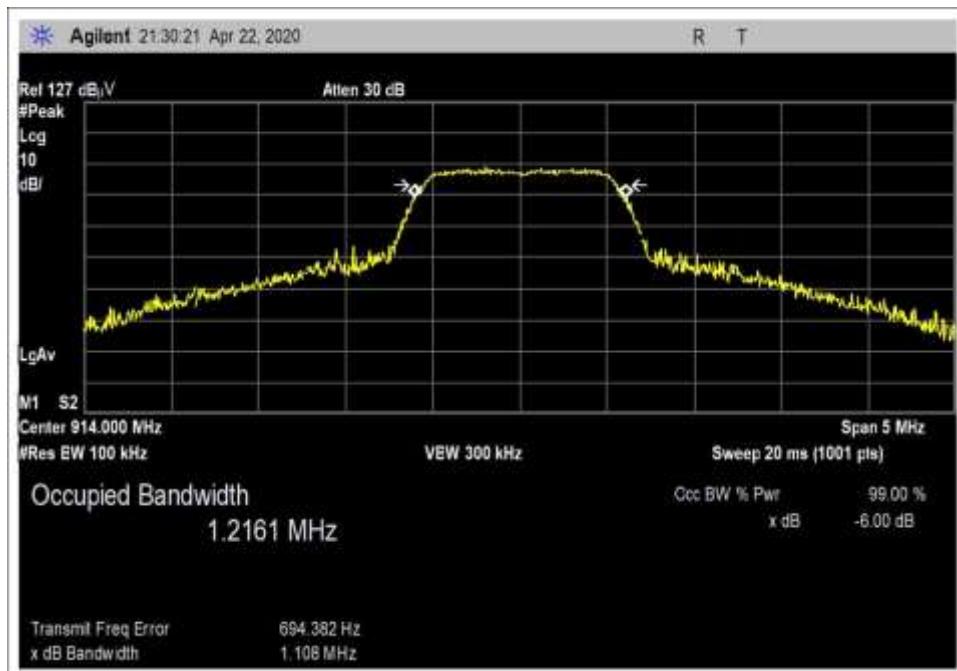
Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
903.2	1	OFDM 1200kbps	1108	≥500	Pass
914	1	OFDM 1200kbps	1108	≥500	Pass
926	1	OFDM 1200kbps	1118	≥500	Pass
903.2	1	OFDM 2400kbps	1104	≥500	Pass
914	1	OFDM 2400kbps	1113	≥500	Pass
926	1	OFDM 2400kbps	1110	≥500	Pass

Plot(s)

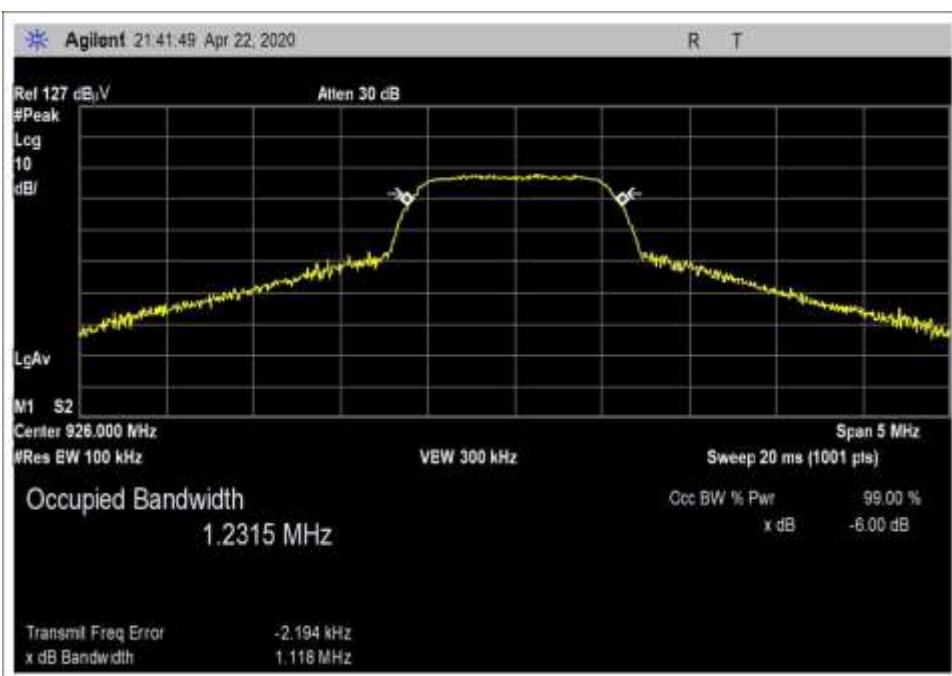
Note: At the time of testing, the date stamp on the plots below was set on a default setting and should read 1/5/2021.



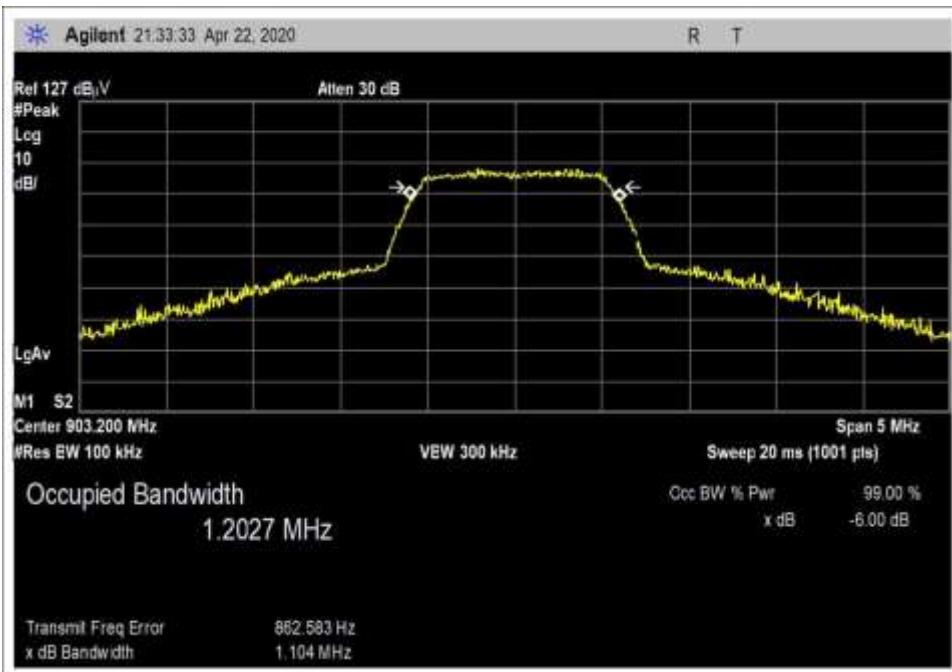
1200kbps, Low Channel



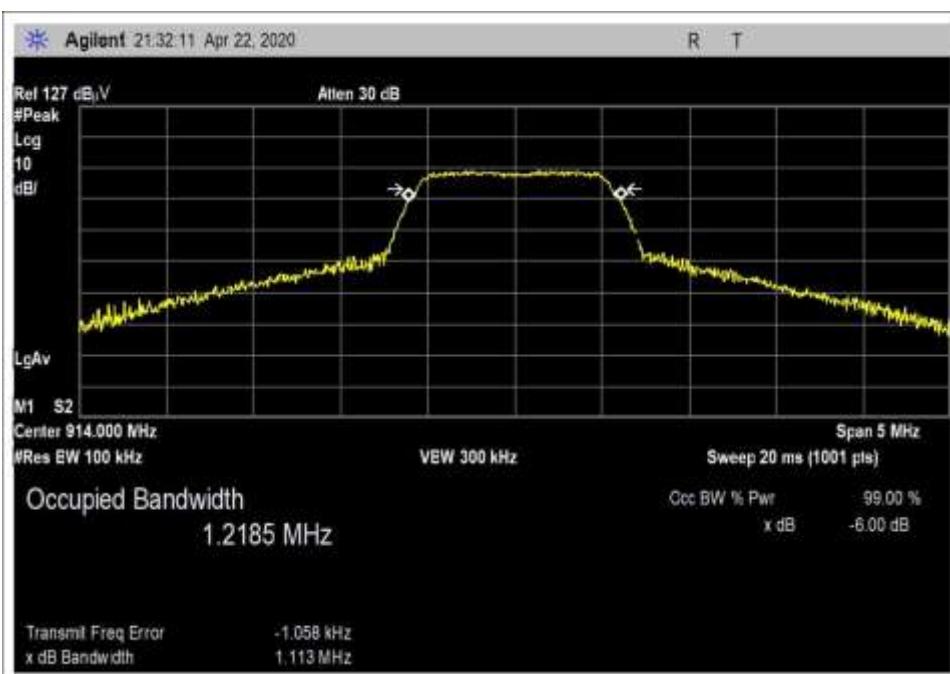
1200kbps, Middle Channel



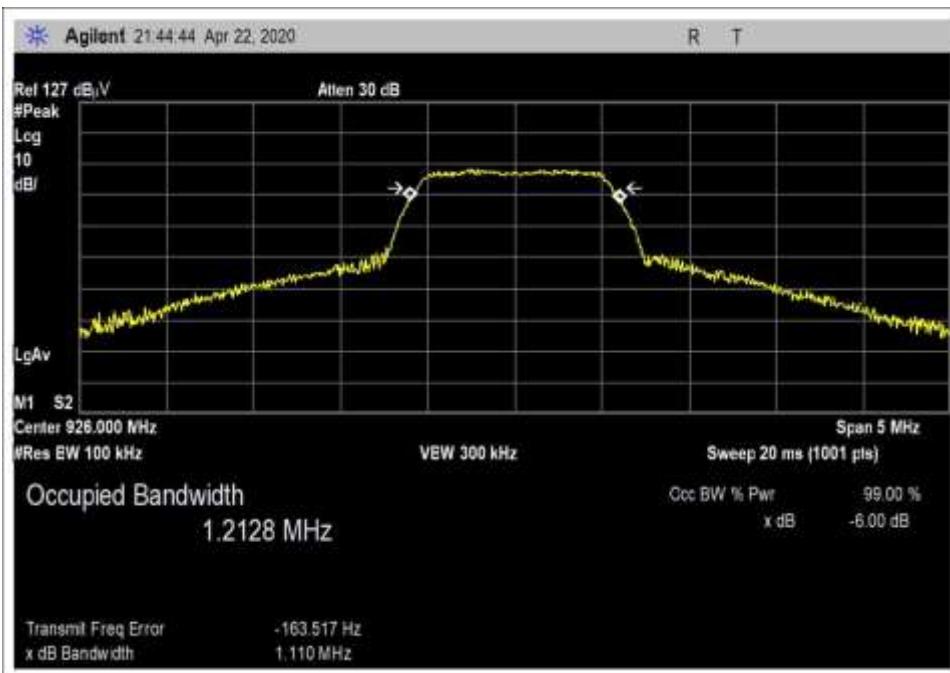
1200kbps, High Channel



2400kbps, Low Channel



2400kbps, Middle Channel



2400kbps, High Channel

Test Setup Photo(s)



15.247(b)(3) Output Power

Test Setup/Conditions			
Test Location:	Bothell Lab Bench	Test Engineer:	M. Harrison
Test Method:	ANSI C63.10 (2013), KDB 558074 v05r02:04/02/2019	Test Date(s):	1/5/2021
Configuration:	1		
Test Setup:	The equipment under test (EUT) is placed on the tabletop. The output of the EUT is connected to the spectrum analyzer using a coaxial cable and attenuator. The EUT is transmitting at its rated output power.		

