

Connected Yard

REVISED TEST REPORT TO 102173-9

Pool Monitor
Model: CY-PM1910-A1

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.249

Report No.: 102173-9A

Date of issue: June 14, 2019



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 # 803.06

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

Connected Yard
380 Portage Ave
Palo Alto, CA 94306

Representative: Paul Carter
Customer Reference Number: SELc481

REPORT PREPARED BY:

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

Project Number: 102173

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

May 3, 2019
May 3, 2019

Revision History

Original: Testing of the Pool Monitor Model: CY-PM1910-A1 to FCC Part 15 Subpart C Section(s) 15.249.
Revision A: To revise Antenna Gain in General Product Table per manufacturer update.

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.
1120 Fulton Place
Fremont, CA 94539

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.12

Site Registration & Accreditation Information

Location	*NIST CB #	FCC	JAPAN
Fremont, CA	US0082	US1023	A-0149

*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	NA

NA = Not Applicable

NA1 = Not applicable because the EUT is operated by an internal battery at 3.0VDC.

ISO/IEC 17025 Decision Rule

The declaration of pass or fail herein is based upon assessment to the specification(s) listed above, including where applicable, assessment of measurement uncertainties. For performance related tests, equipment was monitored for specified criteria identified in that section of testing.

Modifications During Testing

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

Summary of Conditions

No modifications were made during testing.

Modifications listed above must be incorporated into all production units.

Conditions During Testing

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

Summary of Conditions

None

EQUIPMENT UNDER TEST (EUT)

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

Configuration 1

Equipment Tested:

Device	Manufacturer	Model #	S/N
Pool Monitor	Connected Yard	CY-PM1910-A1	NA

Support Equipment:

Device	Manufacturer	Model #	S/N
None			

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Modulation Type(s):	GFSK
Maximum Duty Cycle:	100%
Antenna Type(s) and Gain:	-2.66dBi
Antenna Connection Type:	Integral
Nominal Input Voltage:	3.0VDC
Firmware / Software used for Test:	Firmware 1.7.15/ Software Putty

FCC Part 15 Subpart C

15.215(c) Occupied Bandwidth (20dB BW)

Test Setup/Conditions

Test Location:	Fremont Lab C3	Test Engineer:	Hieu Song Nguyenpham
Test Method:	ANSI C63.10 (2013)	Test Date(s):	5/3/2019
Configuration:	1		
Test Setup:	The EUT is placed on the non-conductive table and operated by an internal battery at 3.0VDC. The EUT is set in continuously transmitting as intended		

Environmental Conditions

Temperature (°C)	22.5	Relative Humidity (%):	37
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Test Equipment

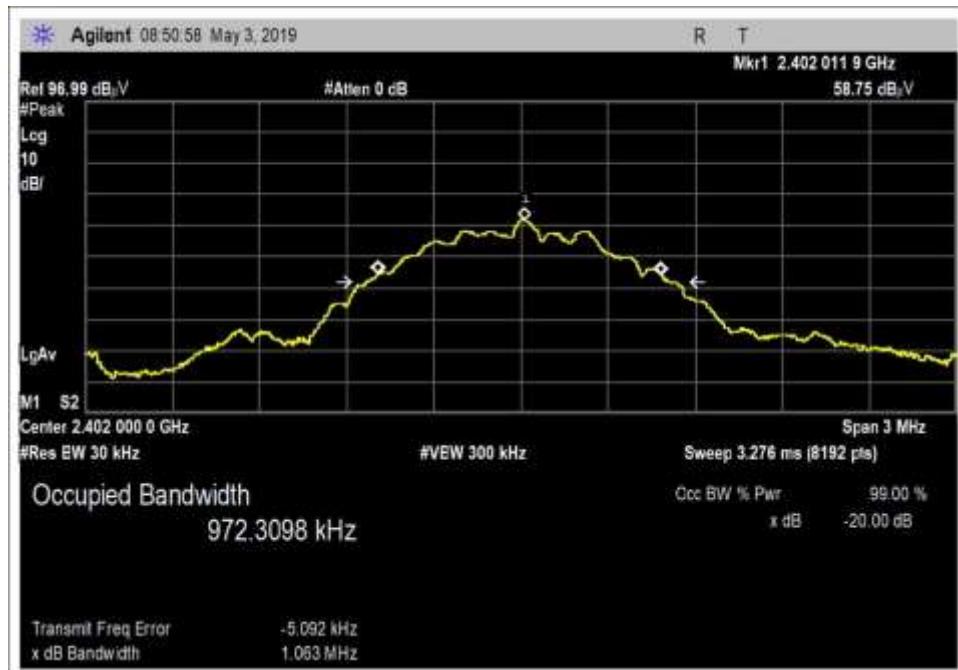
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02157	Horn Antenna	EMCO	3115	1/15/2019	1/15/2021
P01210	Cable	Andrews	FSJ1P-50A-4A	12/18/2018	12/18/2020
03302	Cable	Astrolab	32026-29094K-29094K-72TC	1/15/2018	1/15/2020
02660	Spectrum Analyzer	Agilent	E4446A	10/19/2018	10/19/2020

