Itron, Inc.

REVISED TEST REPORT TO 105379-15

Itron Cellular 500G Module
Model: 500GAC

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.249

Report No.: 105379-15A

Date of issue: August 18, 2021

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

TABLE OF CONTENTS

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

REPORT PREPARED BY:

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

Project Number: 105379

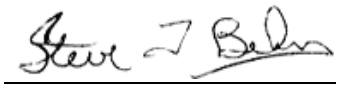
DATE OF EQUIPMENT RECEIPT: May 11, 2021
DATE(S) OF TESTING: May 11, 14, 18, and 27, 2021

Revision History

Original: Testing of the Itron Cellular 500G Module, Model: 500GAC to FCC Part 15 Subpart C Section(s) 15.249.
Revision A: Added statement to the Conditions During Test table to clarify the orientation of the EUT during testing.

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 - 15.249

Test Procedure	Description	Modifications*	Results
15.215(c)	Occupied Bandwidth	NA	PASS
15.249(a)	Field Strength of Fundamental	NA	PASS
15.249(a)	Field Strength of Spurious Emissions	NA	PASS
15.207	AC Conducted Emissions	NA	NA1

NA = Not Applicable

NA = Not applicable because the manufacturer declares the EUT is battery powered.

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

Support Equipment:

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:

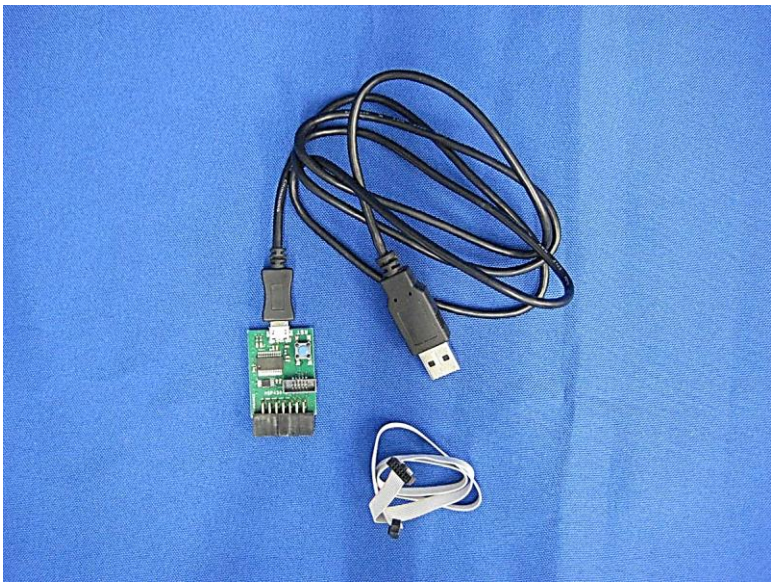
Device	Manufacturer	Model #	S/N
USB to Serial Interface	Itron, Inc.	NA	NA
Laptop Computer	Dell	Latitude E6410	46TXXNI

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Modulation Type(s):	OOK 16.384kbps
Maximum Duty Cycle:	100%
Antenna Type(s) and Gain:	PCB Trace/ 0.9dBi
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)

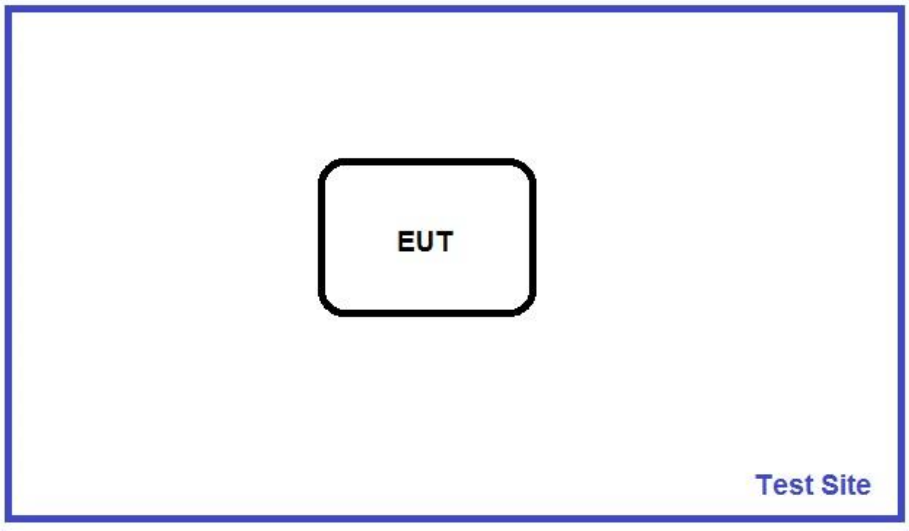


USB to Serial Interface

Laptop Computer and Power Supply

Block Diagram of Test Setup(s)

Test Setup Block Diagram



FCC Part 15 Subpart C

15.215(c) Occupied Bandwidth (20dB BW)