Environmental Conditions			
Temperature (°C)	22	Relative Humidity (%):	41

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02872	Spectrum Analyzer	Agilent	E4440A	11/18/2019	11/18/2021
P05748	Attenuator	Pasternack	PE7004-20	3/4/2020	3/4/2022

Test Data Summary - Voltage Variations					
Frequency (MHz)	Modulation / Ant Port	V _{Minimum} (dBm)	V _{Nominal} (dBm)	V _{Maximum} (dBm)	Max Deviation from V _{Nominal} (dB)
903.2	OFDM / 1	28.7	28.8	28.8	0.1
914	OFDM / 1	28.4	28.4	28.4	0.1
926	OFDM / 1	27.5	27.5	27.5	0

Note: Test performed using operational mode with the highest output power, representing worst case.

Parameter Definitions:

Measurements performed at input voltage V_{Nominal} ± 15%.

Parameter	Value
V _{Nominal} :	115
V _{Minimum} :	98
V _{Maximum} :	132

Test Data Summary - RF Conducted Measurement

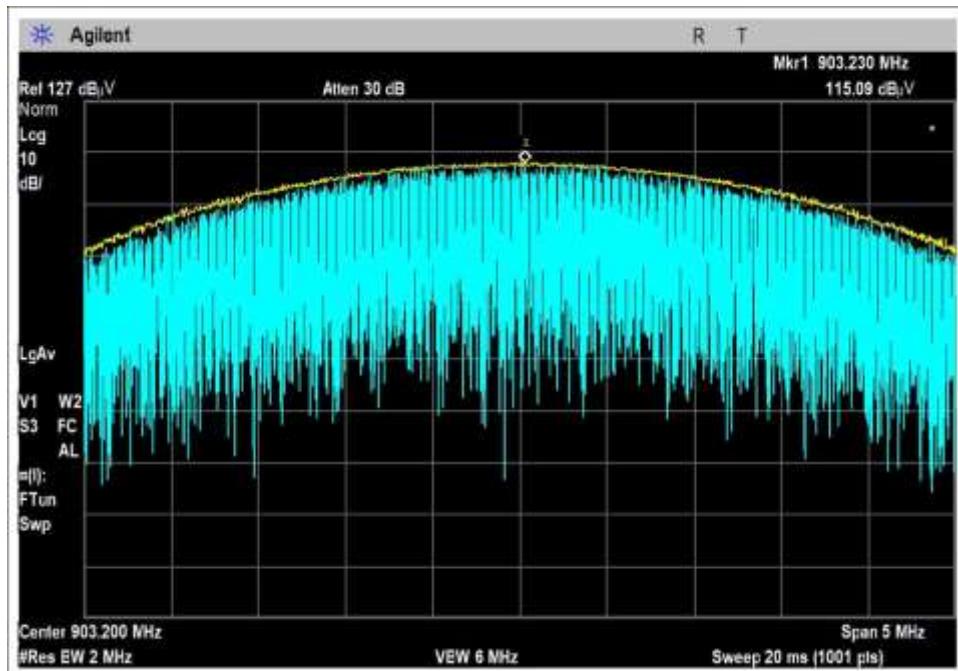
Measurement Option: RBW > DTS Bandwidth

Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Measured (dBm)	Limit (dBm)	Results
903.2	OFDM	Omnidirectional / 2.6dBi	28.8	≤ 30	Pass
914	OFDM	Omnidirectional / 2.6dBi	28.4	≤ 30	Pass
926	OFDM	Omnidirectional / 2.6dBi	27.5	≤ 30	Pass

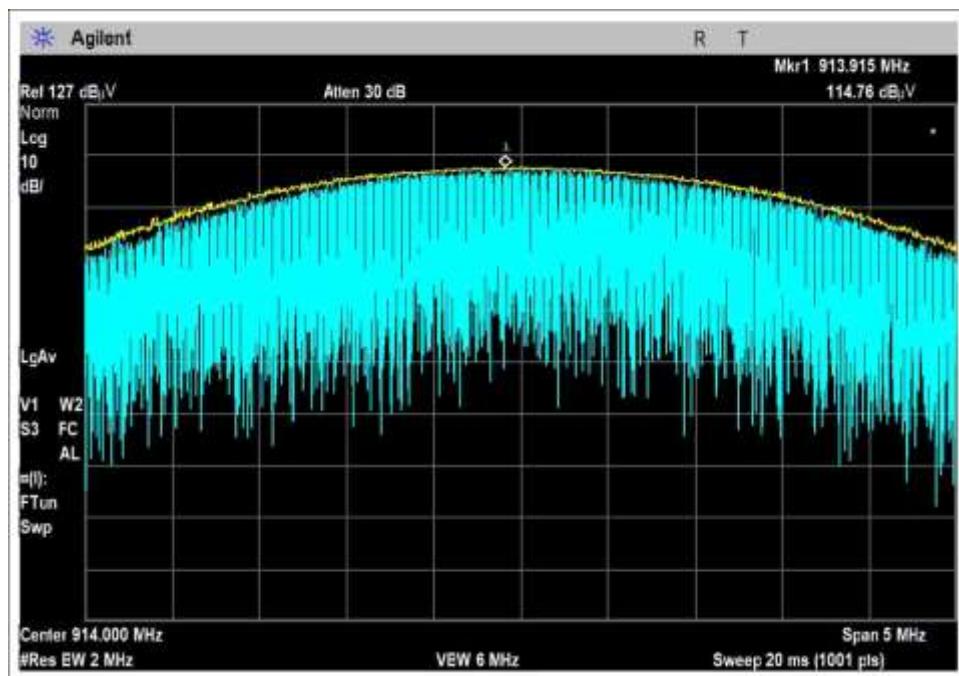
For fixed point-to-point antennas, the limit is calculated in accordance with 15.247(c)(1):

$$\text{Limit} = 30 - \text{Roundup}\left(\frac{G-6}{3}\right)$$

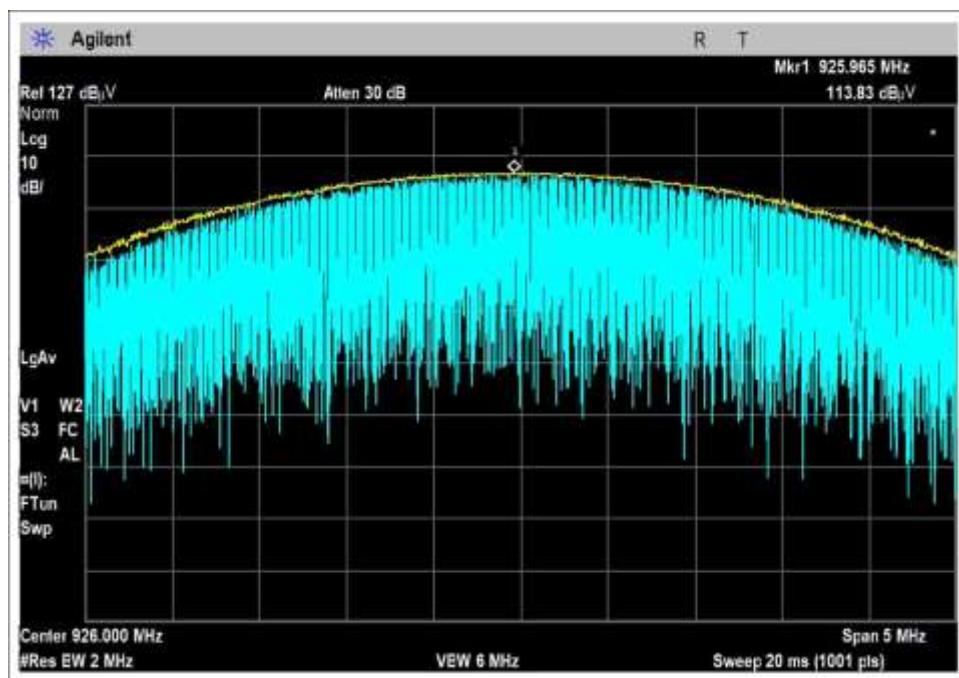
Plot(s)