Test Data Summary

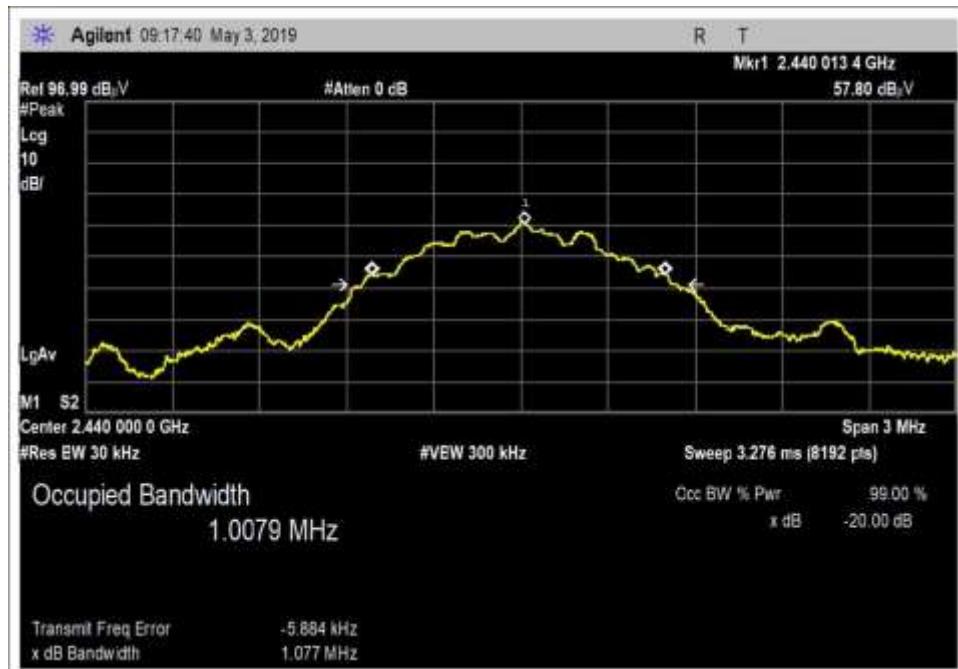
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
2402	1	GFSK	1063	None	NA
2440	1	GFSK	1077	None	NA
2480	1	GFSK	1110	None	NA

NA = Not applicable, because FCC 15.215 does not give any limits so there is no criteria for pass or fail.

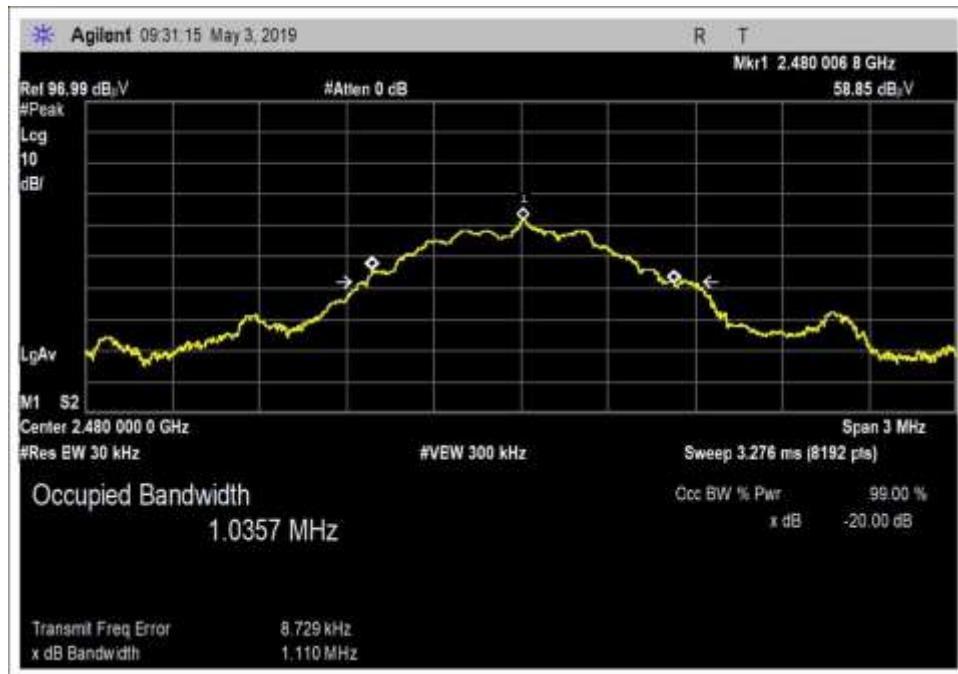
Plot(s)