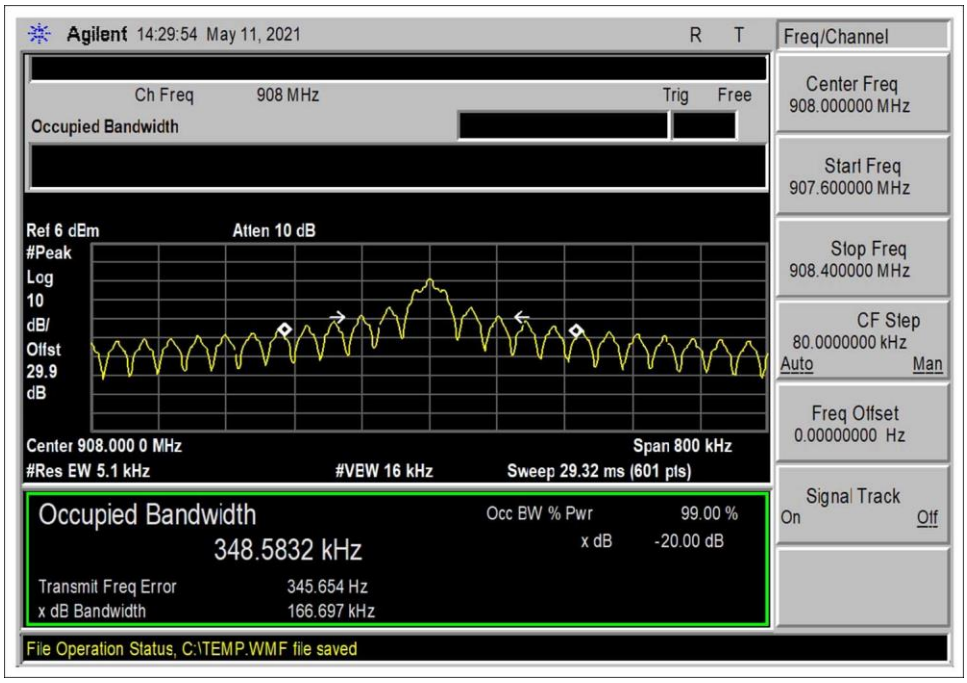
Test Setup/Conditions			
Test Location:	Brea Lab D	Test Engineer:	S. Yamamoto
Test Method:	ANSI C63.10 (2013)	Test Date(s):	5/11/2021
Configuration:	1		

Environmental Conditions			
Temperature (ºC)	21	Relative Humidity (%):	50

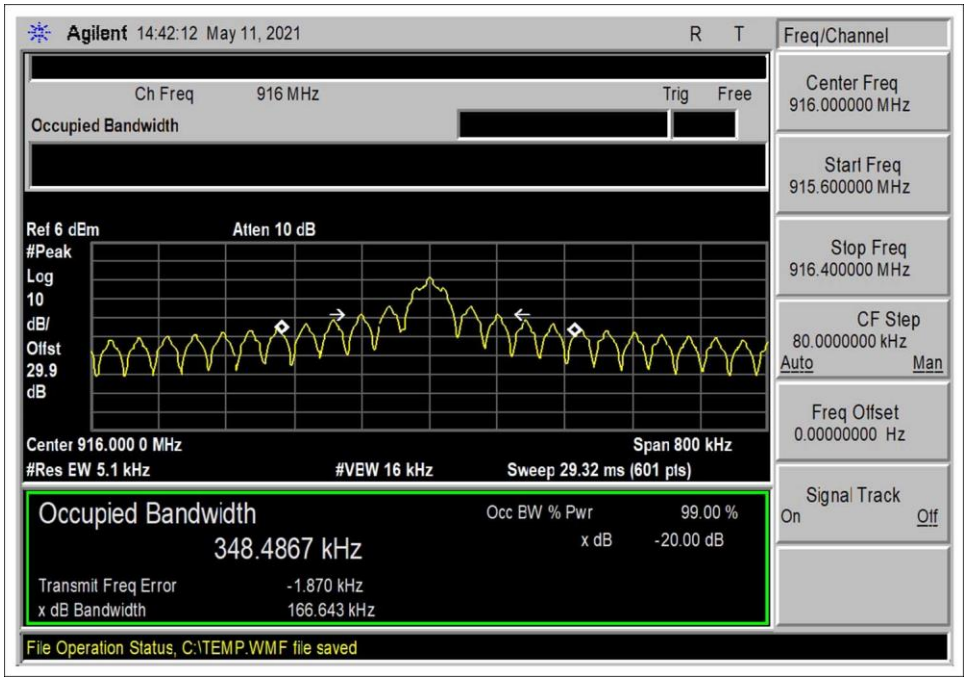
Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02869	Spectrum Analyzer	Agilent	E4440A	8/3/2020	8/3/2021
03432	Attenuator	Aeroflex/Weinschel	90-30-34	10/22/2019	10/22/2021
P07656	Cable	Astrolab, Inc.	32022-29094K-29094K-24TC	7/30/2020	7/30/2022

Test Data Summary					
Frequency (MHz)	**Antenna Port**	**Modulation**	**Measured (kHz)**	**Limit (kHz)**	**Results**
908.0	1	OOK 16.384kbps (PL0)	166.697	None	NA
916.0	1	OOK 16.384kbps (PL0)	166.643	None	NA
923.8	1	OOK 16.384kbps (PL0)	166.763	None	NA