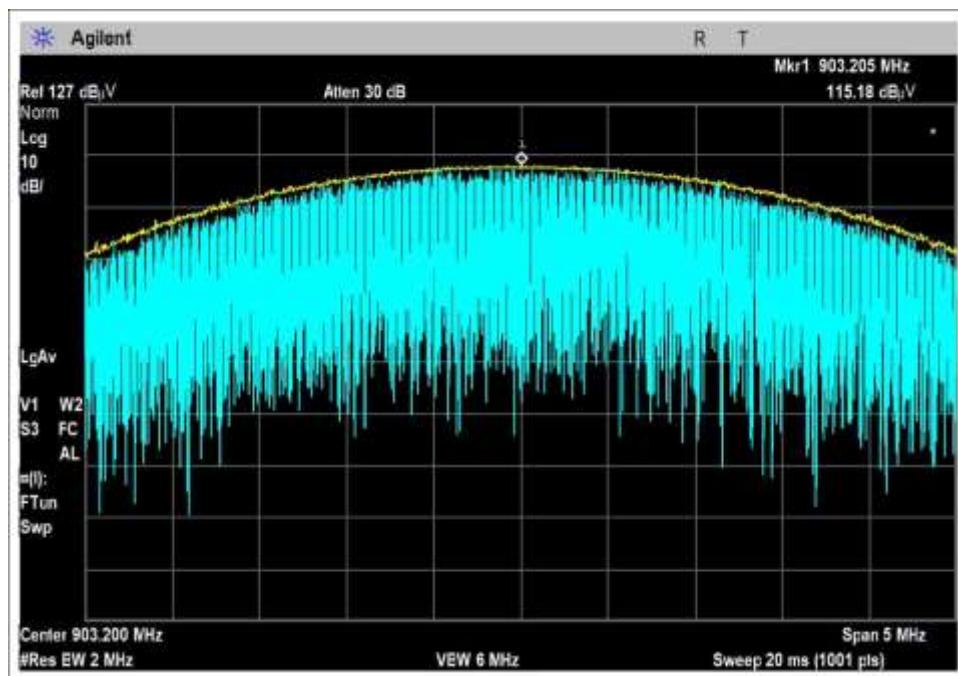
1.2MHz, Low Channel



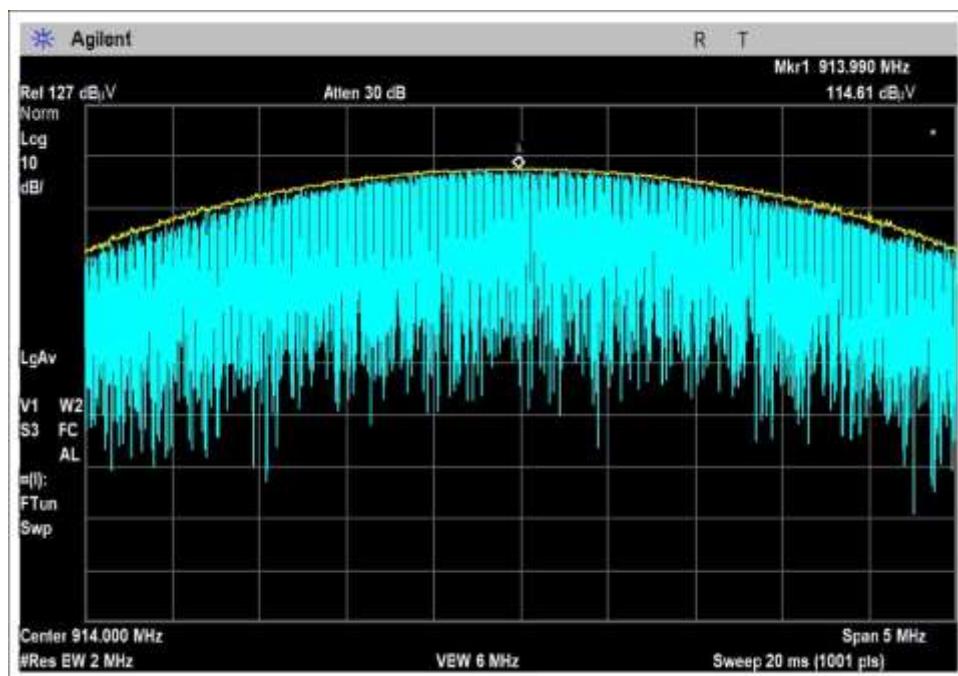
1.2MHz, Middle Channel



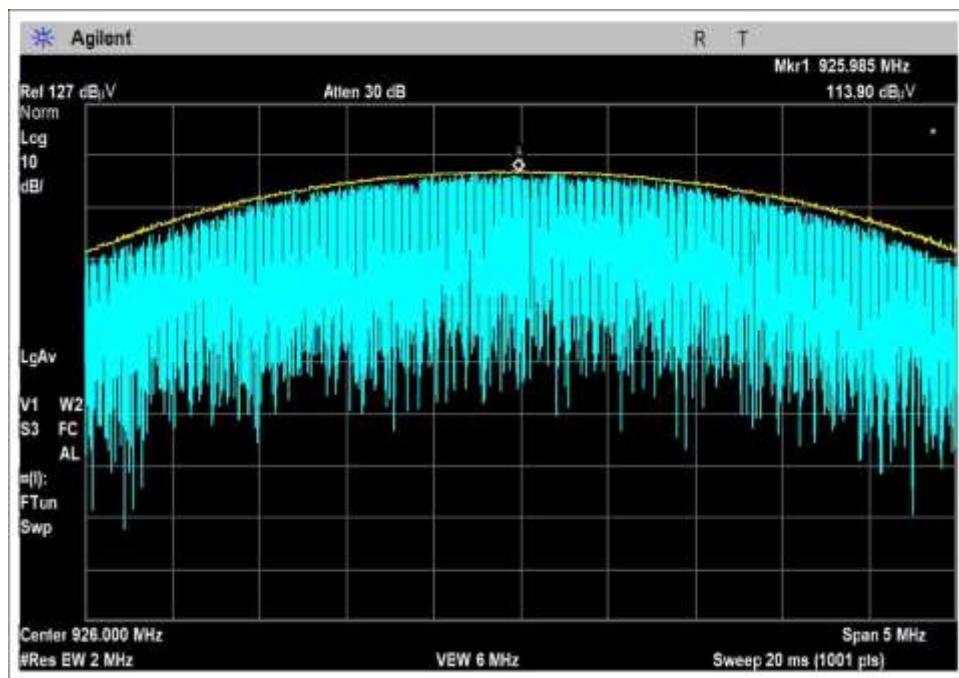
1.2MHz, High Channel



2.4MHz, Low Channel



2.4MHz, Middle Channel



2.4MHz, High Channel

Test Setup / Conditions / Data

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)
 Customer: **Itron, Inc.**
 Specification: **15.247(b) Power Output (902-928 MHz DTS)**
 Work Order #: **104631** Date: 1/18/2021
 Test Type: **Conducted Emissions** Time: 13:24:23
 Tested By: Matt Harrison Sequence#: 10
 Software: EMITest 5.03.19 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

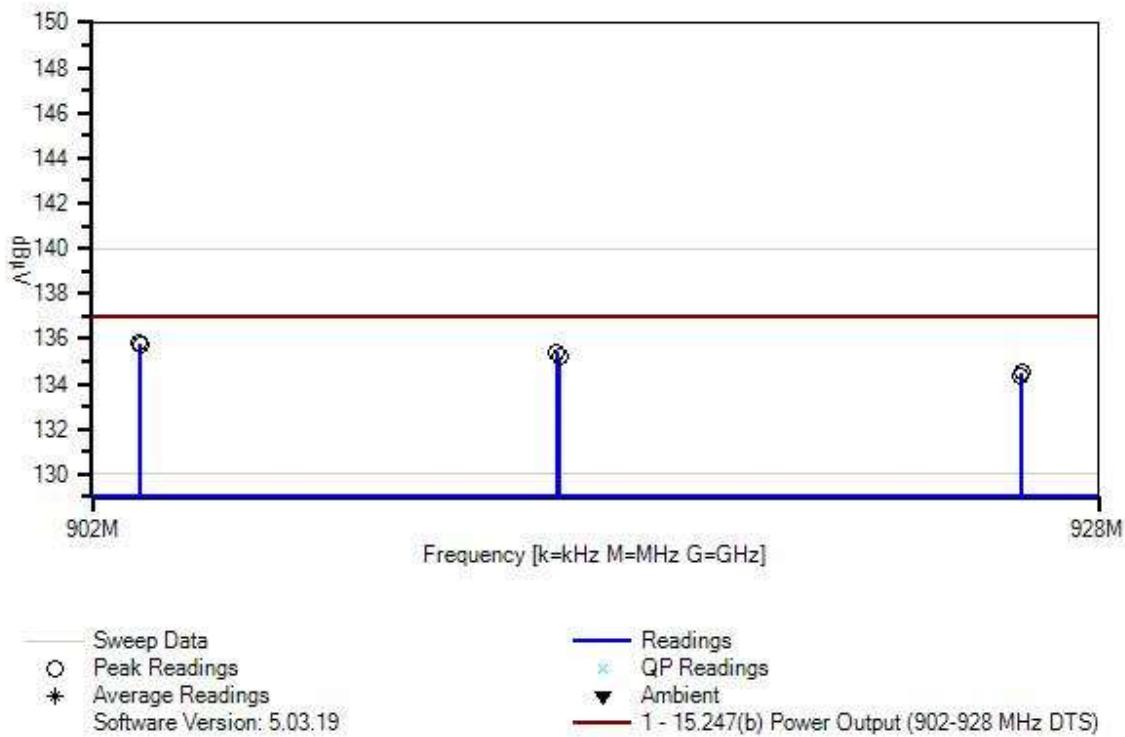
Test Environment Conditions:
 Temperature: 23°C
 Relative Humidity: 41%
 Pressure: 101.6kPa

Test Method: ANSI C63.10 (2013)

Frequency Range: 902-928MHz

Test Setup:

The equipment under test (EUT) is setup for direct antenna port measurements. The EUT is transmitting continuous wave at its rated output power.

Itron, Inc. WO#: 104631 Sequence#: 10 Date: 1/18/2021
 15.247(b) Power Output (902-928 MHz DTS) Test Lead: 120V 60Hz Antenna Port

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06007	Cable	Heliax	1/20/2020	1/20/2022
T2	ANP07229	Attenuator	PE7004-20	10/2/2019	10/2/2021
T3	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021

Measurement Data: Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	903.205M	115.2	+0.5	+20.1	+0.0	+0.0	135.8	137.0	-1.2	Anten 2.4M
2	903.230M	115.1	+0.5	+20.1	+0.0	+0.0	135.7	137.0	-1.3	Anten 1.2M
3	913.915M	114.8	+0.5	+20.1	+0.0	+0.0	135.4	137.0	-1.6	Anten 1.2M
4	913.990M	114.6	+0.5	+20.1	+0.0	+0.0	135.2	137.0	-1.8	Anten 2.4M
5	925.985M	113.9	+0.5	+20.1	+0.0	+0.0	134.5	137.0	-2.5	Anten 2.4M
6	925.965M	113.8	+0.5	+20.1	+0.0	+0.0	134.4	137.0	-2.6	Anten 1.2M

Test Setup Photo(s)



15.247(e) Power Spectral Density

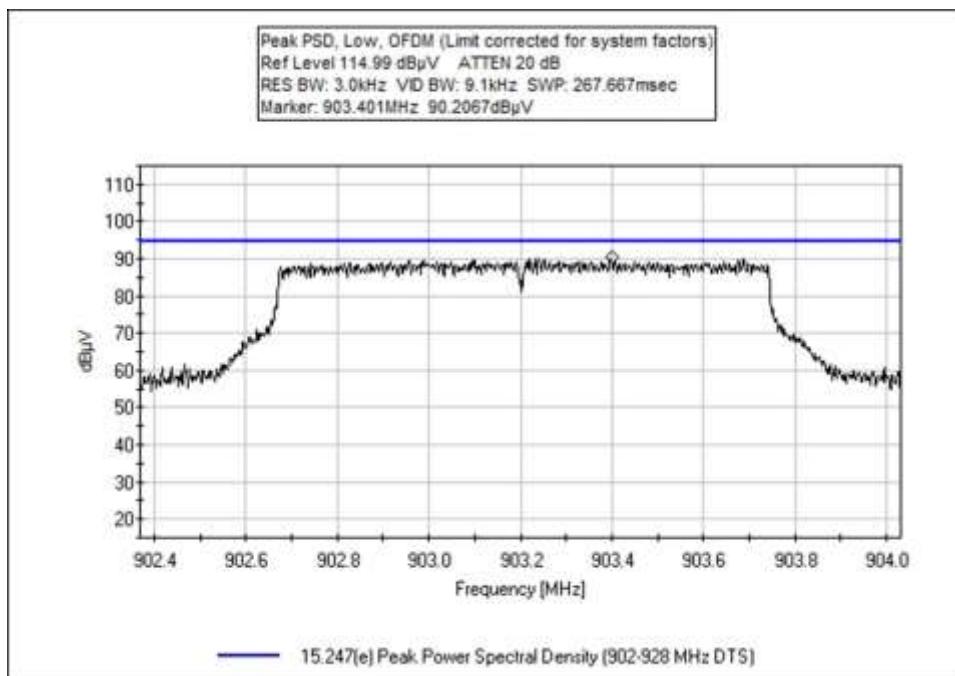
Test Data Summary - RF Conducted Measurement