Low Channel

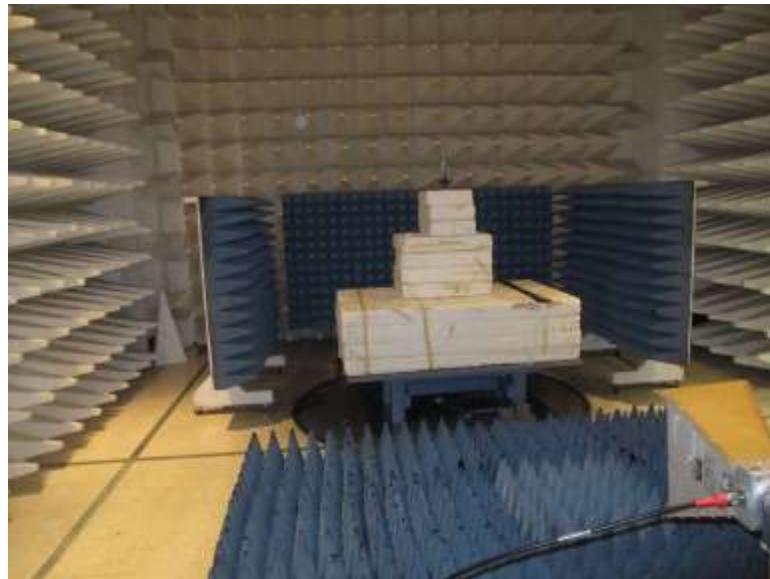


Middle Channel



High Channel

Test Setup Photo(s)



15.249(a) Field Strength of Fundamental

Test Setup/Conditions

Test Location:	Fremont Lab C3	Test Engineer:	Hieu Song Nguyenpham
Test Method:	ANSI C63.10 (2013)	Test Date(s):	5/3/2019
Configuration:	1		
Test Setup	The EUT is placed on the non-conductive table and operated by an internal battery at 3.0VDC. The EUT is set in continuously transmitting as intended		

Environmental Conditions

Temperature (°C)	22.5	Relative Humidity (%):	37.5
------------------	------	------------------------	------

Test Equipment

Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02157	Horn Antenna	EMCO	3115	1/15/2019	1/15/2021
P01210	Cable	Andrews	FSJ1P-50A-4A	12/18/2018	12/18/2020
03302	Cable	Astrolab	32026-29094K-29094K-72TC	1/15/2018	1/15/2020
02660	Spectrum Analyzer	Agilent	E4446A	10/19/2018	10/19/2020

Test Data Summary - Voltage Variations

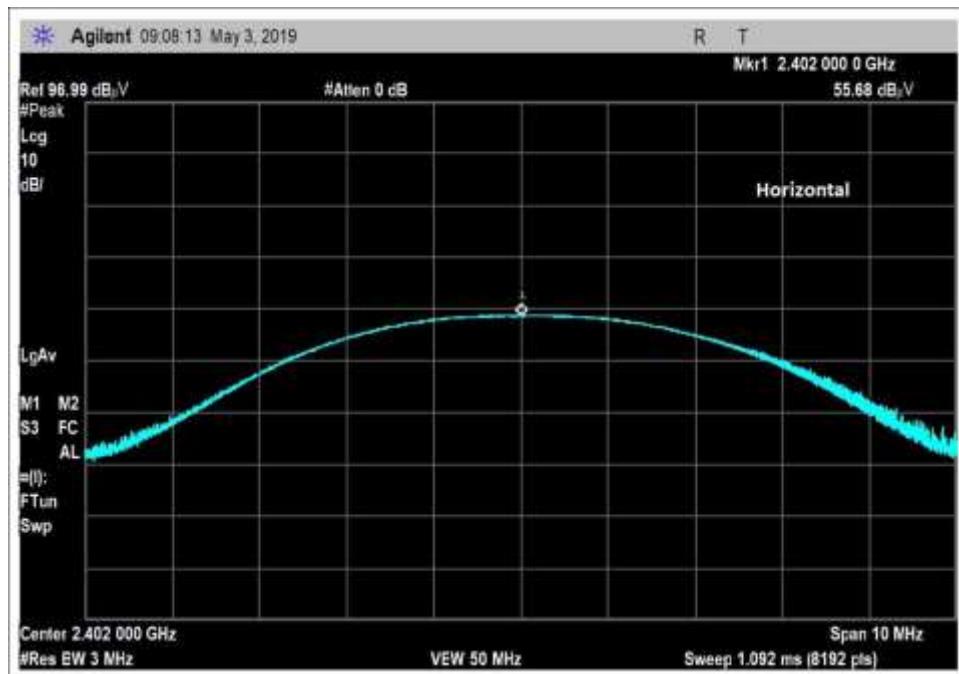
This equipment is battery powered. Power output tests were performed using a fresh battery.