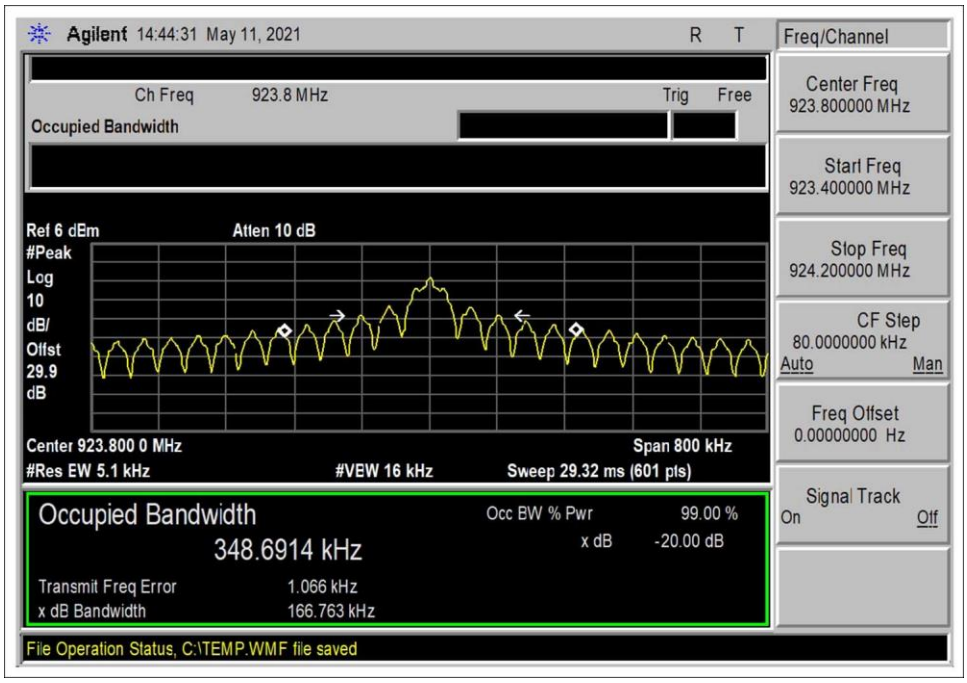
Plot(s)



Low Channel

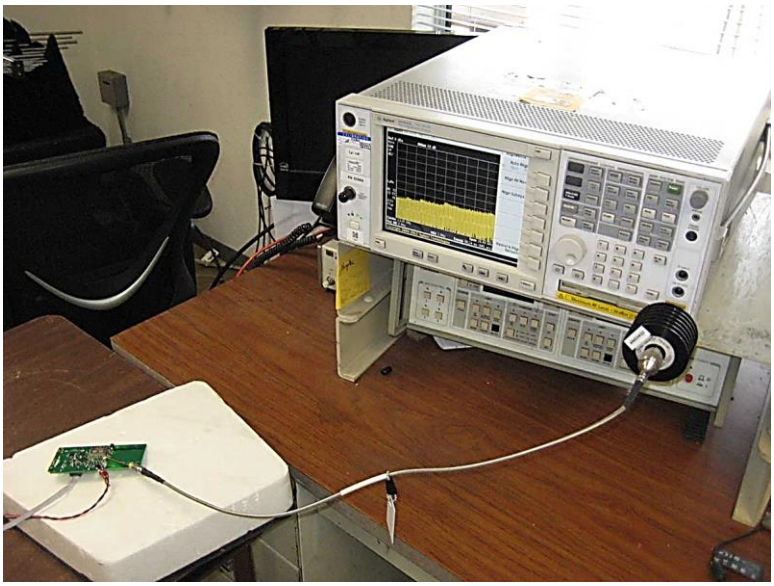


Middle Channel



High Channel

Test Setup Photo(s)



15.249(a) Field Strength of Fundamental

Test Setup / Conditions / Data

Test Location:	CKC Laboratories Inc. • 110 N Olinda Pl • Brea CA 92823 • 714-993-6112		
Customer:	**Itron, Inc.**		
Specification:	**15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**		
Work Order #:	**105379**	Date:	5/14/2021
Test Type:	**Maximized Emissions**	Time:	16:28:55
Tested By:	S. Yamamoto	Sequence#:	16
Software:	EMITest 5.03.19		

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 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.

Once the parameters have been set, the support equipment is removed from the EUT.

Frequency range of test: 908.0MHz to 923.8MHz.

Test Channels:
Low Channel 908.0MHz
Middle Channel 916.0MHz
High Channel 923.8MHz