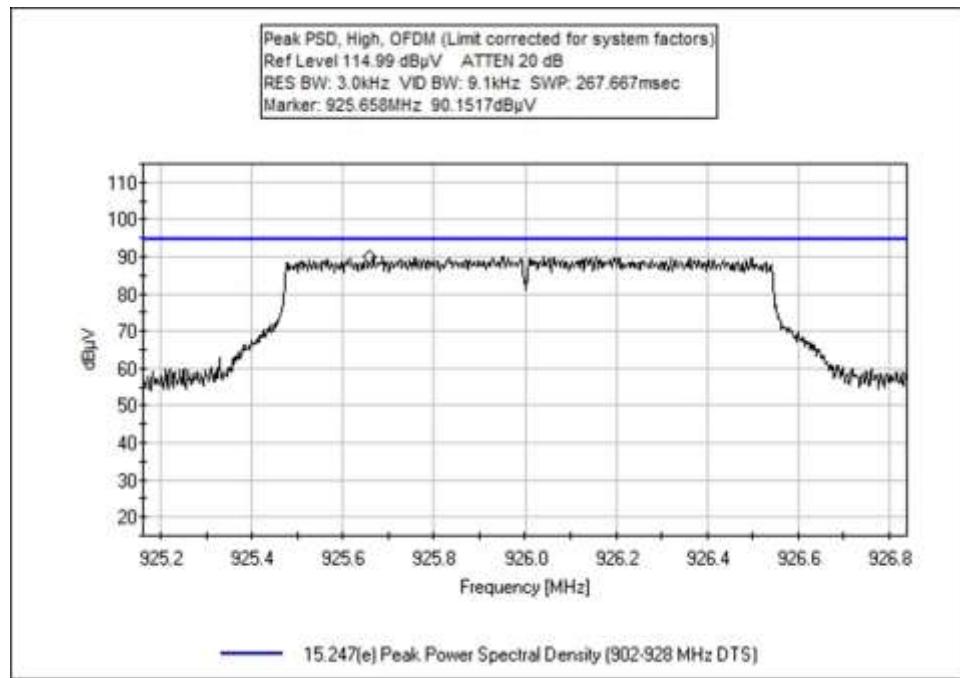
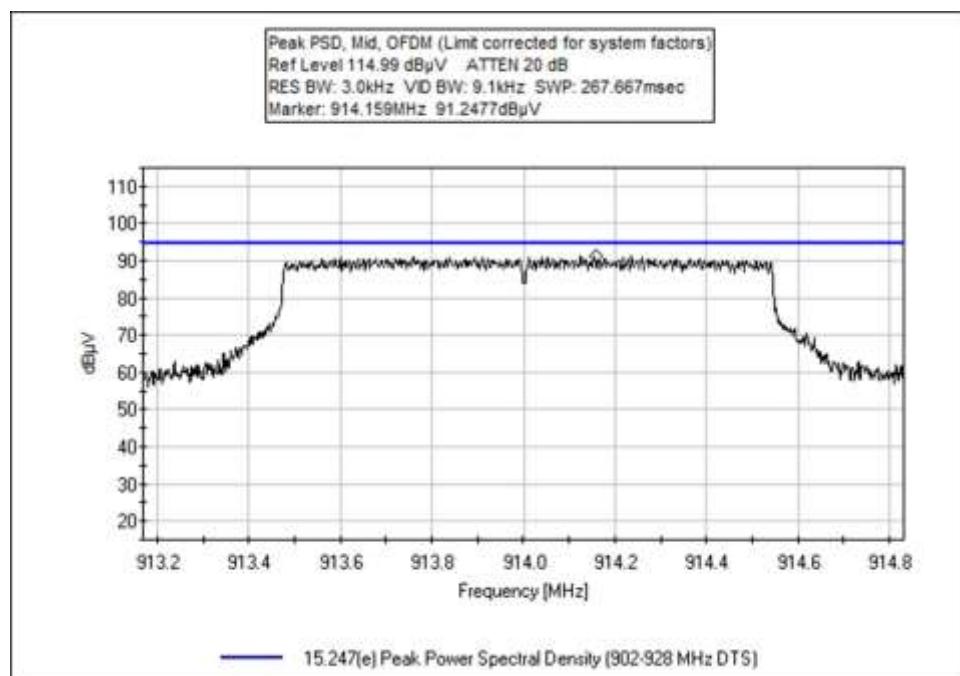
Measurement Method: PKPSD

Frequency (MHz)	Modulation	Measured (dBm/3kHz)	Limit (dBm/3kHz)	Results
903.2	OFDM	3.7	≤8	Pass
914	OFDM	4.7	≤8	Pass
926	OFDM	3.7	≤8	Pass

Note: Worst case presented.

Plot(s)





Test Setup / Conditions / Data

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)
 Customer: **Itron, Inc.**
 Specification: **15.247(e) Peak Power Spectral Density (902-928 MHz DTS)**
 Work Order #: **104631** Date: 1/8/2021
 Test Type: **Conducted Emissions** Time: 09:21:45
 Tested By: Matt Harrison Sequence#: 21
 Software: EMITest 5.03.19 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

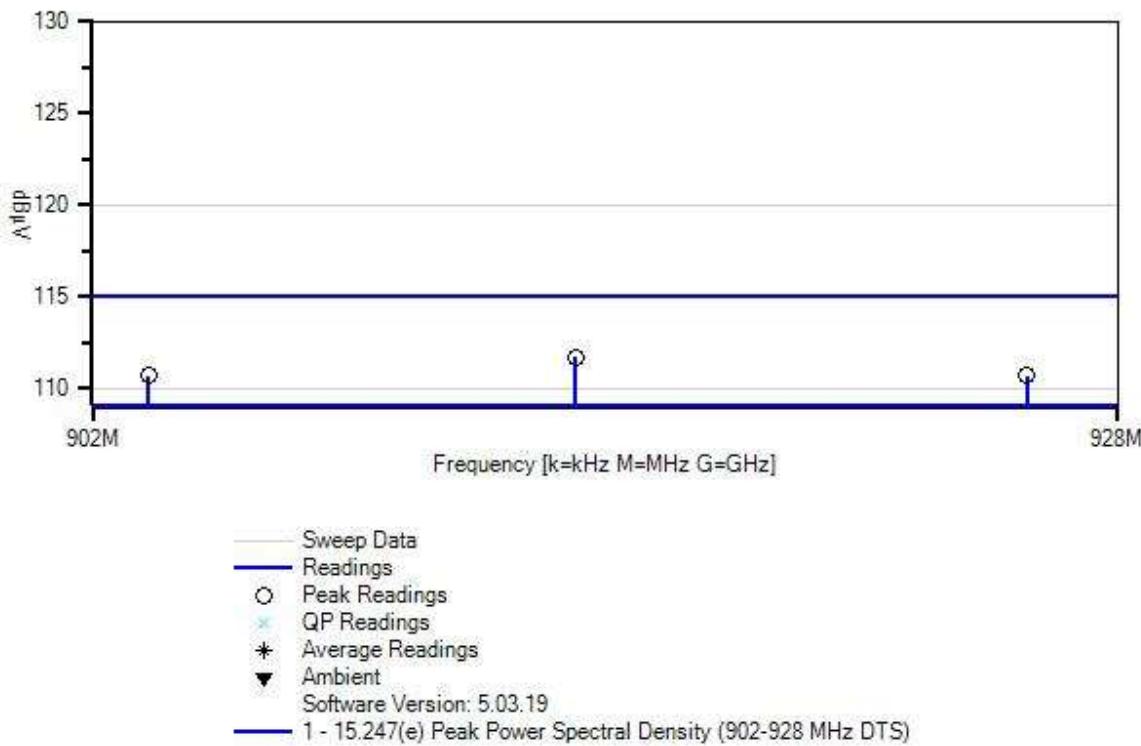
Test Environment Conditions:
 Temperature: 23°C
 Relative Humidity: 41%
 Pressure: 101.6kPa

Test Method: ANSI C63.10 (2013) KDB 558074 v05r02:04/02/2019

Frequency Range: 902-928MHz

Test Setup:

The equipment under test (EUT) is setup for direct antenna port measurements. The EUT is transmitting continuous wave at its rated output power.

Itron, Inc. WO#: 104631 Sequence#: 21 Date: 1/8/2021
 15.247(e) Peak Power Spectral Density (902-928 MHz DTS) Test Lead: 120V 60Hz Antenna Port

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05748	Attenuator	PE7004-20	3/4/2020	3/4/2022
T2	ANP06007	Cable	Heliax	1/20/2020	1/20/2022
	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021

Measurement Data:

Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dB μ V	T1 dB	T2 dB	dB	Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant
1	914.159M	91.2	+20.0	+0.5		+0.0	111.7	115.0	-3.3	Anten
2	925.658M	90.2	+20.0	+0.5		+0.0	110.7	115.0	-4.3	Anten
3	903.401M	90.2	+20.0	+0.5		+0.0	110.7	115.0	-4.3	Anten

Test Setup Photo(s)



15.247(d) RF Conducted Emissions & Band Edge

Test Setup / Conditions / Data

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)
 Customer: **Itron, Inc.**
 Specification: **15.247(d) Conducted Spurious Emissions**
 Work Order #: **104631** Date: 1/8/2021
 Test Type: **Conducted Emissions** Time: 14:41:44
 Tested By: Matt Harrison Sequence#: 25
 Software: EMITest 5.03.19 120V 60Hz

Equipment Tested:

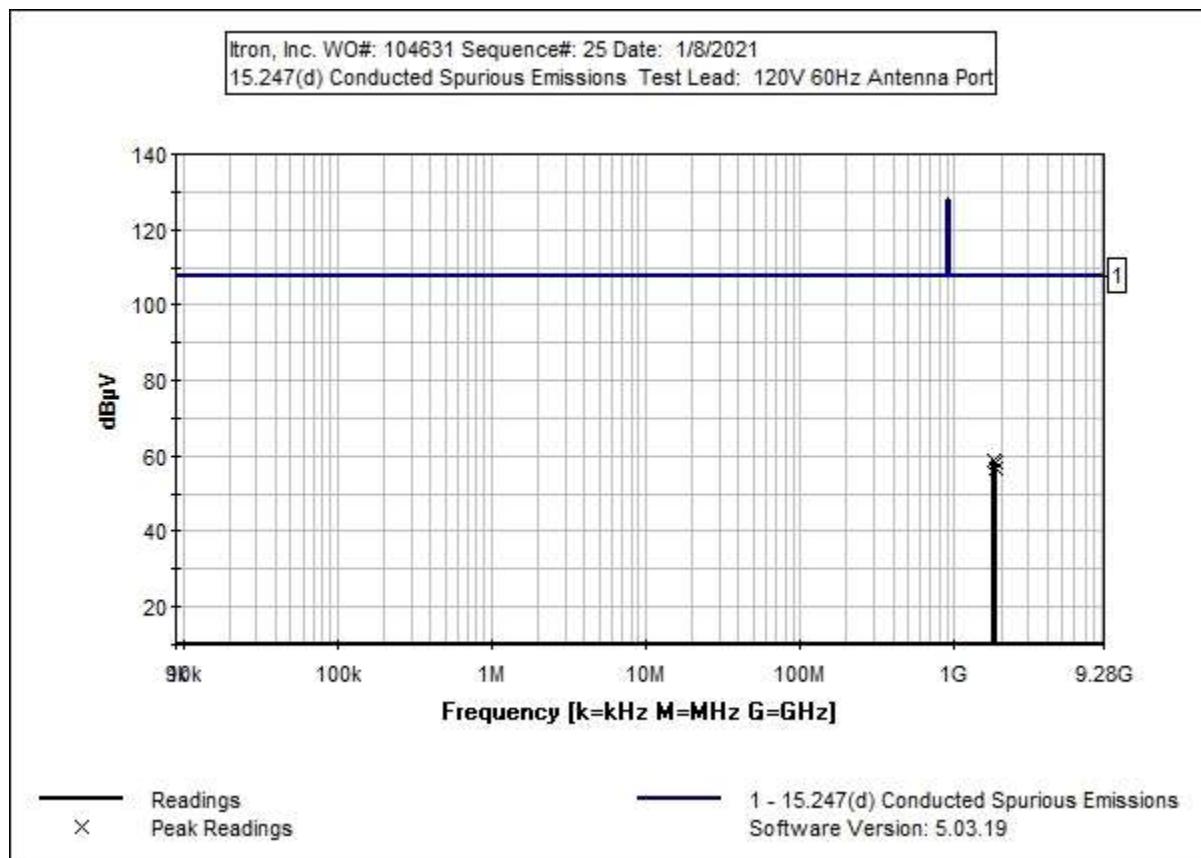
Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions: Temperature: 23°C Relative Humidity: 41% Pressure: 101.6kPa
Test Method: ANSI C63.10 (2013) KDB 558074 v05r02:04/02/2019
Frequency Range: 902-928MHz
Test Setup: The equipment under test (EUT) is setup for direct antenna port measurements. The EUT is transmitting continuous wave at its rated output power. Note: All modulations and baud rates were checked, worst case provided. OFDM Modulation


Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05748	Attenuator	PE7004-20	3/4/2020	3/4/2022
T2	ANP06007	Cable	Heliax	1/20/2020	1/20/2022
	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021

Measurement Data: Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dB μ V	T1 dB	T2 dB	dB	Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant
1	1805.000M	38.4	+20.0	+0.6		+0.0	59.0	107.7	-48.7	Anten
2	1825.000M	37.8	+20.0	+0.6		+0.0	58.4	107.7	-49.3	Anten
3	1855.000M	36.2	+20.0	+0.7		+0.0	56.9	107.7	-50.8	Anten

Band Edge

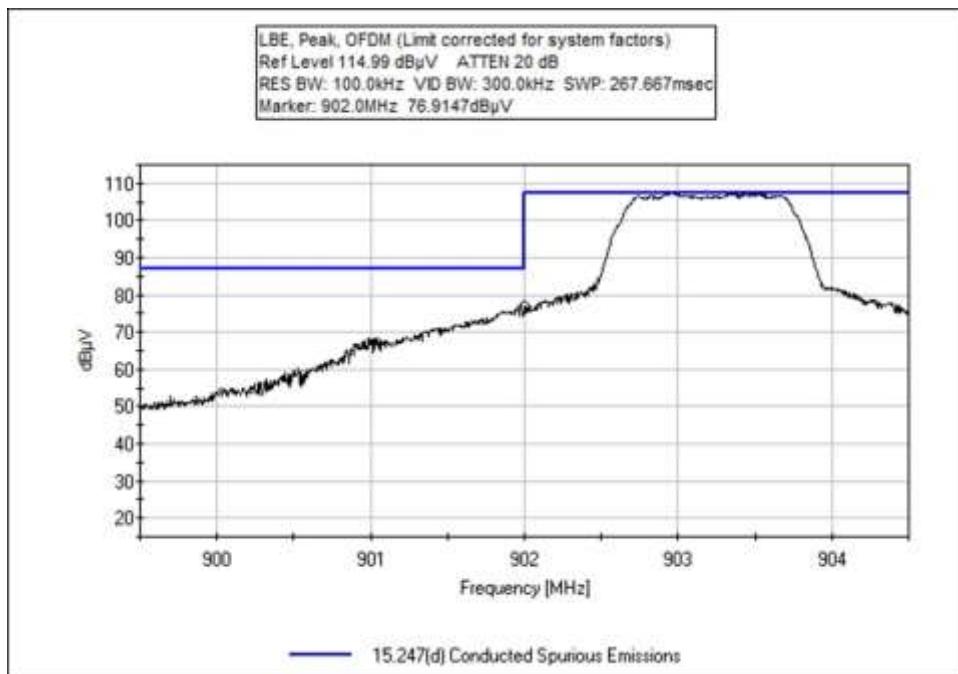
Band Edge Summary

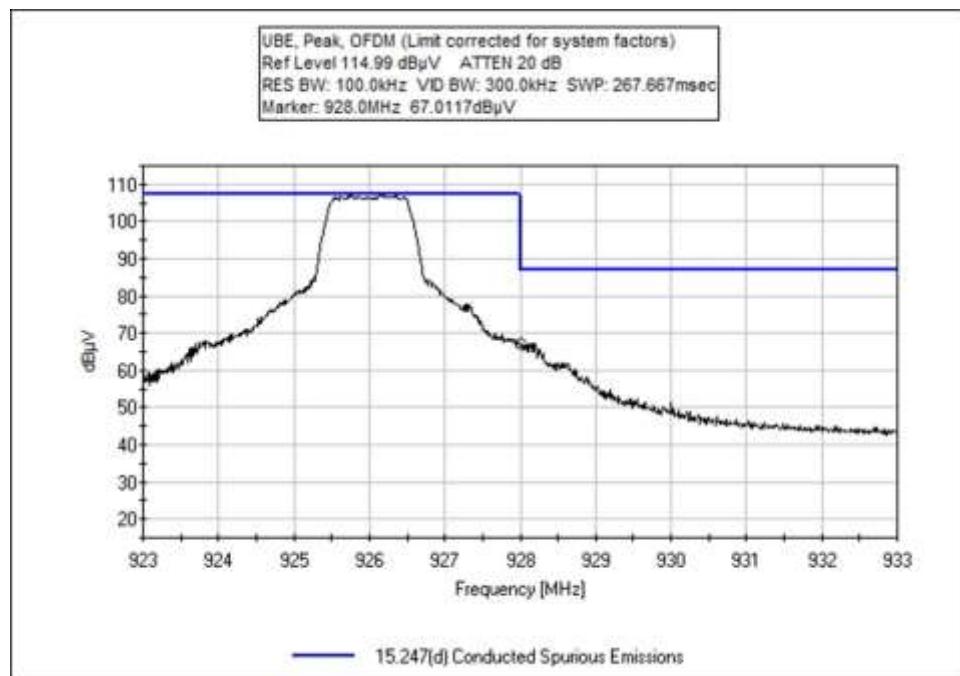
Limit applied: Max Power/100kHz - 20dB.

Frequency (MHz)	Modulation	Measured (dB μ V)	Limit (dB μ V)	Results
902	OFDM	97.4	< 107.7	Pass
928	OFDM	87.5	< 107.7	Pass

Note: All modulations and baud rates were checked, worst case provided.

Band Edge Plots





Test Setup / Conditions / Data

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)
 Customer: **Itron, Inc.**
 Specification: **15.247(d) Conducted Spurious Emissions**
 Work Order #: **104631** Date: 1/8/2021
 Test Type: **Conducted Emissions** Time: 08:58:42
 Tested By: Matt Harrison Sequence#: 20
 Software: EMITest 5.03.19 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions:
Temperature: 23°C
Relative Humidity: 41%
Pressure: 101.6kPa
Test Method: ANSI C63.10 (2013) KDB 558074 v05r02:04/02/2019
Frequency Range: 902-928MHz
Test Setup: The equipment under test (EUT) is setup for direct antenna port measurements. The EUT is transmitting continuous wave at its rated output power.
Note: All modulations and baud rates were checked, worst case provided

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05748	Attenuator	PE7004-20	3/4/2020	3/4/2022
T2	ANP06007	Cable	Heliax	1/20/2020	1/20/2022
	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021

Measurement Data:

#	Freq MHz	Rdng dB μ V	Reading listed by margin.			Test Lead: Antenna Port				
			T1 dB	T2 dB	Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant	
1	902.965M	107.2	+20.0	+0.5		+0.0	127.7	127.7	+0.0	Anten
2	902.000M	76.9	+20.0	+0.5		+0.0	97.4	107.7	-10.3	Anten
3	928.000M	67.0	+20.0	+0.5		+0.0	87.5	107.7	-20.2	Anten

Test Setup Photo(s)



15.247(d) Radiated Emissions & Band Edge

Test Setup / Conditions / Data

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **104631** Date: 1/7/2021
 Test Type: **Radiated Scan** Time: 14:32:49
 Tested By: Matt Harrison Sequence#: 4
 Software: EMITest 5.03.19

Equipment Tested:

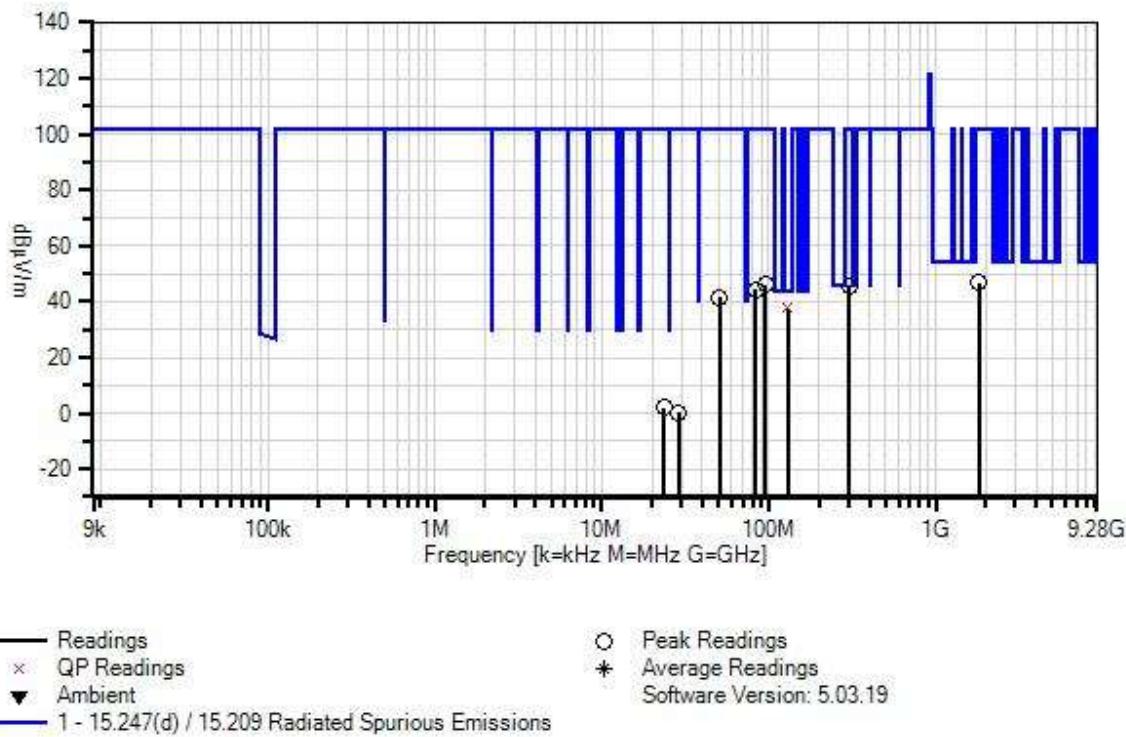
Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions: Temperature: 23°C Relative Humidity: 41% Pressure: 101.6kPa
Test Method: ANSI C63.10 (2013) KDB 558074 v05r02:04/02/2019
Frequency Range: 9kHz-9.28GHz
<p>Test Setup: The equipment under test (EUT) is placed on the tabletop. The EUT is transmitting continuous wave at its rated output power. Low, Mid, High channels investigated, worst case reported. Horizontal and Vertical antenna polarities investigated above 30MHz, worst case reported. 3 x orthogonal axes investigated below 30MHz, worst case reported.</p> <p>Note: All modulations and baud rates were checked, worst case provided.</p> <p>OFDM Modulation</p>

