Itron, Inc.

EMC TEST REPORT FOR

AMR Transceiver Device For Communicating With Utility Meters
Model: IMRA

Tested To The Following Standards:

FCC Part 101 Subpart C

Report No.: 99513-6

Date of issue: June 9, 2017

ACCREDITED
Testing Certificates:
803.01, 803.02, 803.05, 803.06

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 EMC 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: 114073

REPORT PREPARED BY:

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

Project Number: 99513

DATE OF EQUIPMENT RECEIPT: April 4, 2017
DATE(S) OF TESTING: April 4 - 22, 2017

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the sample equipment 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.
22116 23rd Drive S.E., Suite A
Canyon Park, Bothell, WA 98021

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.02
EMITest Immunity	5.03.02

Site Registration & Accreditation Information

Location	CB #	TAIWAN	CANADA	FCC	JAPAN
Canyon Park Bothell, WA	US0081	SL2-IN-E-1145R	3082C-1	US1022	A-0148

SUMMARY OF RESULTS

Standard / Specification: FCC Part 2 / 101

Test Procedure	Description	Modifications	Results
2.1046 / 101.113	Transmitter Power Limitations	NA	Pass
2.1055 / 101.107	Frequency Tolerance	NA	Pass
2.1049 / 101.109	Bandwidth	NA	Pass
2.1051 / 101.111	Emissions Limitations- Conducted	NA	Pass
2.1053 / 101.111	Emissions Limitations- Radiated	NA	Pass
2.1047	Modulation Characteristics	NA	NA1

NA = Not Applicable
NA1 = Not applicable because the EUT does not employ any modulation types outlined in the rules.

Modifications During Testing

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

Summary of Conditions
No modifications were made during testing.

Modifications listed above must be incorporated into all production units.

Conditions During Testing

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

Summary of Conditions
None

EQUIPMENT UNDER TEST (EUT)

During testing numerous configurations may have been utilized. The configurations listed below support compliance to the standard(s) listed in the Summary of Results section.

Configuration 1

Equipment Tested:

Device	Manufacturer	Model #	S/N
AMR Transceiver Device For Communicating With Utility Meters	Itron, Inc.	IMRA	66030023

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	Dell	E6410	46TXXN1
AC Adapter for Laptop	Dell	DA130PE1-00	N/A

Configuration 2

Equipment Tested:

Device	Manufacturer	Model #	S/N
AMR Transceiver Device For Communicating With Utility Meters	Itron, Inc.	IMRA	66030023

Support Equipment:

Device	Manufacturer	Model #	S/N
AC Adapter	Itron, Inc.	GUSB05	N/A

Configuration 3

Equipment Tested:

Device	Manufacturer	Model #	S/N
AMR Transceiver Device For Communicating With Utility Meters	Itron, Inc.	IMRA	66030024

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	Dell	E6410	46TXXN1
AC Adapter for Laptop	Dell	DA130PE1-00	N/A
DC Power Supply	C&C Jetronic, Inc.	GPSU18UI-1	N/A
DC Power Filter	Itron, Inc.	Filter Block 1	N/A

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Modulation Type(s):	OOK
Antenna Type(s) and Gain:	Internal PIFA 2.0dB
Antenna Connection Type:	Integral (External connector provided to facilitate testing)
Nominal Input Voltage:	120VAC, 60Hz
Firmware / Software used for Test:	DPS Firmware 5.71 / MC3 Test v4.0.3.4
Temperature Range	-20C to 50C