RBW=100kHz, VBW=300kHz

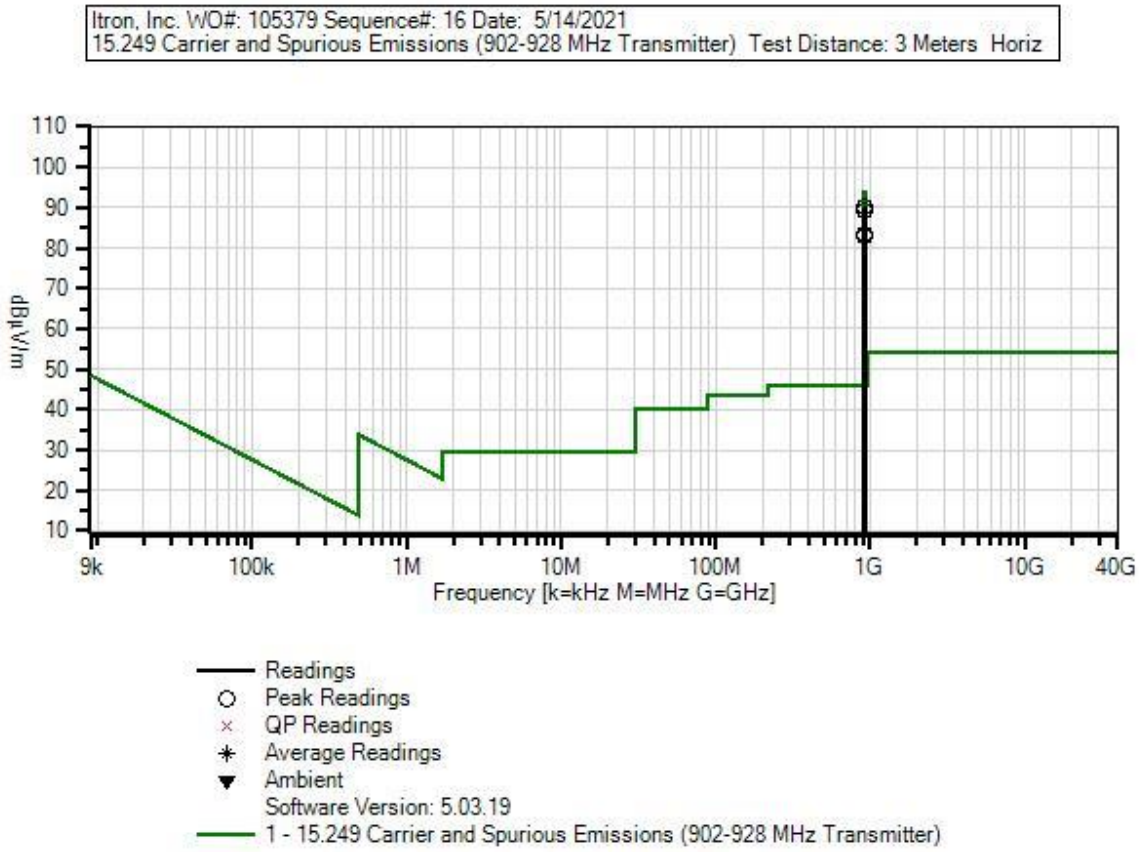
Output level 0 OOK

Test Environment Conditions:
Temperature: 23°C
Humidity: 47%
Pressure: 99kPa

Site D

The EUT is powered from a new 3.6V lithium battery

Test Method: 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	ANP04382	Cable	LDF-50	5/15/2020	5/15/2022
T3	ANP05569	Cable-Amplitude +15C to +45C (dB)	RG-214/U	12/14/2020	12/14/2022
T4	ANP05283	Attenuator	ATT-0218-06-NNN-02	3/26/2020	3/26/2022
T5	AN01994	Biconilog Antenna	CBL6111C	4/14/2020	4/14/2022

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

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	923.800M	54.3	+0.0 +23.2	+3.4	+3.6	+5.9	+0.0	90.4	94.0	-3.6	Vert
2	908.000M	54.2	+0.0 +23.0	+3.4	+3.5	+5.9	+0.0	90.0	94.0	-4.0	Vert
3	916.000M	53.0	+0.0 +23.1	+3.4	+3.6	+5.9	+0.0	89.0	94.0	-5.0	Vert
4	923.800M	47.1	+0.0 +23.2	+3.4	+3.6	+5.9	+0.0	83.2	94.0	-10.8	Horiz
5	908.000M	47.1	+0.0 +23.0	+3.4	+3.5	+5.9	+0.0	82.9	94.0	-11.1	Horiz
6	916.000M	46.7	+0.0 +23.1	+3.4	+3.6	+5.9	+0.0	82.7	94.0	-11.3	Horiz

Parameter Definitions:

Measurements performed at input voltage according to manufacturer specification.

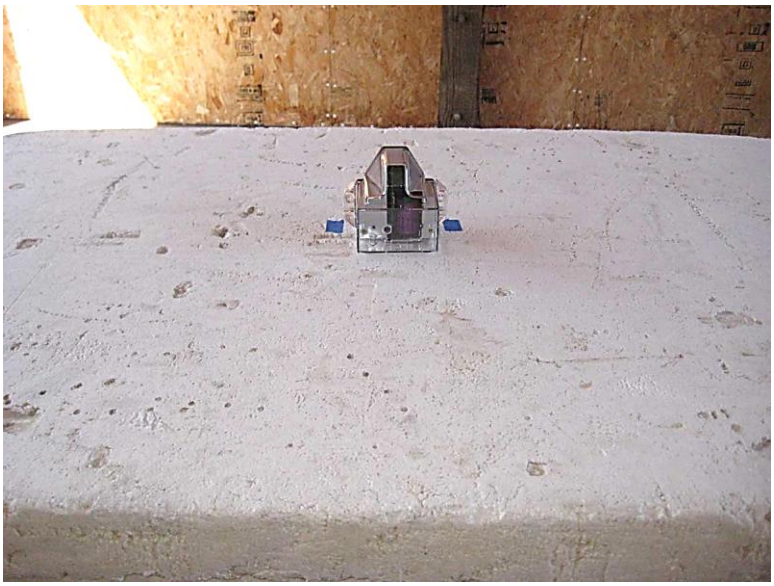
Parameter	Value
$V_{Nominal}$:	3.6Vdc
$V_{Minimum}$:	NA
$V_{Maximum}$:	NA

Test Data Summary - Voltage Variations

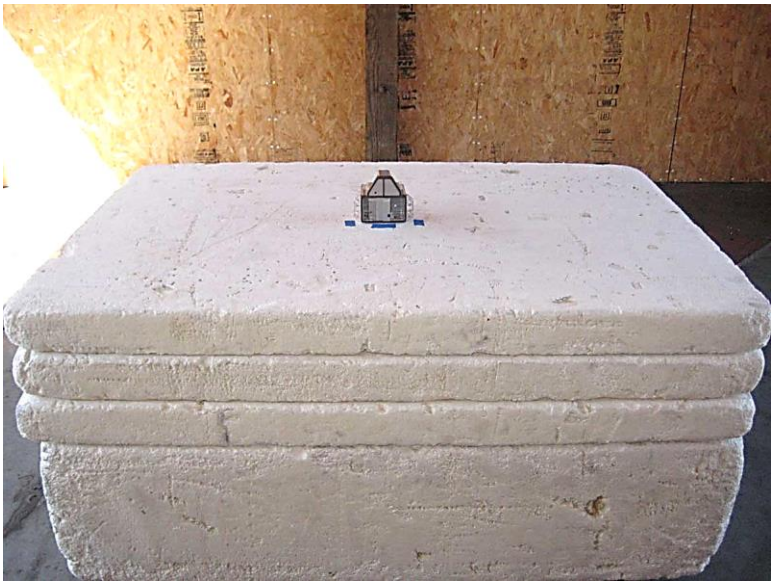
This equipment is battery powered. Power output tests were performed using a power supply simulating a brand new battery.