Itron, Inc. WO#: 104631 Sequence#: 4 Date: 1/7/2021
 15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Perp/Para

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T1	AN03540	Preamp	83017A	5/13/2019	5/13/2021
T2	AN01467	Horn Antenna- ANSI C63.5 Calibration	3115	7/5/2019	7/5/2021
T3	ANP06243	Attenuator	54A-10	1/27/2020	1/27/2022
T4	ANP06515	Cable	Heliax	7/1/2020	7/1/2022
T5	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T6	ANP07505	Cable	CLU40-KMKM- 02.00F	1/17/2019	1/17/2021
T7	AN03170	High Pass Filter	HM1155-11SS	10/23/2019	10/23/2021
T8	AN03628	Biconilog Antenna	3142E	6/11/2019	6/11/2021
T9	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T10	ANP05305	Cable	ETSI-50T	9/6/2019	9/6/2021
T11	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T12	AN00052	Loop Antenna	6502	5/4/2020	5/4/2022

Measurement Data:			Reading listed by margin.				Test Distance: 3 Meters				
#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7	T8					
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	129.813M	22.7	+0.0	+0.0	+0.0	+0.0	+0.0	37.8	43.5	-5.7	Vert/
	QP		+0.1	+0.0	+0.0	+8.0					
		+5.8	+0.5	+0.7	+0.0						
^	129.813M	26.1	+0.0	+0.0	+0.0	+0.0	+0.0	41.2	43.5	-2.3	Vert/
			+0.1	+0.0	+0.0	+8.0					
		+5.8	+0.5	+0.7	+0.0						
3	1802.380M	42.1	-34.8	+26.0	+10.0	+2.3	+0.0	46.8	101.8	-55.0	Vert/
			+0.5	+0.2	+0.5	+0.0					
		+0.0	+0.0	+0.0	+0.0						
4	96.000M	31.5	+0.0	+0.0	+0.0	+0.0	+0.0	46.2	101.8	-55.6	Vert/
			+0.1	+0.0	+0.0	+7.7					
		+5.8	+0.5	+0.6	+0.0						
5	302.600M	24.6	+0.0	+0.0	+0.0	+0.0	+0.0	45.8	101.8	-56.0	Vert/
			+0.2	+0.0	+0.0	+13.2					
		+5.8	+0.9	+1.1	+0.0						
6	83.400M	30.7	+0.0	+0.0	+0.0	+0.0	+0.0	44.3	101.8	-57.5	Vert/
			+0.1	+0.0	+0.0	+6.8					
		+5.8	+0.4	+0.5	+0.0						
7	50.400M	27.6	+0.0	+0.0	+0.0	+0.0	+0.0	41.6	101.8	-60.2	Vert/
			+0.1	+0.0	+0.0	+7.3					
		+5.8	+0.4	+0.4	+0.0						
8	98.535k	36.8	+0.0	+0.0	+0.0	+0.0	-80.0	-33.6	27.7	-61.3	Perp/
			+0.0	+0.0	+0.0	+0.0					
		+0.0	+0.0	+0.0	+9.6						
9	23.433M	15.1	+0.0	+0.0	+0.0	+0.2	-20.0	2.1	101.8	-99.7	Perp/
			+0.1	+0.0	+0.0	+0.0					
		+0.0	+0.0	+0.0	+6.7						
10	28.806M	15.2	+0.0	+0.0	+0.0	+0.3	-20.0	0.3	101.8	-101.5	Perp/
			+0.1	+0.0	+0.0	+0.0					
		+0.0	+0.0	+0.0	+4.7						

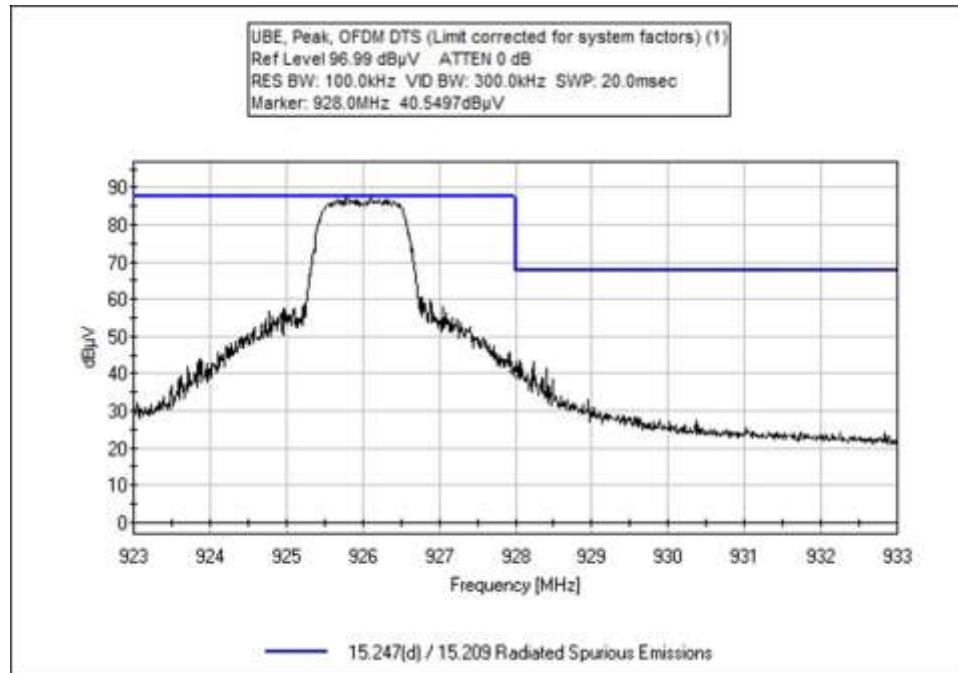
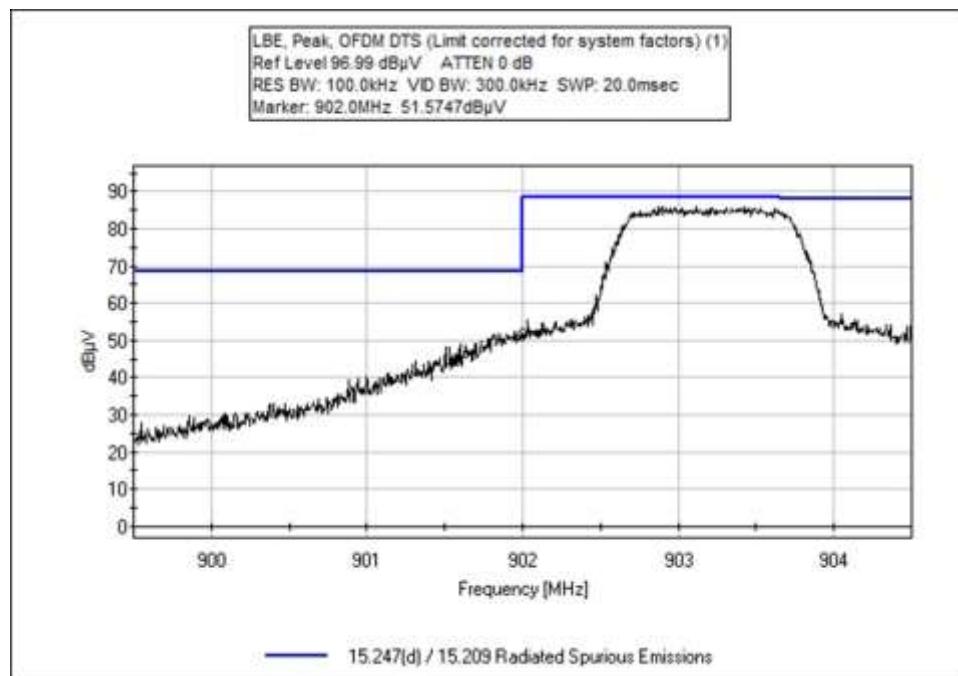
Band Edge

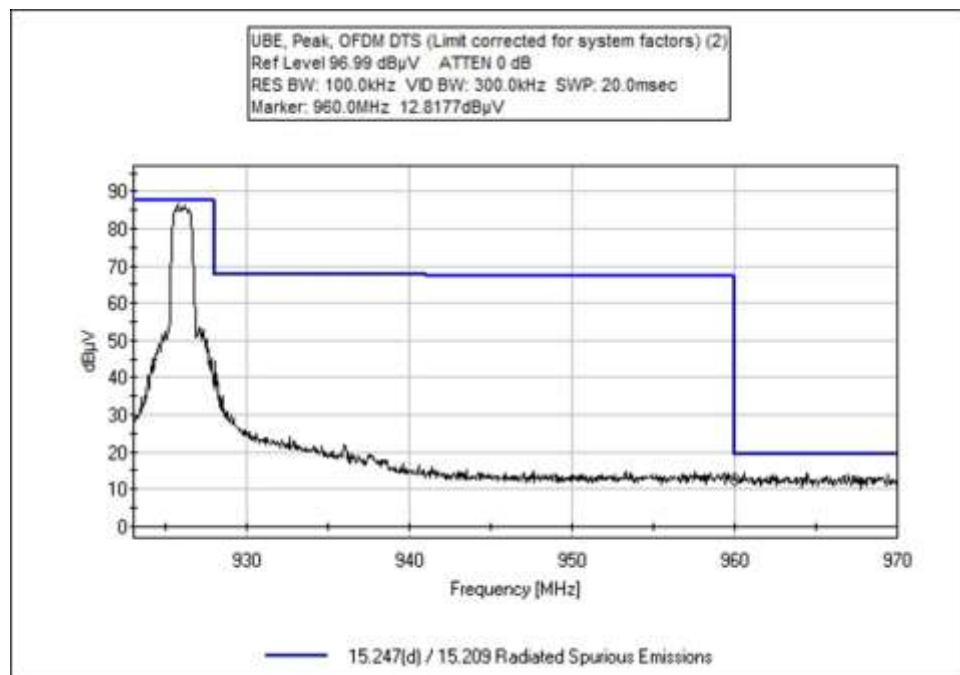
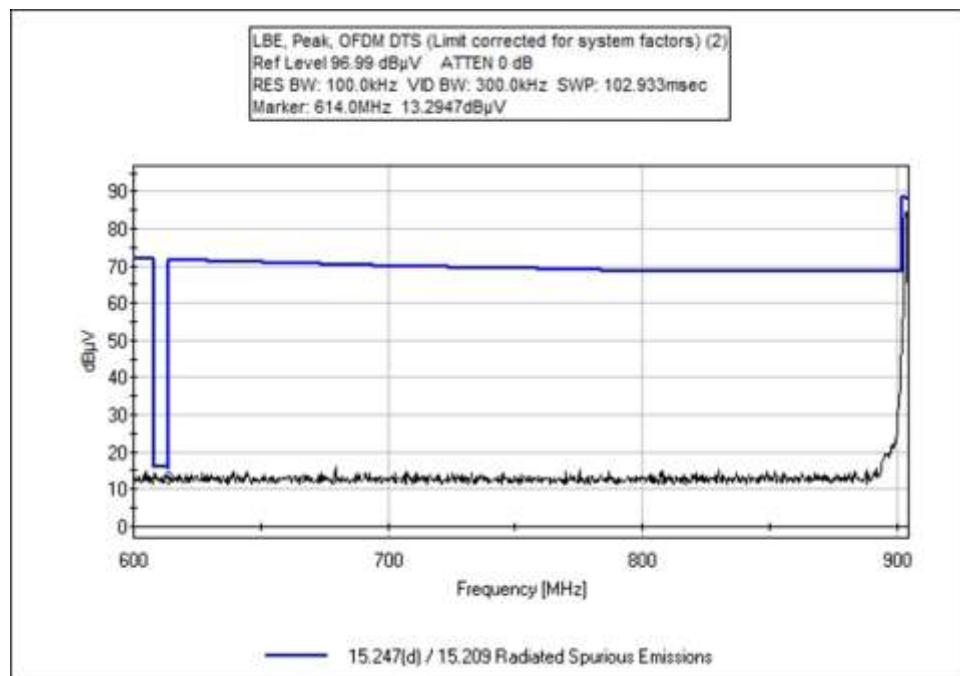
Band Edge Summary

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	OFDM	Omnidirectional / 2.6dBi	39.7	<46	Pass
902	OFDM	Omnidirectional / 2.6dBi	85	< 101.8	Pass
928	OFDM	Omnidirectional / 2.6dBi	74.6	< 101.8	Pass
960	OFDM	Omnidirectional / 2.6dBi	47.3	<54	Pass

Note: All modulations and baud rates were checked, worst case provided.