FCC PART(S) 2 / 101

2.1046 / 101.113 Transmitter Power Limitations

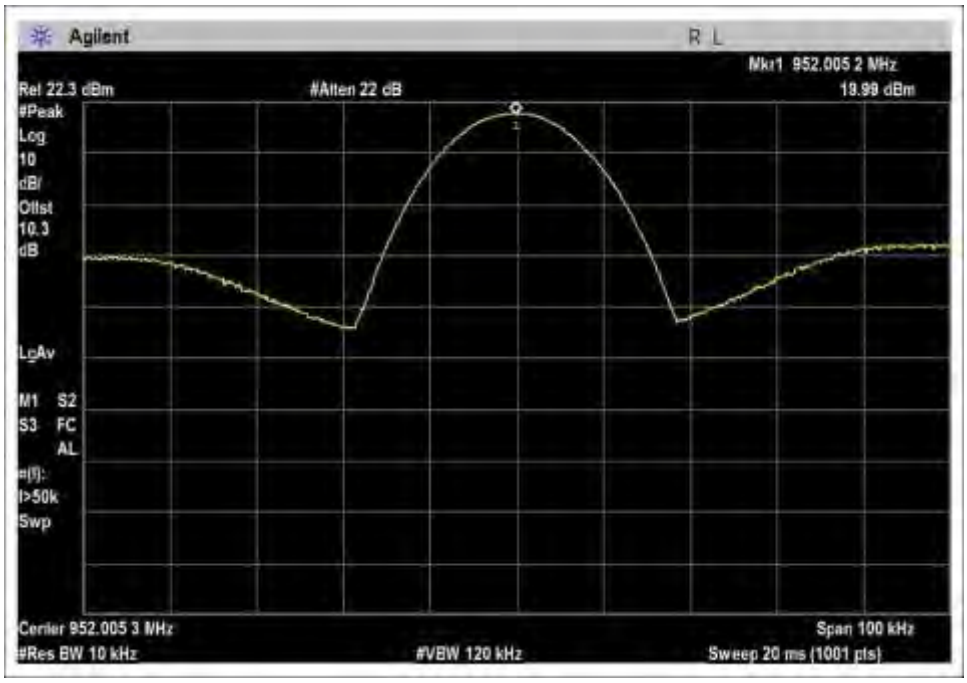
Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	Randal Clark
Test Method:	FCC CFR 47 Part 101.113, TIA-603D	Test Date(s):	4/17/2017 to 4/18/2017
Configuration:	3		
Test Setup:	Frequency Range: 952-959.85MHz Frequency tested: 952, 959.84MHz Firmware power setting: Max Power EUT Firmware: 5.71 Protocol /MCS/Modulation: OOK Antenna type: Internal PIFA Antenna Gain: 2.0 dBi Duty Cycle: 100% (Test Mode) Test Mode: Continuously transmitting Test Setup: EUT is transmitting through a temporary antenna connector and is attached directly to the spectrum analyzer. Multiple modulation tones investigated, only worst case reported. Modifications Added: None		

Environmental Conditions			
Temperature (ºC)	20-22	Relative Humidity (%):	36-41

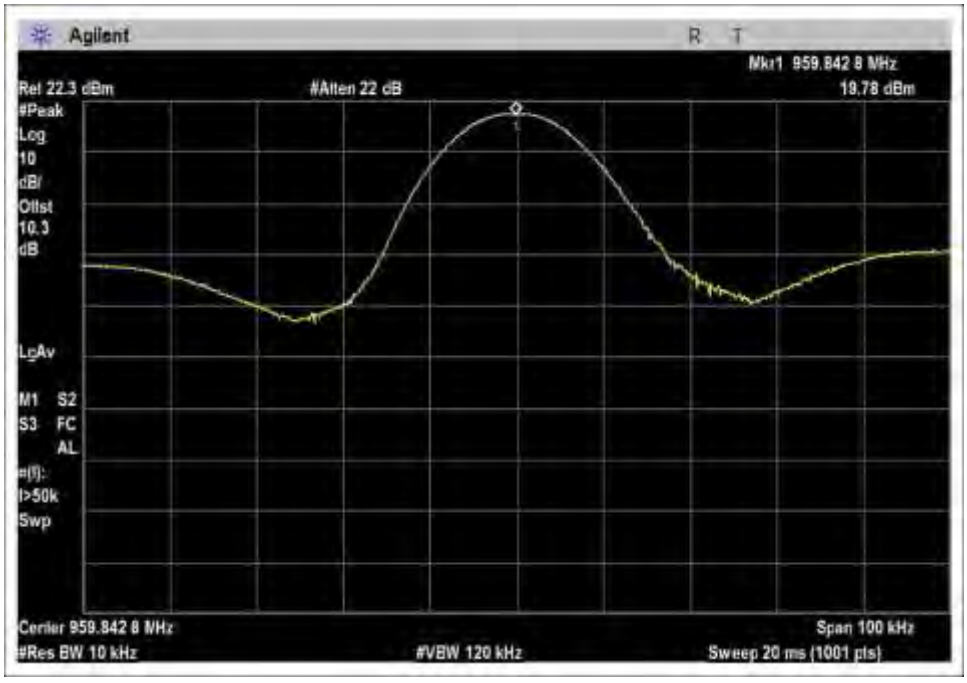
Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02872	Spectrum Analyzer	Agilent	E4440A	11/18/2015	11/18/2017
P06243	Attenuator	Weinschel	54A-10	3/9/2016	3/9/2018
03122	Cable	Astrolab	32026-2-29801-36	4/28/2016	4/28/2018

Test Data Summary				
Frequency (MHz)	**Measured Power (dBm)**	**Power Watts**	**Limit Watts**	**Results**
952.0	20.0	0.100	25	Pass
959.84	19.8	0.095	25	