Test Data Summary – Radiated Field Strength Measurement					
Frequency (MHz)	**Modulation**	**Ant. Type**	**Measured (dBuV/m @ 3m)**	**Limit (dBuV/m @ 3m)**	**Results**
908.0	OOK 16.384kbps (PL0)	PCB trace	90.0	≤94	Pass
916.0	OOK 16.384kbps (PL0)	PCB trace	89.0	≤94	Pass
923.8	OOK 16.384kbps (PL0)	PCB trace	90.4	≤94	Pass

Test Setup Photo(s)



Below 1GHz, Front View



Below 1GHz, Back View

15.249(a) Radiated Emissions and 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:	**15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**		
Work Order #:	**105379**	Date:	5/18/2021
Test Type:	**Maximized Emissions**	Time:	11:18:10
Tested By:	S. Yamamoto	Sequence#:	17
Software:	EMITest 5.03.19		

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 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.

Once the parameters have been set, the support equipment is removed from the EUT.

Frequency range of test: 9KHz to 9.28GHz.

RBW=1MHz, VBW=3MHz

Test Channels?
Low channel 908.0MHz
Middle channel 916.0MHz
High channel 923.8MHz

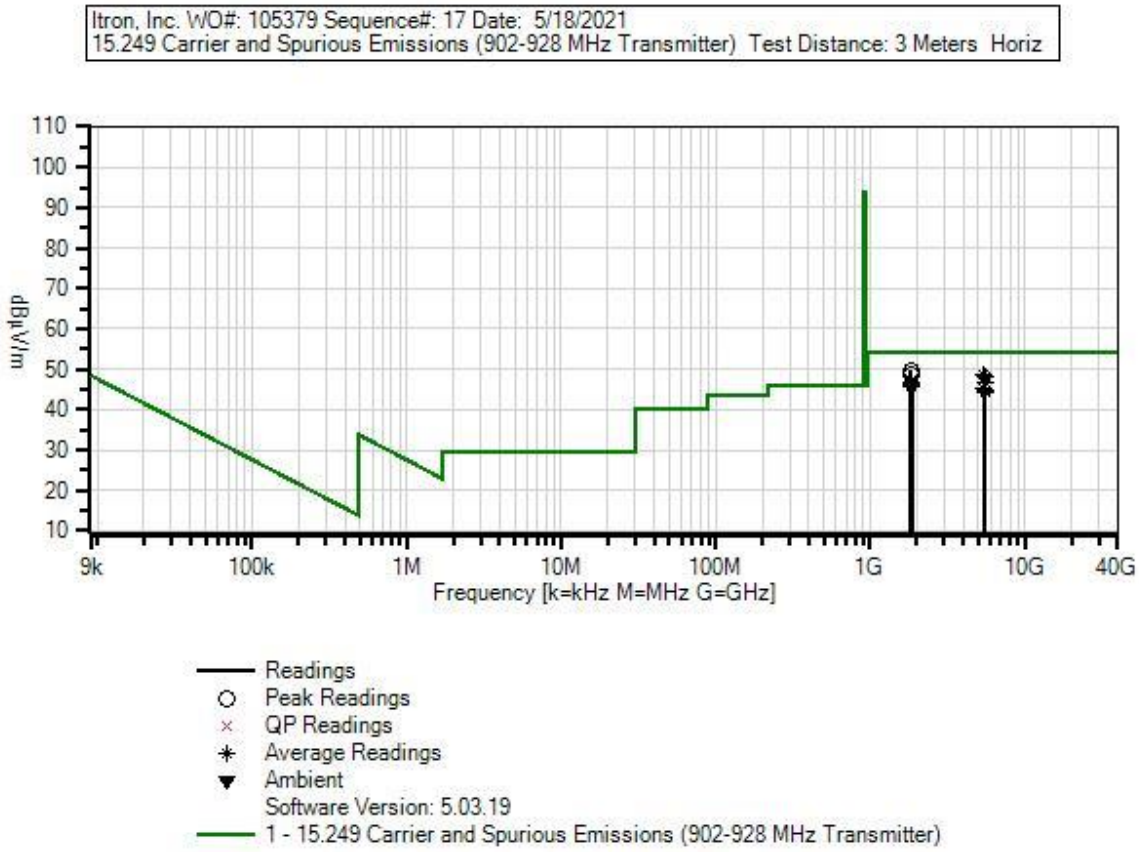
Output level 0 OOK

Due to modulation being OOK, this type of modulation allows for 50% duty cycle correction factor or 20log(0.5) = -6dB.