Band Edge Plots





Test Setup / Conditions / Data

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **104631** Date: 1/7/2021
 Test Type: **Radiated Scan** Time: 11:29:59
 Tested By: Matt Harrison Sequence#: 5
 Software: EMITest 5.03.19

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions:
Temperature: 23°C
Relative Humidity: 41%
Pressure: 101.6kPa
Test Method: ANSI C63.10 (2013) KDB 558074 v05r02:04/02/2019
Frequency Range: 600-970MHz
Test Setup: The equipment under test (EUT) is placed on the tabletop. The EUT is transmitting continuous wave at its rated output power. Low, Mid, High channels investigated, worst case reported. Horizontal and Vertical antenna polarities investigated above 30MHz, worst case reported. 3 x orthogonal axes investigated below 30MHz, worst case reported.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03628	Biconilog Antenna	3142E	6/11/2019	6/11/2021
T2	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T3	ANP05305	Cable	ETSI-50T	9/6/2019	9/6/2021
T4	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T5	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T6	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021

Measurement Data:			Reading listed by margin.				Test Distance: 3 Meters				
#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6			Table	dB μ V/m	dB μ V/m		
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m		Ant
1	925.780M	87.8	+24.1 +0.4	+5.8 +0.0	+1.5	+2.2	+0.0	121.8 SC	121.8	+0.0	Vert/
2	614.000M QP	9.5	+21.2 +0.3	+5.8 +0.0	+1.2	+1.7	+0.0	39.7 SC	46.0	-6.3	Vert/
^	614.000M	13.3	+21.2 +0.3	+5.8 +0.0	+1.2	+1.7	+0.0	43.5 SC	46.0	-2.5	Vert/
4	960.000M	12.8	+24.6 +0.4	+5.8 +0.0	+1.5	+2.2	+0.0	47.3 SC	54.0	-6.7	Vert/
5	902.000M	51.6	+23.8 +0.3	+5.8 +0.0	+1.4	+2.1	+0.0	85.0 SC	101.8	-16.8	Vert/
6	928.000M	40.5	+24.2 +0.4	+5.8 +0.0	+1.5	+2.2	+0.0	74.6	101.8	-27.2	Vert/

Test Setup Photo(s)



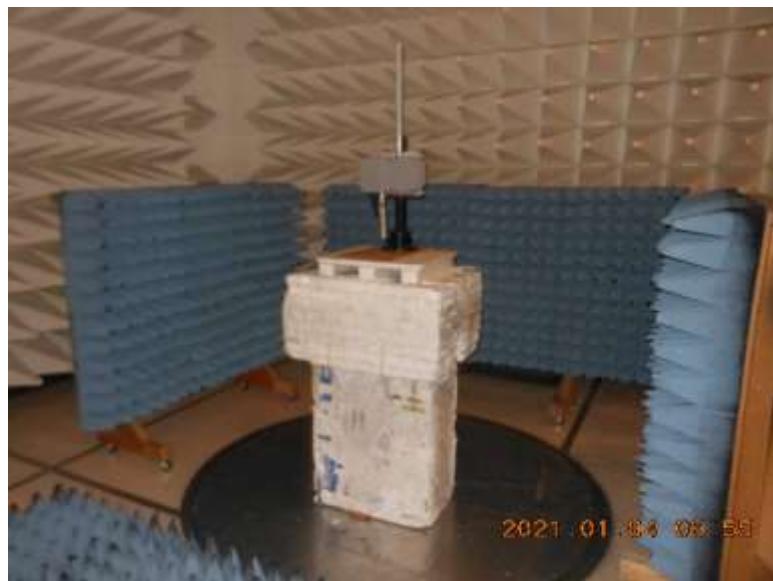
Below 1GHz



Below 1GHz



Above 1GHz



Above 1GHz

15.207 AC Conducted Emissions

Test Setup / Conditions / Data

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)
 Customer: **Itron, Inc.**
 Specification: **15.207 AC Mains - Average**
 Work Order #: **104631** Date: 1/7/2021
 Test Type: **Conducted Emissions** Time: 16:10:42
 Tested By: Matt Harrison Sequence#: 18
 Software: EMITest 5.03.19 120V 60Hz

Equipment Tested:

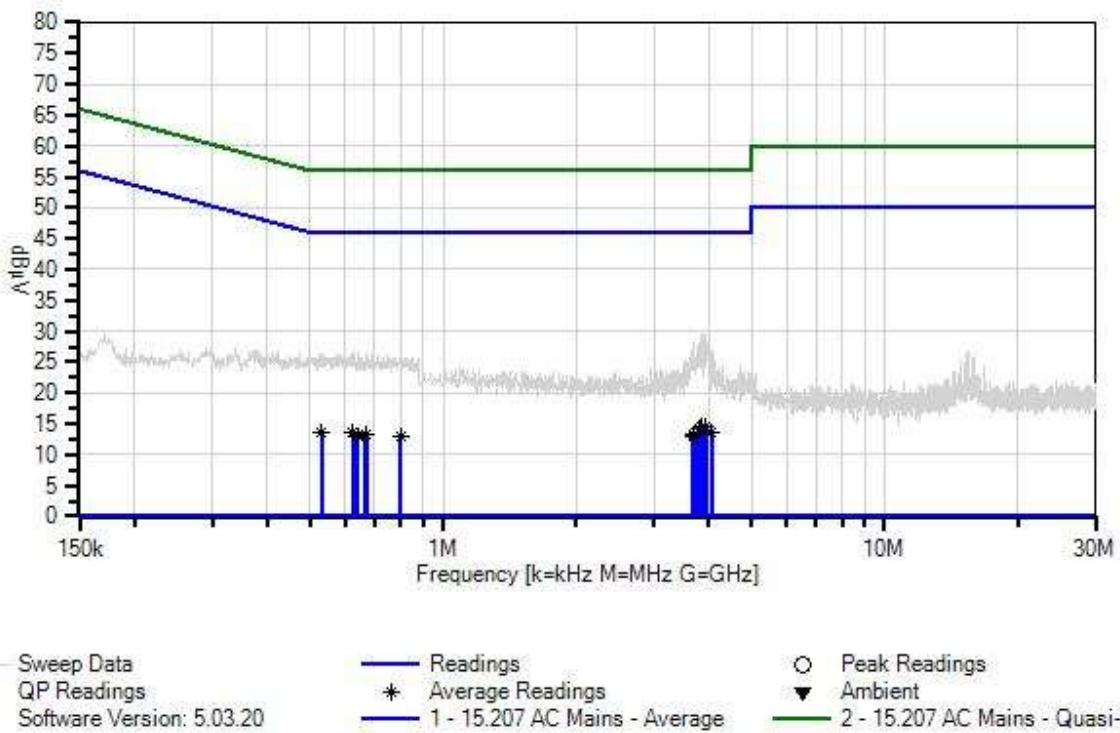
Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions:
Temperature: 23°C
Relative Humidity: 41%
Pressure: 101.6kPa
Test Method: ANSI C63.10 (2013)
Frequency Range: 600-970MHz
Test Setup: The equipment under test (EUT) is placed on the tabletop. The EUT is transmitting continuous wave at its rated output power. Low, Mid, High channels investigated, worst case reported. Horizontal and Vertical antenna polarities investigated above 30MHz, worst case reported. 3 x orthogonal axes investigated below 30MHz, worst case reported.

Itron, Inc. WO#: 104631 Sequence#: 18 Date: 1/7/2021
 15.207 AC Mains - Average Test Lead: 120V 60Hz Line

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06219	Attenuator	768-10	4/7/2020	4/7/2022
T2	ANP06515	Cable	Heliax	7/1/2020	7/1/2022
T3	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T4	AN01311	50uH LISN-Line1 (L)	3816/2	2/24/2020	2/24/2022
	AN01311	50uH LISN-Line2 (N)	3816/2	2/24/2020	2/24/2022
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T5	AN02611	High Pass Filter	HE9615-150K-50-720B	1/10/2020	1/10/2022