Plots



Low Channel



High Channel

Test Setup Photo

2.1055 / 101.107 Frequency Tolerance

Test Setup/Conditions			
Test Location:	Bothell Lab Bench 2	Test Engineer:	S. Pittsford
Test Method:	FCC CFR 47 Part 101.107, TIA-603D	Test Date(s):	4/22/2017
Configuration:	2		
Test Setup:	Frequency Range: 952-959.85MHz Frequency tested: 952.5, 959.84MHz Firmware power setting: Max Power EUT Firmware: 5.71 Protocol /MCS/Modulation: OOK Antenna type: Internal PIFA Antenna Gain: 2.0 dBi Duty Cycle: 100% (Test Mode) Test Mode: Continuously transmitting Test Setup: EUT is inside temperature chamber transmitting through a temporary antenna connector and is attached directly to the spectrum analyzer. Modifications Added: None		

Environmental Conditions			
Temperature (ºC)	23	Relative Humidity (%):	38

Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02757	Temperature Chamber	Bemco	F100/350-8	1/2/2017	1/2/2019
02871	Spectrum Analyzer	Agilent	E4440A	2/24/2017	2/24/2019
P05747	Attenuator	Pasternack	PE7004-20	1/29/2016	1/29/2018
P06123	Attenuator	Aeroflex	18N-6	5/8/2015	5/8/2017
P06678	Cable	Astrolab	32026-29801-29801-144	9/19/2016	9/19/2018

Test Data Summary					
Temperature (ºC)	**Voltage**	**Frequency (MHz)**	**Frequency Tolerance (%)**	**Limit (%)**	**Results**
-30	$V_{Nominal}$	952.00485	0.00007	0.0005	Pass
-20	$V_{Nominal}$	952.00506	0.00004	0.0005	
-10	$V_{Nominal}$	952.00539	0.00001	0.0005	
0	$V_{Nominal}$	952.00570	0.00002	0.0005	
10	$V_{Nominal}$	952.00565	0.00002	0.0005	
20	$V_{Minimum}$	952.00545	0.00000	0.0005	
20	$V_{Nominal}$	952.00548	0.00000	0.0005	
20	$V_{Maximum}$	952.00547	0.00000	0.0005	
30	$V_{Nominal}$	952.00485	0.00007	0.0005	
40	$V_{Nominal}$	952.00539	0.00001	0.0005	
50	$V_{Nominal}$	952.00542	0.00001	0.0005	
Nominal Frequency:		952.00548			

Test Data Summary					
Temperature (ºC)	**Voltage**	**Frequency (MHz)**	**Frequency Tolerance (%)**	**Limit (%)**	**Results**
-30	$V_{Nominal}$	959.84242	0.00005	0.0005	Pass
-20	$V_{Nominal}$	959.84260	0.00003	0.0005	
-10	$V_{Nominal}$	959.84278	0.00001	0.0005	
0	$V_{Nominal}$	959.84321	0.00003	0.0005	
10	$V_{Nominal}$	959.84316	0.00003	0.0005	
20	$V_{Minimum}$	959.84293	0.00000	0.0005	
20	$V_{Nominal}$	959.84292	0.00000	0.0005	
20	$V_{Maximum}$	959.84293	0.00000	0.0005	
30	$V_{Nominal}$	959.84286	0.00001	0.0005	
40	$V_{Nominal}$	959.84293	0.00000	0.0005	
50	$V_{Nominal}$	959.84291	0.00000	0.0005	
Nominal Frequency:		959.84292			

Parameter Definitions:

Measurements performed at input voltage Vnominal ± 15%.