Test Environment Conditions:
Temperature: 19°C
Relative Humidity: 57%
Pressure: 99kPa

Site D

The EUT is powered from a new 3.6V lithium battery
Test Method: 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	ANP04382	Cable	LDF-50	5/15/2020	5/15/2022
T3	ANP07138	Cable	ANDL1-PNMNM-60	3/30/2021	3/30/2023
T4	AN00787	Preamp	83017A	5/31/2019	5/31/2021
T5	ANP07657	Cable	32022-29094K-29094K-24TC	7/30/2020	7/30/2022
T6	AN03169	High Pass Filter	HM1155-11SS	5/10/2021	5/10/2023
T7	AN01646	Horn Antenna	3115	3/17/2020	3/17/2022
	AN00010	Preamp	8447D	1/2/2020	1/2/2022
	AN00314	Loop Antenna	6502	4/13/2020	4/13/2022
	AN01994	Biconilog Antenna	CBL6111C	4/14/2020	4/14/2022
	ANP05283	Attenuator	ATT-0218-06-NNN-02	3/26/2020	3/26/2022
	ANP05569	Cable-Amplitude +15C to +45C (dB)	RG-214/U	12/14/2020	12/14/2022
	ANP06978	Cable	Sucoflex 104A	3/26/2020	3/26/2022

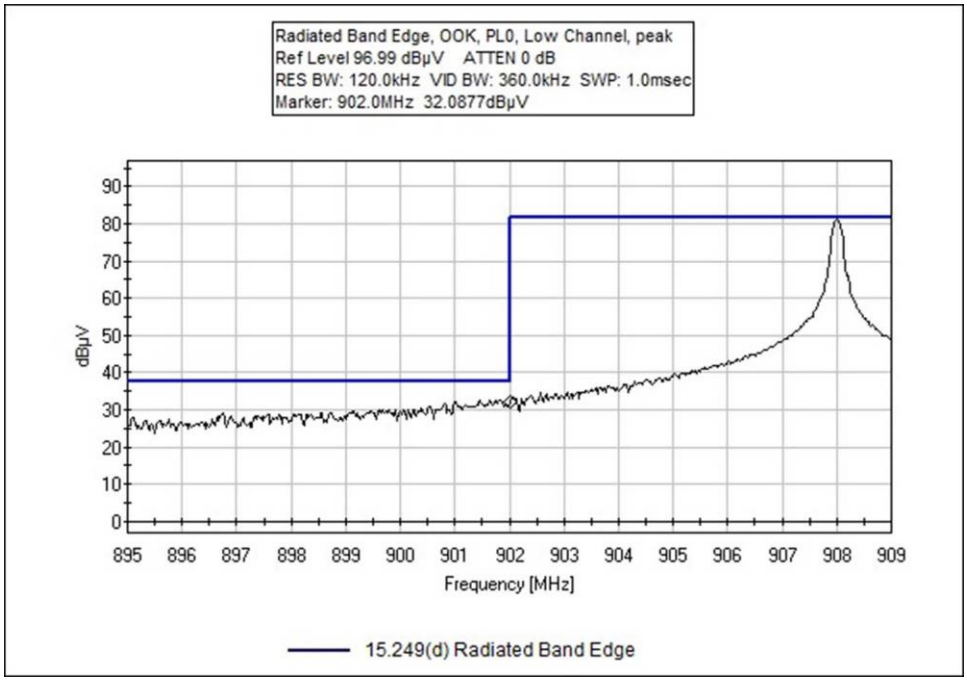
Measurement Data: Reading listed by margin. Test Distance: 3 Meters