Test Data Summary – Radiated Field Strength Measurement

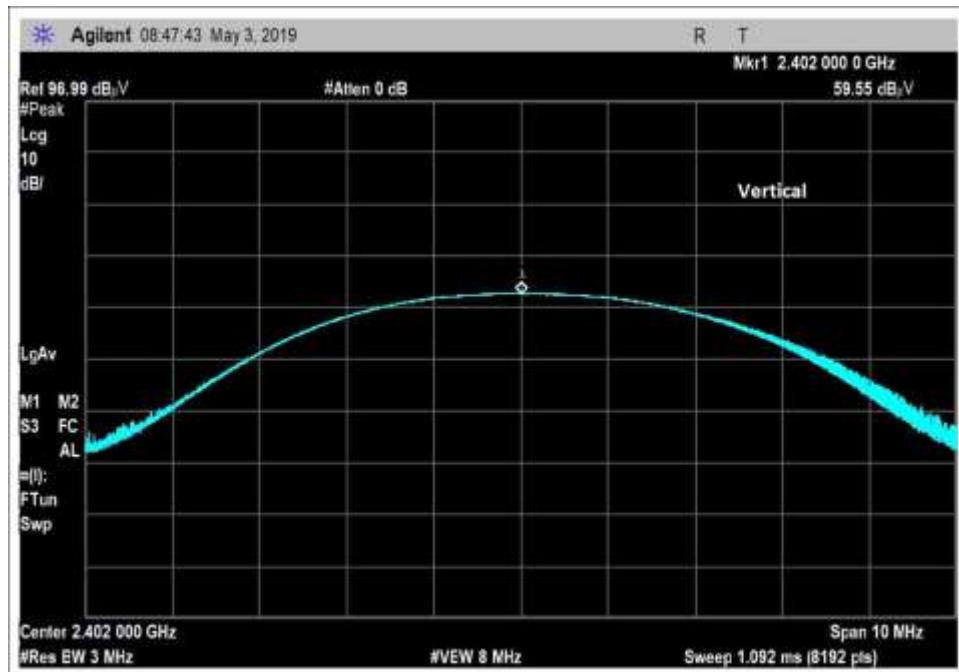
Frequency (MHz)	Modulation	Ant. Type	Measured (dBuV/m @ 3m)	Limit (dBuV/m @ 3m)	Results
2402 Horizontal	GFSK	Integral	88.2	≤94	Pass
2402 Vertical	GFSK	Integral	92.0	≤94	Pass
2440 Horizontal	GFSK	Integral	87.0	≤94	Pass
2440 Vertical	GFSK	Integral	92.1	≤94	Pass
2480 Horizontal	GFSK	Integral	86.3	≤94	Pass
2480 Vertical	GFSK	Integral	92.7	≤94	Pass



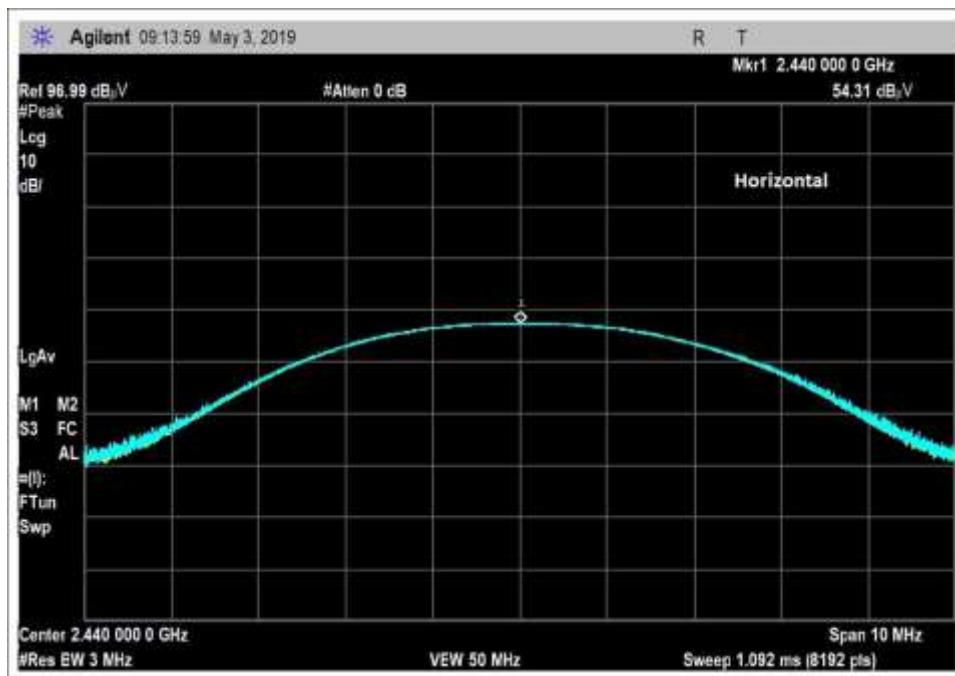
Plot(s)