Parameter	Value
$V_{Nominal}$:	115VAC
$V_{Minimum}$:	97VAC
$V_{Maximum}$:	133VAC

Test Setup Photos

Inside Temperature Chamber

Outside Temperature Chamber

2.1049 / 101.109 Bandwidth

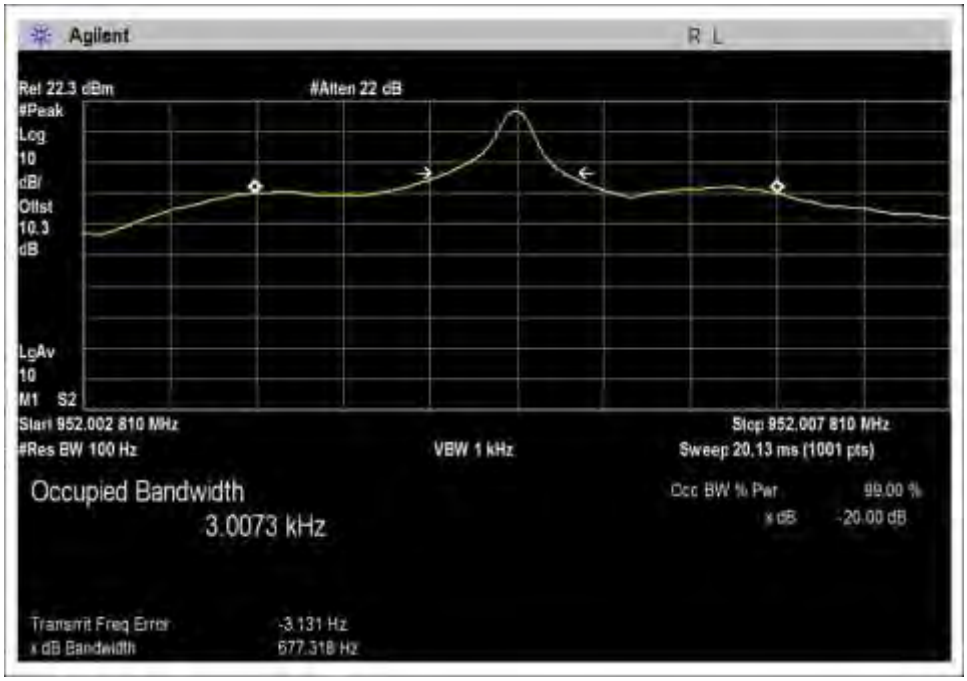
Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	Randal Clark
Test Method:	FCC CFR 47 Part 101.109, TIA-603D	Test Date(s):	4/17/2017 to 4/18/2017
Configuration:	3		
Test Setup:	Frequency Range: 952-959.85MHz Frequency tested: 952, 959.84MHz Firmware power setting: Max Power EUT Firmware: 5.71 Protocol /MCS/Modulation: OOK Antenna type: Internal PIFA Antenna Gain: 2.0 dBi Duty Cycle: 100% (Test Mode) Test Mode: Continuously transmitting Test Setup: EUT is transmitting through a temporary antenna connector and is attached directly to the spectrum analyzer. Multiple modulation tones investigated, only worst case reported. Modifications Added: None		

Environmental Conditions			
Temperature (ºC)	20-22	Relative Humidity (%):	36-41

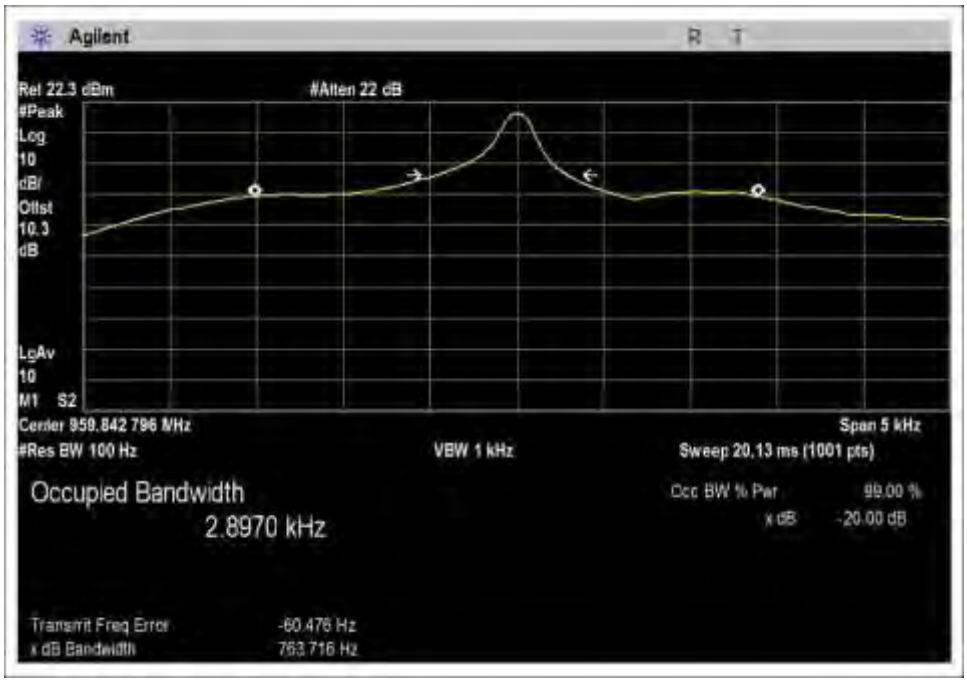
Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02872	Spectrum Analyzer	Agilent	E4440A	11/18/2015	11/18/2017
P06243	Attenuator	Weinschel	54A-10	3/9/2016	3/9/2018
03122	Cable	Astrolab	32026-2-29801-36	4/28/2016	4/28/2018

Test Data Summary				
Frequency (MHz)	**Modulation**	**Measured (kHz)**	**Limit (kHz)**	**Results**
952.0	OOK	0.677	<12.5	Pass
959.84	OOK	0.764	<12.5	Pass