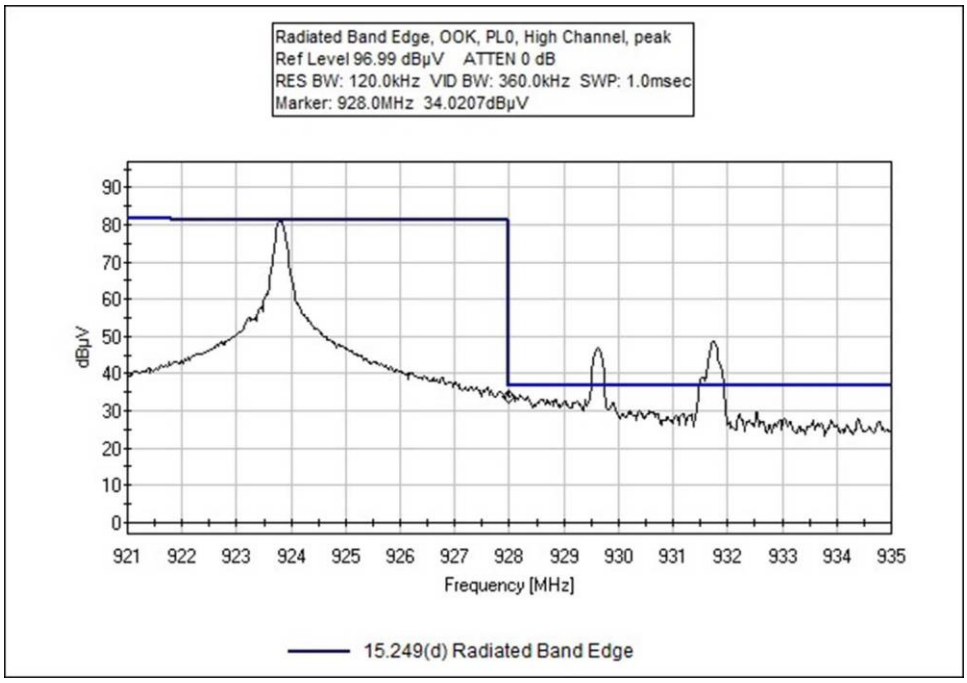
#	Freq	Rdng	T1 T5	T2 T6	T3 T7	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	1832.000M	53.7	+0.0 +0.4	+5.0 +0.3	+3.3 +26.8	-39.8	+0.0	49.7	54.0	-4.3	Horiz
2	1816.000M	52.7	+0.0 +0.4	+5.0 +0.3	+3.3 +26.7	-39.8	+0.0	48.6	54.0	-5.4	Horiz
3	5448.000M Ave	37.8	+0.0 +0.8	+9.0 +0.2	+6.2 +34.2	-39.7	+0.0	48.5	54.0	-5.5	Horiz
^	5448.000M	43.8	+0.0 +0.8	+9.0 +0.2	+6.2 +34.2	-39.7	+0.0	54.5	54.0	+0.5	Horiz
5	5496.000M Ave	37.4	+0.0 +0.8	+9.0 +0.2	+6.2 +34.2	-39.7	+0.0	48.1	54.0	-5.9	Horiz
^	5496.000M	43.4	+0.0 +0.8	+9.0 +0.2	+6.2 +34.2	-39.7	+0.0	54.1	54.0	+0.1	Horiz
7	5542.800M Ave	36.1	+0.0 +0.8	+9.1 +0.2	+6.2 +34.2	-39.7	+0.0	46.9	54.0	-7.1	Horiz
^	5542.800M	42.1	+0.0 +0.8	+9.1 +0.2	+6.2 +34.2	-39.7	+0.0	52.9	54.0	-1.1	Horiz
9	1816.000M Ave	50.7	+0.0 +0.4	+5.0 +0.3	+3.3 +26.7	-39.8	+0.0	46.6	54.0	-7.4	Vert
^	1816.000M	56.7	+0.0 +0.4	+5.0 +0.3	+3.3 +26.7	-39.8	+0.0	52.6	54.0	-1.4	Vert
11	1847.600M Ave	50.2	+0.0 +0.4	+5.0 +0.3	+3.3 +26.9	-39.8	+0.0	46.3	54.0	-7.7	Vert
^	1847.600M	56.2	+0.0 +0.4	+5.0 +0.3	+3.3 +26.9	-39.8	+0.0	52.3	54.0	-1.7	Vert
13	1832.000M Ave	49.8	+0.0 +0.4	+5.0 +0.3	+3.3 +26.8	-39.8	+0.0	45.8	54.0	-8.2	Vert
^	1832.000M	55.8	+0.0 +0.4	+5.0 +0.3	+3.3 +26.8	-39.8	+0.0	51.8	54.0	-2.2	Vert
15	1847.600M Ave	49.4	+0.0 +0.4	+5.0 +0.3	+3.3 +26.9	-39.8	+0.0	45.5	54.0	-8.5	Horiz
^	1847.600M	55.4	+0.0 +0.4	+5.0 +0.3	+3.3 +26.9	-39.8	+0.0	51.5	54.0	-2.5	Horiz
17	5448.000M Ave	34.5	+0.0 +0.8	+9.0 +0.2	+6.2 +34.2	-39.7	+0.0	45.2	54.0	-8.8	Vert
^	5448.000M	40.5	+0.0 +0.8	+9.0 +0.2	+6.2 +34.2	-39.7	+0.0	51.2	54.0	-2.8	Vert
19	5496.000M Ave	34.3	+0.0 +0.8	+9.0 +0.2	+6.2 +34.2	-39.7	+0.0	45.0	54.0	-9.0	Vert
^	5496.000M	40.3	+0.0 +0.8	+9.0 +0.2	+6.2 +34.2	-39.7	+0.0	51.0	54.0	-3.0	Vert
21	5542.800M Ave	33.7	+0.0 +0.8	+9.1 +0.2	+6.2 +34.2	-39.7	+0.0	44.5	54.0	-9.5	Vert
^	5542.800M	39.7	+0.0 +0.8	+9.1 +0.2	+6.2 +34.2	-39.7	+0.0	50.5	54.0	-3.5	Vert

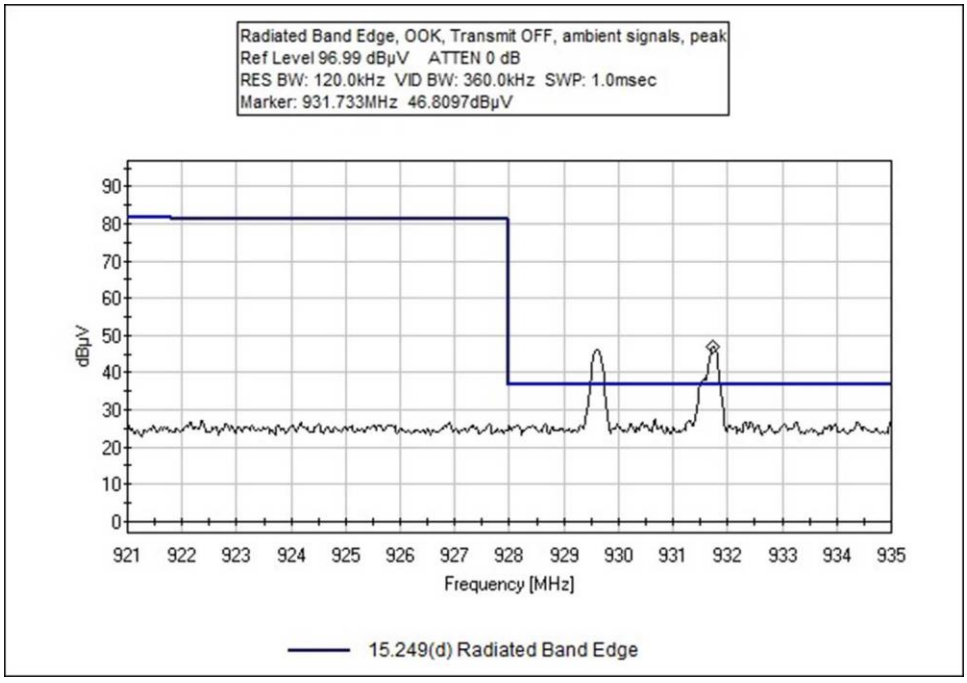
Band Edge

Band Edge Summary					
Frequency (MHz)	**Modulation**	**Ant. Type**	**Field Strength (dBuV/m @3m)**	**Limit (dBuV/m @3m)**	**Results**
902	OOK 16.384kbps (PL0)	PCB trace	40.6	<46	Pass
928	OOK 16.384kbps (PL0)	PCB trace	43.1	<46	Pass