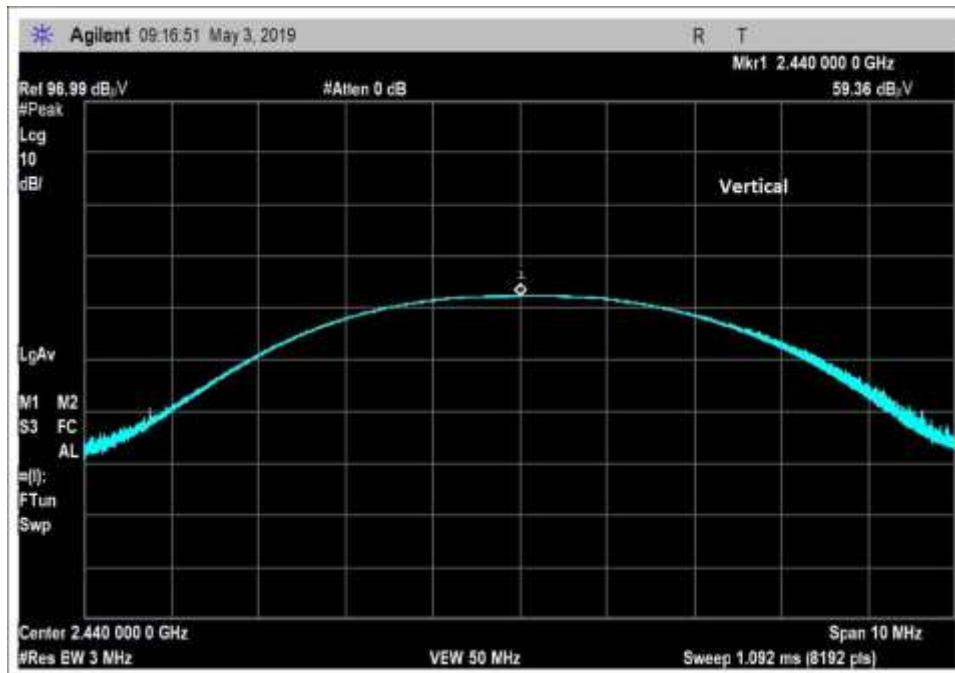
Low Channel, Horizontal



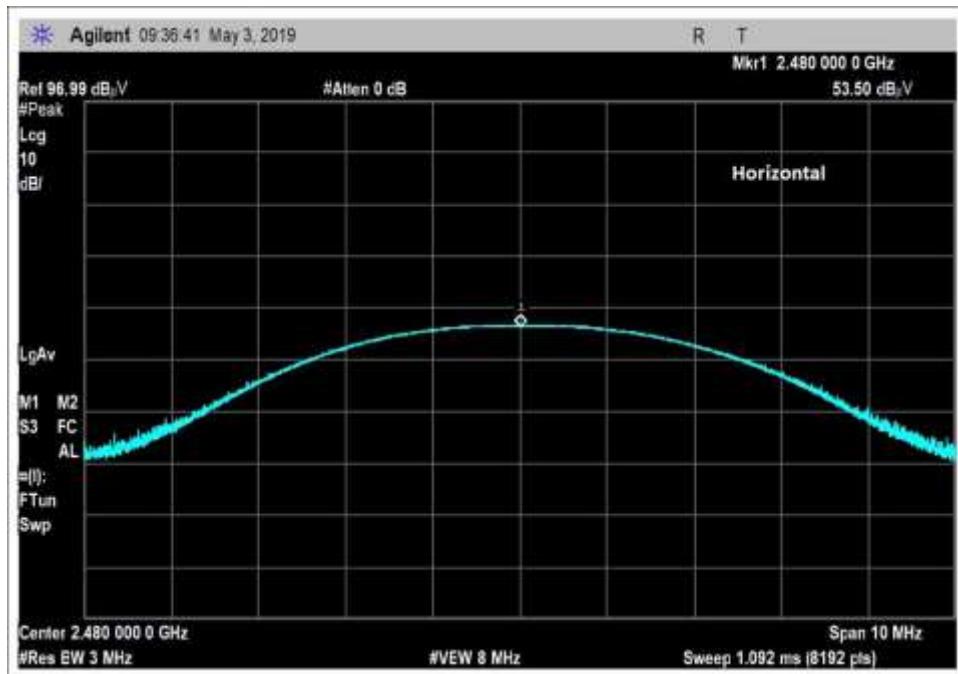
Low Channel, Vertical



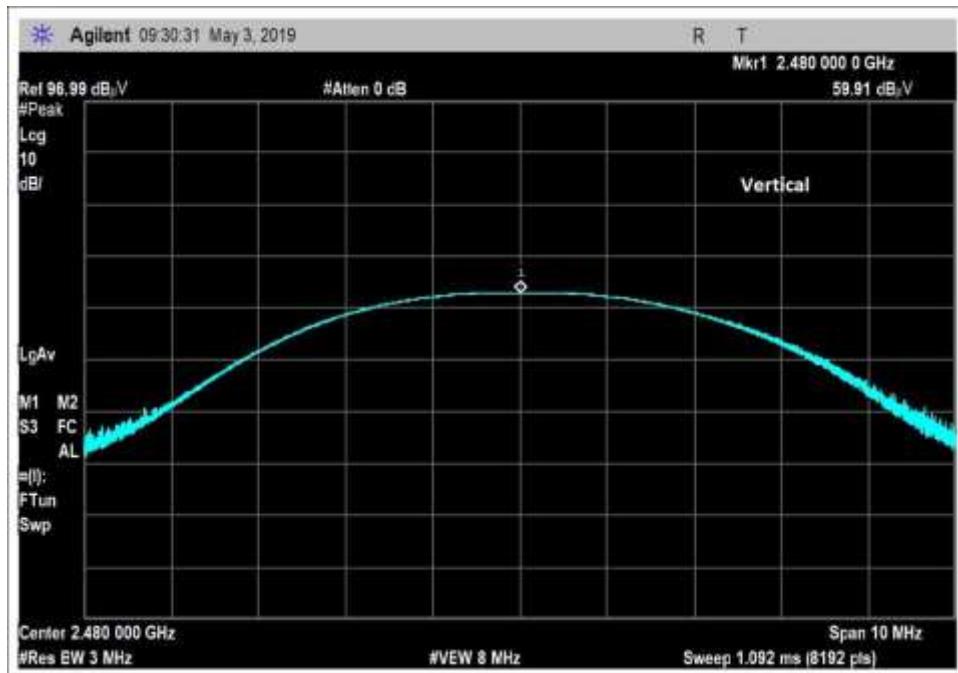
Middle Channel, Horizontal



Middle Channel, Vertical



High Channel, Horizontal



High Channel, Vertical

Test Setup / Conditions / Data

Test Location: CKC Laboratories Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249-1170
 Customer: **Connect Yard**
 Specification: **15.249 Carrier and Spurious Emissions (2400-2483.5 MHz Transmitter)**
 Work Order #: **102173** Date: 5/3/2019