Plots



Low Channel



High Channel

Test Setup Photo

2.1051 / 101.111 Emissions Limitations - Conducted

Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	Randal Clark
Test Method:	FCC CFR 47 Part 101.111, TIA-603D	Test Date(s):	4/17/2017 to 4/18/2017
Configuration:	3		
Test Setup:	Frequency Range: 952-959.85MHz Frequency tested: 9kHz-10GHz Firmware power setting: Max Power EUT Firmware: 5.71 Protocol /MCS/Modulation: OOK Antenna type: Internal PIFA Antenna Gain: 2.0 dBi Duty Cycle: 100% (Test Mode) Test Mode: Continuously transmitting Test Setup: EUT is transmitting through a temporary antenna connector and is attached directly to the spectrum analyzer. Multiple modulation tones investigated, only worst case reported. Modifications Added: None		

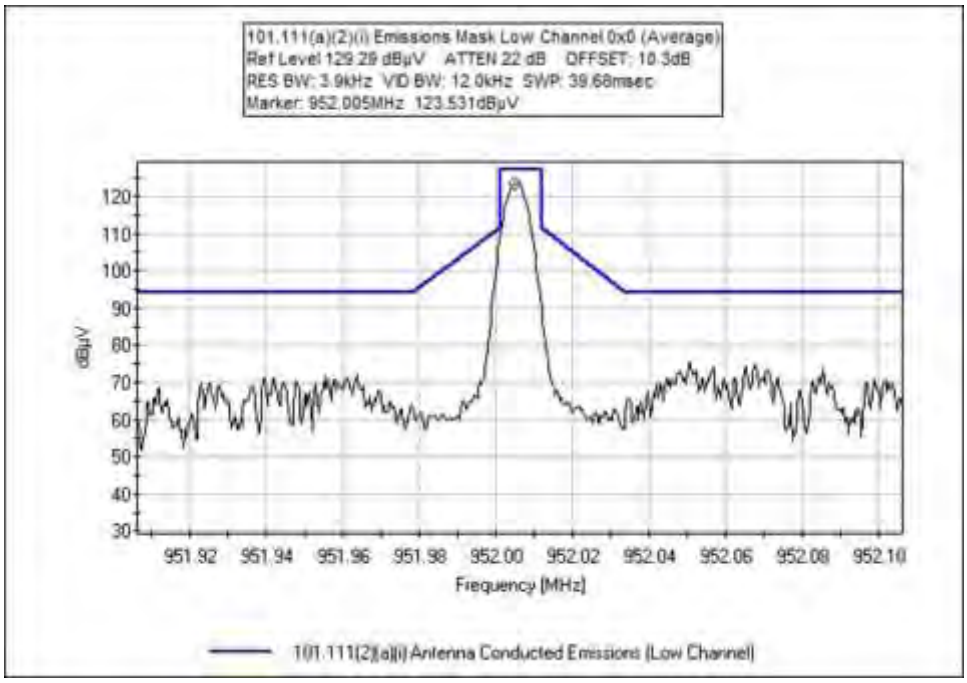
Environmental Conditions			
Temperature (ºC)	20-22	Relative Humidity (%):	36-41

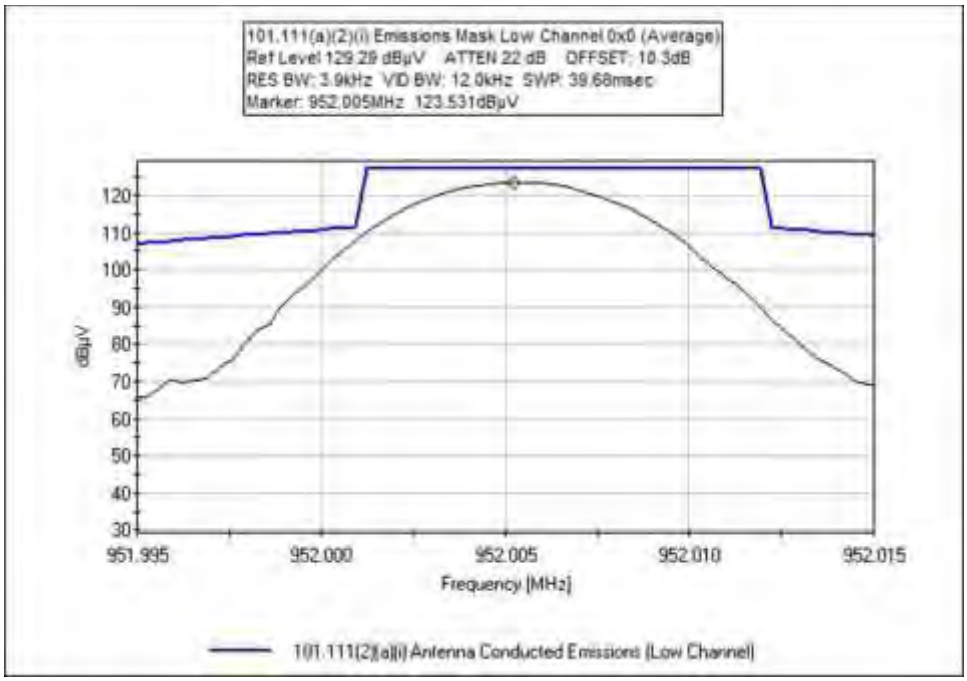
Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02872	Spectrum Analyzer	Agilent	E4440A	11/18/2015	11/18/2017
P06243	Attenuator	Weinschel	54A-10	3/9/2016	3/9/2018
03122	Cable	Astrolab	32026-2-29801-36	4/28/2016	4/28/2018