Measurement Data:			Reading listed by margin.				Test Lead: Line					
#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar	
			MHz	dB μ V	dB	dB	dB	Table	dB μ V	dB μ V	dB	Ant
1	3.935M	5.1	+9.1 +0.1	+0.1	+0.0	-0.3	+0.0	14.7	46.0	-31.3	Line	
Ave												
^	3.935M	19.6	+9.1 +0.1	+0.1	+0.0	-0.3	+0.0	29.2	46.0	-16.8	Line	
3	3.909M	5.0	+9.1 +0.1	+0.1	+0.0	-0.3	+0.0	14.6	46.0	-31.4	Line	
Ave												
^	3.909M	20.6	+9.1 +0.1	+0.1	+0.0	-0.3	+0.0	30.2	46.0	-15.8	Line	
5	3.858M	4.9	+9.1 +0.1	+0.1	+0.0	-0.3	+0.0	14.5	46.0	-31.5	Line	
Ave												
^	3.858M	20.6	+9.1 +0.1	+0.1	+0.0	-0.3	+0.0	30.2	46.0	-15.8	Line	
7	3.841M	4.8	+9.1 +0.1	+0.1	+0.0	-0.3	+0.0	14.4	46.0	-31.6	Line	
Ave												
^	3.841M	18.6	+9.1 +0.1	+0.1	+0.0	-0.3	+0.0	28.2	46.0	-17.8	Line	
9	3.803M	4.7	+9.1 +0.1	+0.1	+0.0	-0.3	+0.0	14.3	46.0	-31.7	Line	
Ave												
^	3.803M	19.2	+9.1 +0.1	+0.1	+0.0	-0.3	+0.0	28.8	46.0	-17.2	Line	
11	3.790M	4.6	+9.1 +0.1	+0.1	+0.0	-0.3	+0.0	14.2	46.0	-31.8	Line	
Ave												
^	3.790M	18.6	+9.1 +0.1	+0.1	+0.0	-0.3	+0.0	28.2	46.0	-17.8	Line	
13	4.058M	3.9	+9.1 +0.1	+0.1	+0.0	-0.4	+0.0	13.6	46.0	-32.4	Line	
Ave												
^	4.058M	18.1	+9.1 +0.1	+0.1	+0.0	-0.4	+0.0	27.8	46.0	-18.2	Line	
15	531.782k	3.8	+9.1 +0.3	+0.0	+0.0	-0.4	+0.0	13.6	46.0	-32.4	Line	
Ave												
^	531.782k	17.5	+9.1 +0.3	+0.0	+0.0	-0.4	+0.0	27.3	46.0	-18.7	Line	
17	623.410k	3.7	+9.1 +0.3	+0.0	+0.0	-0.4	+0.0	13.5	46.0	-32.5	Line	
Ave												
^	623.410k	17.6	+9.1 +0.3	+0.0	+0.0	-0.4	+0.0	27.4	46.0	-18.6	Line	
19	669.951k	3.5	+9.1 +0.3	+0.0	+0.0	-0.4	+0.0	13.3	46.0	-32.7	Line	
Ave												
20	666.315k	3.5	+9.1 +0.3	+0.0	+0.0	-0.4	+0.0	13.3	46.0	-32.7	Line	
Ave												
^	666.315k	17.4	+9.1 +0.3	+0.0	+0.0	-0.4	+0.0	27.2	46.0	-18.8	Line	
^	669.951k	17.4	+9.1 +0.3	+0.0	+0.0	-0.4	+0.0	27.2	46.0	-18.8	Line	
23	3.697M	3.6	+9.1 +0.1	+0.1	+0.0	-0.3	+0.0	13.2	46.0	-32.8	Line	
Ave												
^	3.697M	17.7	+9.1 +0.1	+0.1	+0.0	-0.3	+0.0	27.3	46.0	-18.7	Line	

25	3.684M	3.5	+9.1 +0.1	+0.1	+0.0	-0.3	+0.0	13.1	46.0	-32.9	Line
Ave											
^	3.684M	19.3	+9.1 +0.1	+0.1	+0.0	-0.3	+0.0	28.9	46.0	-17.1	Line
27	800.121k	3.4	+9.1 +0.2	+0.0	+0.0	-0.3	+0.0	13.0	46.0	-33.0	Line
Ave											
^	800.121k	17.4	+9.1 +0.2	+0.0	+0.0	-0.3	+0.0	27.0	46.0	-19.0	Line
29	641.590k	3.1	+9.1 +0.3	+0.0	+0.0	-0.4	+0.0	12.9	46.0	-33.1	Line
Ave											
^	641.590k	17.7	+9.1 +0.3	+0.0	+0.0	-0.4	+0.0	27.5	46.0	-18.5	Line



Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)
Customer: **Itron, Inc.**
Specification: **15.207 AC Mains - Average**
Work Order #: **104631** Date: 1/7/2021
Test Type: **Conducted Emissions** Time: 16:22:51
Tested By: Matt Harrison Sequence#: 19
Software: EMITest 5.03.19 120V 60Hz

Equipment Tested:

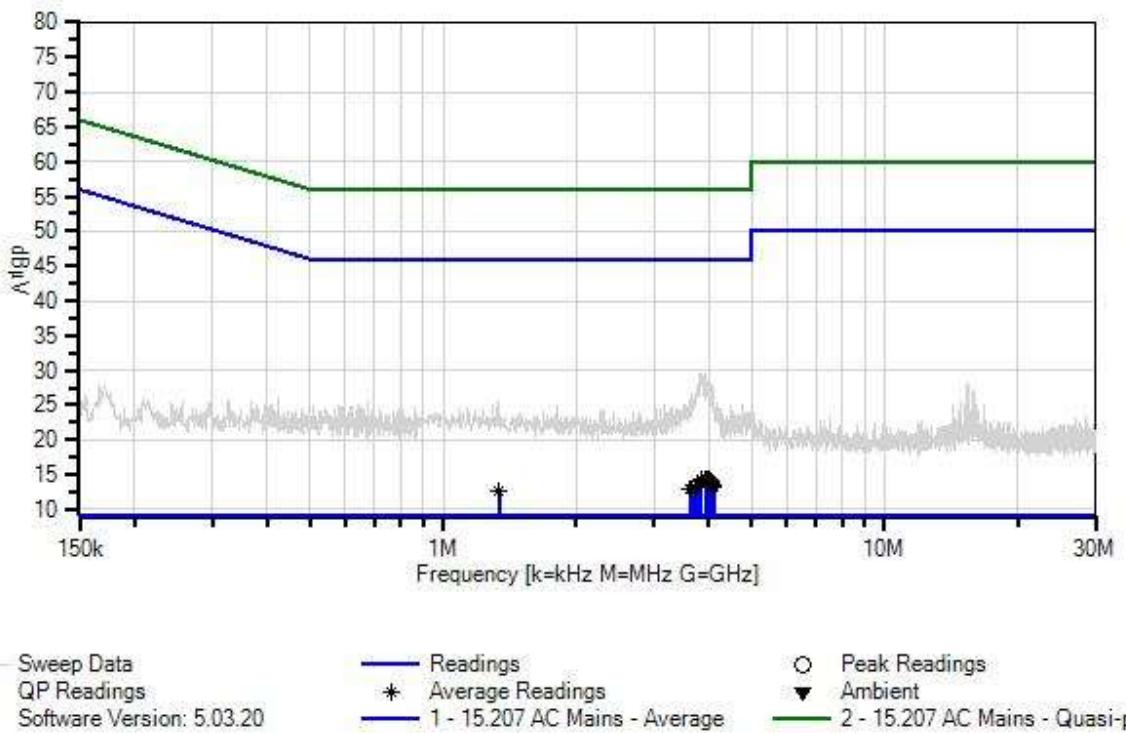
Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions; Temperature: 23°C Relative Humidity: 41% Pressure: 101.6kPa
Test Method: ANSI C63.10 (2013)
Frequency Range: 600-970MHz
Test Setup: The equipment under test (EUT) is placed on the tabletop. The EUT is transmitting continuous wave at its rated output power. Low, Mid, High channels investigated, worst case reported. Horizontal and Vertical antenna polarities investigated above 30MHz, worst case reported. 3 x orthogonal axes investigated below 30MHz, worst case reported.

Itron, Inc. WO#: 104631 Sequence#: 19 Date: 1/7/2021
 15.207 AC Mains - Average Test Lead: 120V 60Hz Neutral

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06219	Attenuator	768-10	4/7/2020	4/7/2022
T2	ANP06515	Cable	Heliax	7/1/2020	7/1/2022
T3	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
	AN01311	50uH LISN-Line1 (L)	3816/2	2/24/2020	2/24/2022
T4	AN01311	50uH LISN-Line2 (N)	3816/2	2/24/2020	2/24/2022
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T5	AN02611	High Pass Filter	HE9615-150K-50-720B	1/10/2020	1/10/2022

Measurement Data:			Reading listed by margin.				Test Lead: Neutral				
#	Freq MHz	Rdng dB μ V	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar
1	3.829M Ave	4.9 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	14.5	46.0	-31.5	Neutr
^	3.829M	20.6 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	30.2	46.0	-15.8	Neutr
3	3.977M Ave	4.7 +0.1	+9.1	+0.1	+0.0	-0.4	+0.0	14.4	46.0	-31.6	Neutr
^	3.977M	19.7 +0.1	+9.1	+0.1	+0.0	-0.4	+0.0	29.4	46.0	-16.6	Neutr
5	4.007M Ave	4.7 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	14.3	46.0	-31.7	Neutr
^	4.007M	20.2 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	29.8	46.0	-16.2	Neutr
7	3.939M Ave	4.5 +0.1	+9.1	+0.1	+0.0	-0.4	+0.0	14.2	46.0	-31.8	Neutr
^	3.939M	20.6 +0.1	+9.1	+0.1	+0.0	-0.4	+0.0	30.3	46.0	-15.7	Neutr
9	4.045M Ave	4.4 +0.1	+9.1	+0.1	+0.0	-0.4	+0.0	14.1	46.0	-31.9	Neutr
10	4.054M Ave	4.3 +0.1	+9.1	+0.1	+0.0	-0.4	+0.0	14.0	46.0	-32.0	Neutr
^	4.054M	19.3 +0.1	+9.1	+0.1	+0.0	-0.4	+0.0	29.0	46.0	-17.0	Neutr
^	4.045M	18.8 +0.1	+9.1	+0.1	+0.0	-0.4	+0.0	28.5	46.0	-17.5	Neutr
13	4.067M Ave	4.0 +0.1	+9.1	+0.1	+0.0	-0.4	+0.0	13.7	46.0	-32.3	Neutr
^	4.067M	18.1 +0.1	+9.1	+0.1	+0.0	-0.4	+0.0	27.8	46.0	-18.2	Neutr
15	4.080M Ave	3.9 +0.1	+9.1	+0.1	+0.0	-0.4	+0.0	13.6	46.0	-32.4	Neutr
^	4.080M	17.8 +0.1	+9.1	+0.1	+0.0	-0.4	+0.0	27.5	46.0	-18.5	Neutr
17	3.752M Ave	4.0 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	13.6	46.0	-32.4	Neutr
^	3.752M	18.9 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	28.5	46.0	-17.5	Neutr
19	4.097M Ave	3.5 +0.1	+9.1	+0.1	+0.0	-0.4	+0.0	13.2	46.0	-32.8	Neutr
^	4.097M	18.8 +0.1	+9.1	+0.1	+0.0	-0.4	+0.0	28.5	46.0	-17.5	Neutr
21	3.714M Ave	3.6 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	13.2	46.0	-32.8	Neutr
^	3.714M	17.7 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	27.3	46.0	-18.7	Neutr
23	3.658M Ave	3.4 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	13.0	46.0	-33.0	Neutr
^	3.658M	17.8 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	27.4	46.0	-18.6	Neutr

25	3.620M	3.3	+9.1	+0.1	+0.0	-0.3	+0.0	12.9	46.0	-33.1	Neutr
Ave			+0.1								
^	3.620M	17.0	+9.1	+0.1	+0.0	-0.3	+0.0	26.6	46.0	-19.4	Neutr
			+0.1								
27	3.646M	3.3	+9.1	+0.1	+0.0	-0.3	+0.0	12.9	46.0	-33.1	Neutr
Ave			+0.1								
^	3.646M	16.7	+9.1	+0.1	+0.0	-0.3	+0.0	26.3	46.0	-19.7	Neutr
			+0.1								
29	1.336M	3.1	+9.1	+0.0	+0.0	-0.3	+0.0	12.7	46.0	-33.3	Neutr
Ave			+0.2								
^	1.336M	16.5	+9.1	+0.0	+0.0	-0.3	+0.0	26.1	46.0	-19.9	Neutr
			+0.2								

Test Setup Photo(s)



SUPPLEMENTAL INFORMATION

Measurement Uncertainty

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

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

Emissions Test Details

TESTING PARAMETERS

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

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

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

CORRECTION FACTORS

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

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

TEST INSTRUMENTATION AND ANALYZER SETTINGS

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

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

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

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

Peak

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

Quasi-Peak

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

Average

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