 Test Type: **Radiated Scan** Time: 09:37:03
 Tested By: Hieu Song Nguyenpham Sequence#: 2
 Software: EMITest 5.03.12

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

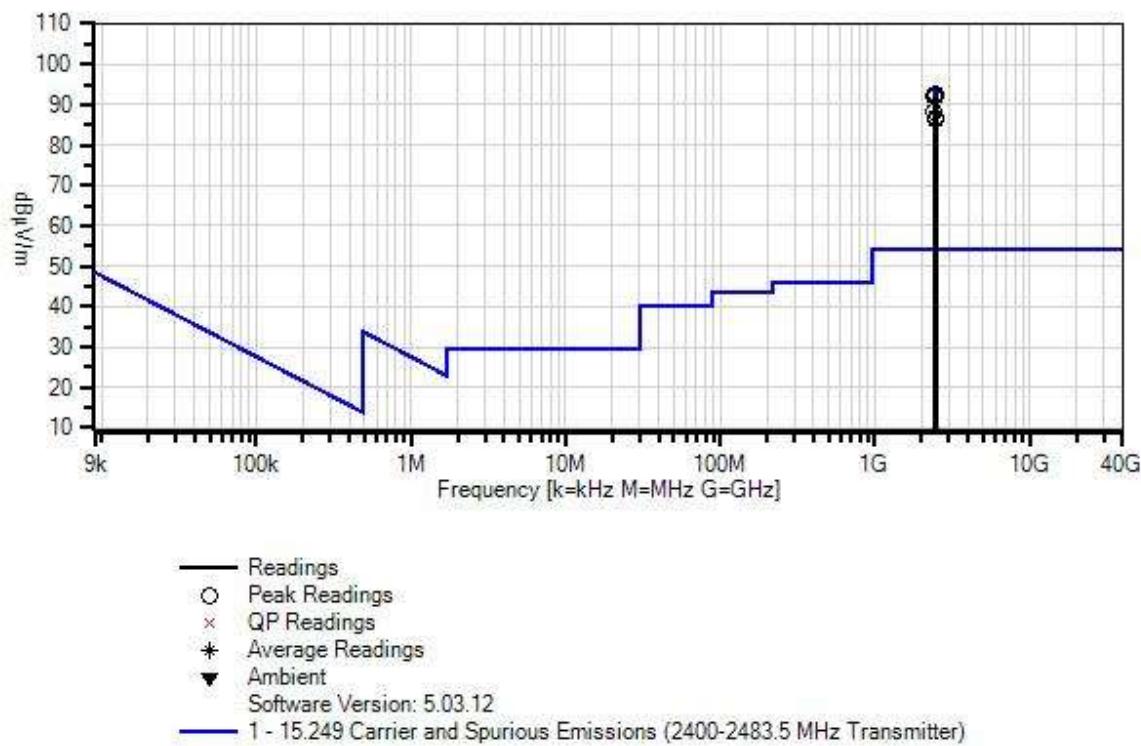
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Fundamental
Firmware: 1.7.15
Application: Putty
Temperature: 22.5°C
Humidity: 37 %
Atmospheric Pressure: 101.5kPa
Highest Generation Frequency: 2.48GHz
Method: ANSI C 63.10 2013
The EUT is placed on a non-conductive table and operated by an internal battery at 3.0VDC. The EUT is set in continuously transmitting as intended.