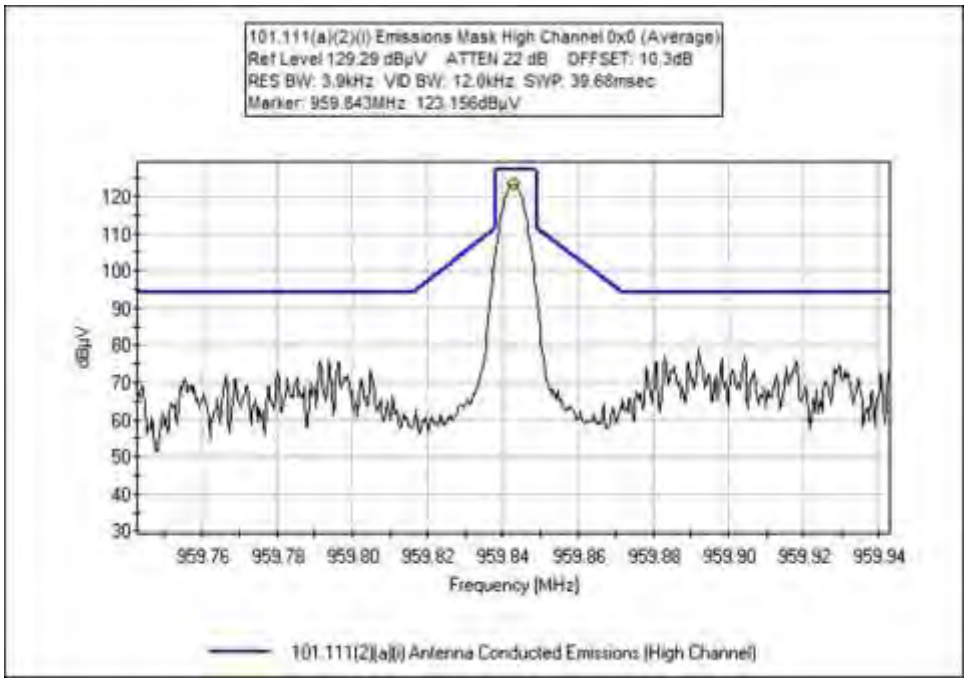
Test Data Summary
Limit applied: Part 101.111 (a) (2) (i) Max Power – (35 + 0.8(P − 50) + 10Log10 B) down to -13dBm P = Percent removed from the center frequency of the transmitter bandwidth. B = Authorized bandwidth in MHz Conversion to Limit (dBuV) = Limit (dBm) +107