Band Edge Plots




Radiated Band Edge, OOK, PL0, High Channel, peak
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 360.0kHz SWP: 1.0msec
Marker: 928.0MHz 34.0207dBµV
dBµV
Frequency [MHz]
15.249(d) Radiated Band Edge


Radiated Band Edge, OOK, Transmit OFF, ambient signals, peak
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 360.0kHz SWP: 1.0msec
Marker: 931.733MHz 46.8097dBµV
dBµV
Frequency [MHz]
15.249(d) Radiated 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:	**15.249(d) Radiated Band Edge**		
Work Order #:	**105379**	Date:	5/27/2021
Test Type:	**Maximized Emissions**	Time:	11:54:24
Tested By:	S. Yamamoto	Sequence#:	28
Software:	EMITest 5.03.19		

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 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.

Once the parameters have been set, the support equipment is removed from the EUT.

Frequency range of test: 895MHz to 935MHz.

Test Channels:
Low channel 908.0MHz
High channel 923.8MHz

RBW=120kHz, VBW=360kHz

Output level 0 OOK

Test Environment Conditions:
Temperature: 20°C
Relative Humidity: 52%
Pressure: 99kPa

Site D

The EUT is powered from a new 3.6V lithium battery

Test Method: ANSI C63.10-2013

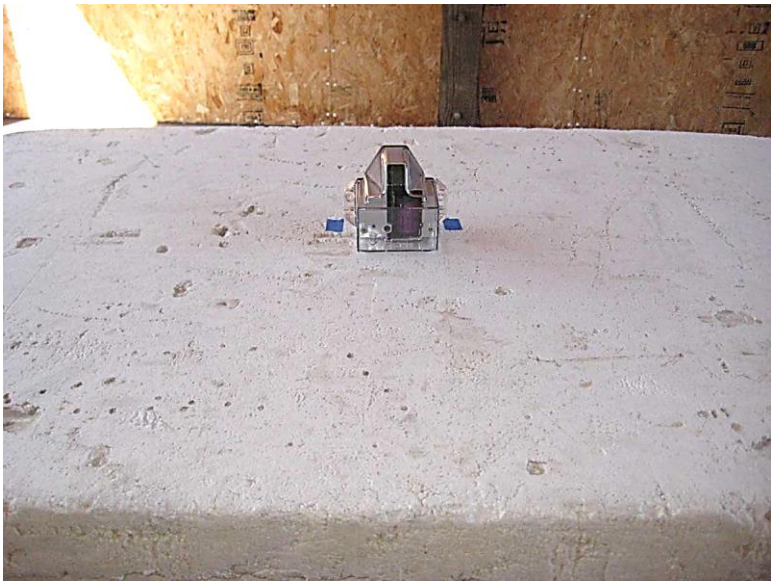
Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	8/3/2020	8/3/2021
T2	ANP04382	Cable	LDF-50	5/15/2020	5/15/2022
T3	ANP05569	Cable-Amplitude +15C to +45C (dB)	RG-214/U	12/14/2020	12/14/2022
T4	ANP05283	Attenuator	ATT-0218-06-NNN-02	3/26/2020	3/26/2022
T5	AN01994	Biconilog Antenna	CBL6111C	4/14/2020	4/14/2022
T6	AN00010	Preamp	8447D	1/2/2020	1/2/2022
T7	ANP06978	Cable	Sucoflex 104A	3/26/2020	3/26/2022

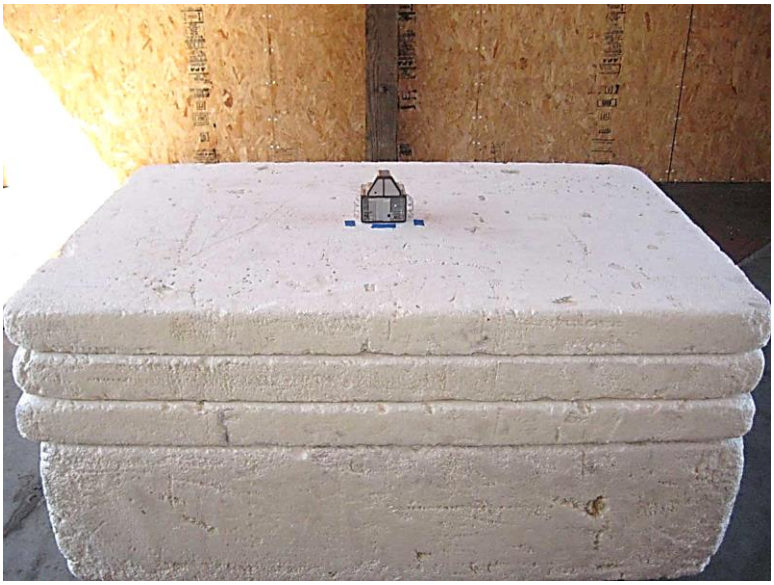
Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3 T7	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	928.000M	34.0	+0.0 +23.2	+3.5 -27.4	+3.6 +0.3	+5.9	+0.0	43.1	46.0 OOK, PL0	-2.9	Vert
2	902.000M	32.1	+0.0 +22.9	+3.4 -27.5	+3.5 +0.3	+5.9	+0.0	40.6	46.0 OOK, PL0	-5.4	Vert

Test Setup Photo(s)



Below 1GHz, Font View



Below 1GHz, Back View

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 dBµV/m, the spectrum analyzer reading in dBµV 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	(dBµV)
+	Antenna Factor	(dB/m)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/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.