Connect Yard W/O#: 102173 Sequence#: 2 Date: 5/3/2019
15.249 Carrier and Spurious Emissions (2400-2483.5 MHz Transmitter) Test Distance: 3 Meters Horiz



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02157	Horn Antenna- ANSI C63.5	3115	1/15/2019	1/15/2021
T2	AN03302	Cable	32026-29094K- 29094K-72TC	1/15/2018	1/15/2020
T3	ANP01210	Cable	FSJ1P-50A-4A	12/18/2018	12/18/2020
	AN02660	Spectrum Analyzer	E4446A	10/19/2018	10/19/2020

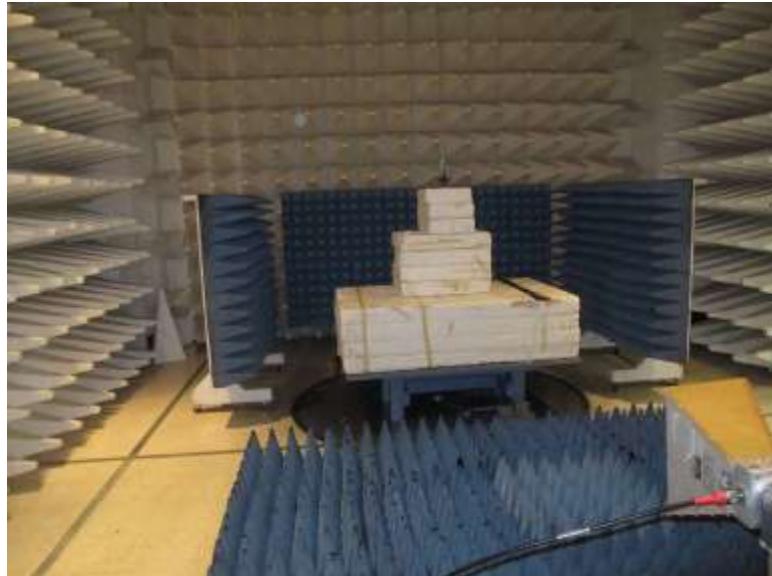
Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB μ V	T1 dB	T2 dB	T3 dB	Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
1	2480.000M	59.9	+28.9	+1.3	+2.6	+0.0	92.7	94.0	-1.3	Vert
2	2440.000M	59.4	+28.8	+1.3	+2.6	+0.0	92.1	94.0	-1.9	Vert
3	2402.000M	59.5	+28.6	+1.3	+2.6	+0.0	92.0	94.0	-2.0	Vert
4	2402.000M	55.7	+28.6	+1.3	+2.6	+0.0	88.2	94.0	-5.8	Horiz
5	2440.000M	54.3	+28.8	+1.3	+2.6	+0.0	87.0	94.0	-7.0	Horiz
6	2480.000M	53.5	+28.9	+1.3	+2.6	+0.0	86.3	94.0	-7.7	Horiz

Test Setup Photo(s)



15.249(a) Radiated Emissions

Test Setup / Conditions / Data

Test Location: CKC Laboratories Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249-1170
 Customer: **Connect Yard**
 Specification: **15.249 Carrier and Spurious Emissions (2400-2483.5 MHz Transmitter)**
 Work Order #: **102173** Date: 5/3/2019
 Test Type: **Radiated Scan** Time: 14:31:45
 Tested By: Hieu Song Nguyenpham Sequence#: 14
 Software: EMITest 5.03.12