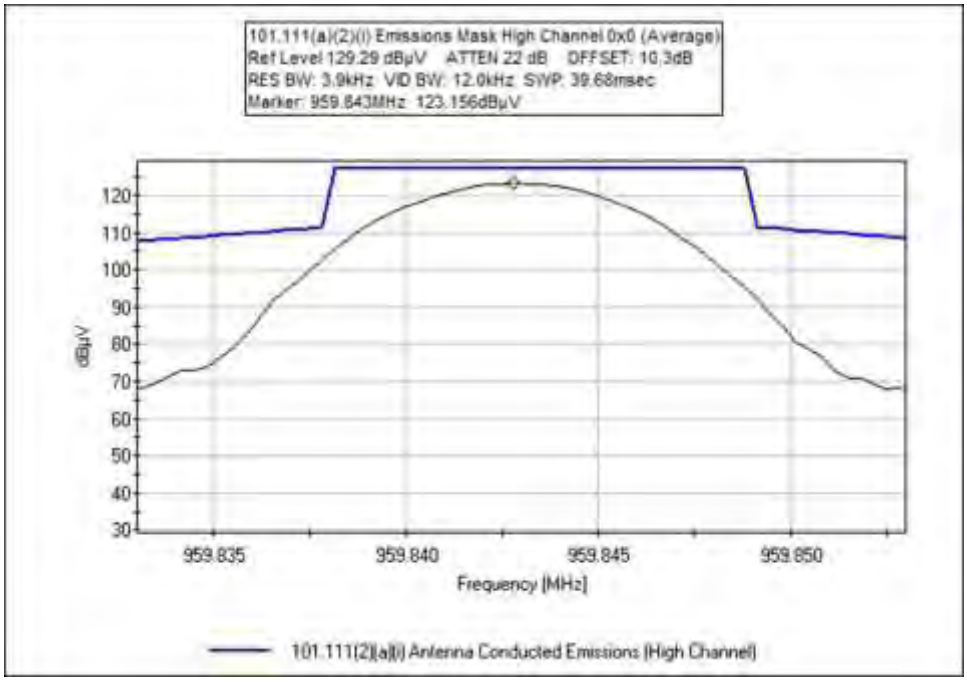
Frequency (MHz)	Measured (dBuV)	Limit (dBuV)	Margin (dB)	Results
2856.016	58.3	94	-35.7	Pass
4760.026	51.7	94	-42.3	Pass
1904.011	50.1	94	-43.9	Pass
6664.037	45.8	94	-48.2	Pass
7616.043	43.7	94	-50.3	Pass
863.186	37.8	94	-56.2	Pass
5712.032	36.9	94	-57.1	Pass
3808.022	36.9	94	-57.1	Pass
9520.055	34.8	94	-59.2	Pass
8568.048	32.9	94	-61.1	Pass
2879.528	58	94	-36	Pass
1919.686	51.3	94	-42.7	Pass
4799.214	50.5	94	-43.5	Pass
6718.9	42.9	94	-51.1	Pass
7678.742	40.7	94	-53.3	Pass
5759.058	36.5	94	-57.5	Pass
9598.428	32.8	94	-61.2	Pass
3839.377	32.8	94	-61.2	Pass
956.06	31.7	94	-62.3	Pass
963.62	30.4	94	-63.6	Pass
8638.585	30.4	94	-63.6	Pass

Plots


101.111(a)(2)(i) Emissions Mask Low Channel 0x0 (Average)
Ref Level 129.29 dBµV ATTEN 22 dB OFFSET: 10.3dB
RES BW: 3.9kHz VID BW: 12.0kHz SWP: 39.68msec
Marker: 952.005MHz 123.531dBµV
dBµV
120
110
100
90
80
70
60
50
40
30
951.92
951.94
951.96
951.98
952.00
952.02
952.04
952.06
952.08
952.10
Frequency [MHz]
101.111(2)(a)(i) Antenna Conducted Emissions (Low Channel)


101.111(a)(2)(i) Emissions Mask Low Channel 0x0 (Average)
Ref Level 129.29 dBµV ATTEN 22 dB OFFSET: 10.3dB
RES BW: 3.9kHz VID BW: 12.0kHz SWP: 39.68msec
Marker: 952.005MHz 123.531dBµV
dBµV
120
110
100
90
80
70
60
50
40
30
951.995
952.000
952.005
952.010
952.015
Frequency [MHz]
101.111(2)(a)(i) Antenna Conducted Emissions (Low Channel)


101.111(a)(2)(i) Emissions Mask High Channel 0x0 (Average)
Ref Level 129.29 dBµV ATTEN 22 dB OFFSET: 10.3dB
RES BW: 3.9kHz VID BW: 12.0kHz SWP: 39.68msec
Marker: 959.843MHz 123.156dBµV
dBµV
120
110
100
90
80
70
60
50
40
30
959.76 959.78 959.80 959.82 959.84 959.86 959.88 959.90 959.92 959.94
Frequency (MHz)
101.111(2)(a)(i) Antenna Conducted Emissions (High Channel)


101.111(a)(2)(i) Emissions Mask High Channel 0x0 (Average)
Ref Level 129.29 dBµV ATTEN 22 dB OFFSET: 10.3dB
RES BW: 3.9kHz VID BW: 12.0kHz SWP: 39.68msec
Marker: 959.843MHz 123.156dBµV
dBµV
120
110
100
90
80
70
60
50
40
30
959.835 959.840 959.845 959.850
Frequency (MHz)
101.111(2)(a)(i) Antenna Conducted Emissions (High Channel)

Test Setup Photo

2.1053 / 101.111 Emissions Limitations - Radiated

Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	M. Atkinson
Test Method:	FCC CFR 47 Part 101.111, TIA-603D	Test Date(s):	4/4/2017 to 4/11/2017
Configuration:	1		
Test Setup:	Frequency Range: 952-959.85MHz Frequency tested: 9kHz-10GHz Firmware power setting: Max Power EUT Firmware: 5.71 Protocol /MCS/Modulation: OOK Antenna type: Internal PIFA Antenna Gain: 2.0 dBi Duty Cycle: 100% (Test Mode) Test Mode: Continuously transmitting Test Setup: EUT has temporary antenna connector and is connected to termination. Multiple modulation tones investigated, only worst case reported. Modifications Added: None		

Environmental Conditions			
Temperature (ºC)	22-23	Relative Humidity (%):	30-31

Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02673	Spectrum Analyzer	Agilent	E4446A	2/3/2017	2/3/2019
P06540	Cable	Andrews	Heliax	10/29/2015	10/29/2017
P05305	Cable	Andrews	ETSI-50T	2/15/2016	2/15/2018
03540	Preamp	HP	83017A	4/30/2015	4/30/2017
01467	Horn Antenna	EMCO	3115	8/12/2015	8/12/2017
P06935	Cable	Astrolab	32026-29801-29801-18	3/11/2016	3/11/2018
02872	Spectrum Analyzer	Agilent	E4440A	11/18/2015	11/18/2017
P05963	Cable	Belden	RG-214	2/15/2016	2/15/2018
P05360	Cable	Belden	RG214	11/30/2016	11/30/2018
01991	Biconilog Antenna	Chase	CBL6111C	3/11/2016	3/11/2018
P05657	Attenuator	Paternack	PE7004-6	12/22/2015	12/22/2017
00052	Loop Antenna	EMCO	6502	4/8/2016	4/8/2018

Test Data Summary

Limit applied: Part 101.111 (a) (2) (i)
Max Power – (35 + 0.8(P − 50) + 10Log10 B) down to -13dBm (EIRP)

P = Percent removed from the center frequency of the transmitter bandwidth.
B = Authorized bandwidth in MHz

Conversion to EIRP limit (dBuV/m at 3m) = Power Limit (dBm) – 20Log10(3) + 107

Note: The limit and measurements were recorded and corrected for dBµV/m at 3m using correction factors based on known measurement system losses.

Frequency (MHz)	Measured (dBµV/m at 3m)	Limit (dBµV/m at 3m)	Margin (dB)	Results
2856.1	54.9	84.5	-29.6	Pass
2857.44	54.8	84.5	-29.7	Pass
0.219	53.9	84.5	-30.6	Pass
898.2	50.7	84.5	-33.8	Pass
238.5	50.6	84.5	-33.9	Pass
2879.41	50.2	84.5	-34.3	Pass
238.5	48	84.5	-36.5	Pass
256	47.9	84.5	-36.6	Pass
259.9	47.6	84.5	-36.9	Pass
8572.5	47.5	84.5	-37	Pass
7620	47.3	84.5	-37.2	Pass
4762.64	47	84.5	-37.5	Pass
6667.5	46.9	84.5	-37.6	Pass
4760	46.6	84.5	-37.9	Pass
9525	46.5	84.5	-38	Pass
685.7	46	84.5	-38.5	Pass
8568	44.9	84.5	-39.6	Pass
8638.65	44.8	84.5	-39.7	Pass
5715.14	44.4	84.5	-40.1	Pass
9520	44.2	84.5	-40.3	Pass
7678.81	43.7	84.5	-40.8	Pass
4799.28	43.6	84.5	-40.9	Pass
3810.04	43.6	84.5	-40.9	Pass
7616	43.4	84.5	-41.1	Pass
9598.5	43.2	84.5	-41.3	Pass
6718.97	42.1	84.5	-42.4	Pass
5759.12	42.1	84.5	-42.4	Pass
5712	42	84.5	-42.5	Pass
3808.1	41.9	84.5	-42.6	Pass
3839.72	41.7	84.5	-42.8	Pass
6664	41.5	84.5	-43	Pass
1905.2	41.2	84.5	-43.3	Pass
1919.97	39.8	84.5	-44.7	Pass
199.7	38.8	84.5	-45.7	Pass
1903.9	37.3	84.5	-47.2	Pass

Frequency (MHz)	Measured (dBµV/m at 3m)	Limit (dBµV/m at 3m)	Margin (dB)	Results
206.5	36.5	84.5	-48	Pass
96.9	33.3	84.5	-51.2	Pass
48.4	33.3	84.5	-51.2	Pass
18.993	30.9	84.5	-53.6	Pass
27.841	28.6	84.5	-55.9	Pass

Test Setup Photo(s)

Below 1GHz

Above 1GHz

X Axis

Y Axis

Z Axis

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.