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

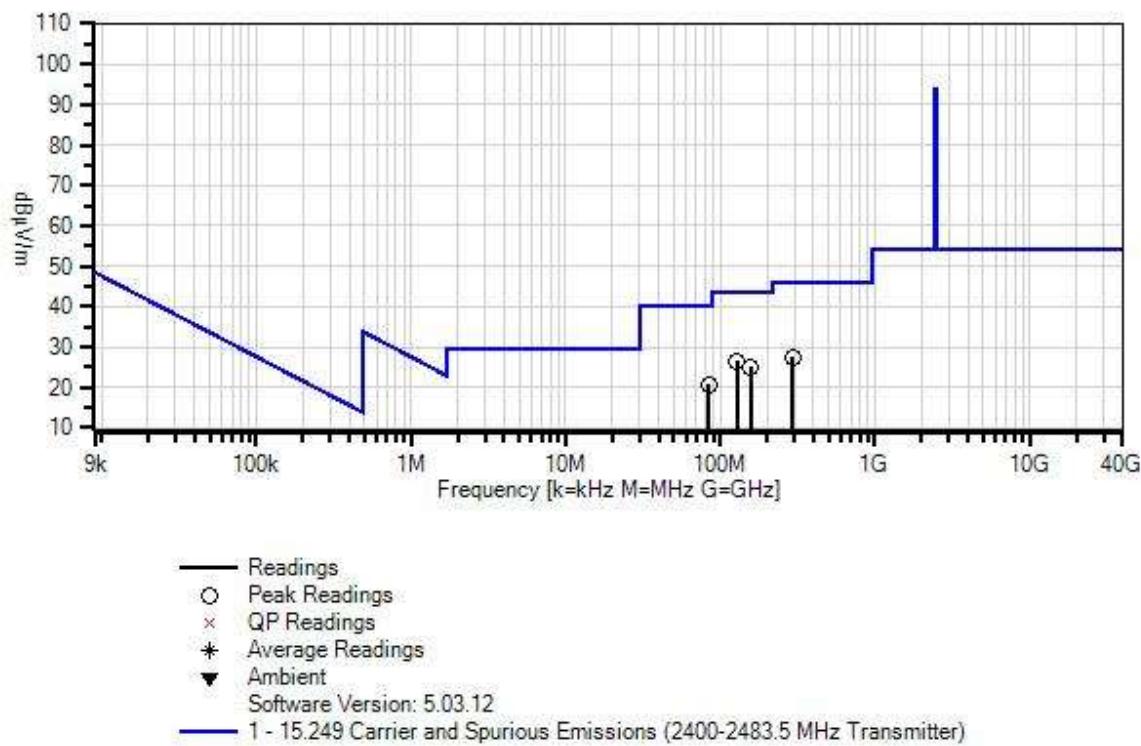
Radiated Emission
 Frequency Range: 9kHz to 1000MHz

Firmware: 1.7.15
 Application: Putty
 Temperature: 22.5°C
 Humidity: 37 %
 Atmospheric Pressure: 101.5kPa
 Highest Generation Frequency: 2.48GHz
 Method: ANSI C 63.10 2013

The EUT is placed on a non-conductive table and operated by an internal battery at 3.0VDC. The EUT is set in continuously transmitting as intended.

Low Channel

Connect Yard WO#: 102173 Sequence#: 14 Date: 5/3/2019
15.249 Carrier and Spurious Emissions (2400-2483.5 MHz Transmitter) Test Distance: 3 Meters



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP07508	Preamp	310N	10/15/2018	10/15/2020
	AN00432	Loop Antenna	6502	2/19/2019	2/19/2021
T2	ANP06049	Attenuator	PE7002-6	5/14/2018	5/14/2020
T3	ANP00880	Cable	RG214U	5/14/2018	5/14/2020
T4	ANP01187	Cable	CNT-195	8/20/2018	8/20/2020
T5	ANP06691	Cable	PE3062-180	5/14/2018	5/14/2020
	AN02660	Spectrum Analyzer	E4446A	10/19/2018	10/19/2020
T6	AN00852	Biconilog Antenna	CBL 6111C	5/1/2018	5/1/2020

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				dB	Ant
1	128.770M	39.2	-32.1 +0.4	+6.0 +11.7	+1.0	+0.2	+0.0	26.4	43.5	-17.1	Vert
2	158.000M	38.5	-32.1 +0.4	+5.9 +11.0	+1.2	+0.2	+0.0	25.1	43.5	-18.4	Vert
3	291.900M	37.7	-32.0 +0.6	+5.9 +13.2	+1.7	+0.3	+0.0	27.4	46.0	-18.6	Vert
4	84.300M	37.3	-32.1 +0.3	+5.9 +8.3	+0.8	+0.1	+0.0	20.6	40.0	-19.4	Vert



Test Location: CKC Laboratories Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249-1170
Customer: **Connect Yard**
Specification: **15.249 Carrier and Spurious Emissions (2400-2483.5 MHz Transmitter)**
Work Order #: **102173** Date: 5/3/2019
Test Type: **Radiated Scan** Time: 15:42:37
Tested By: Hieu Song Nguyenpham Sequence#: 8
Software: EMITest 5.03.12

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

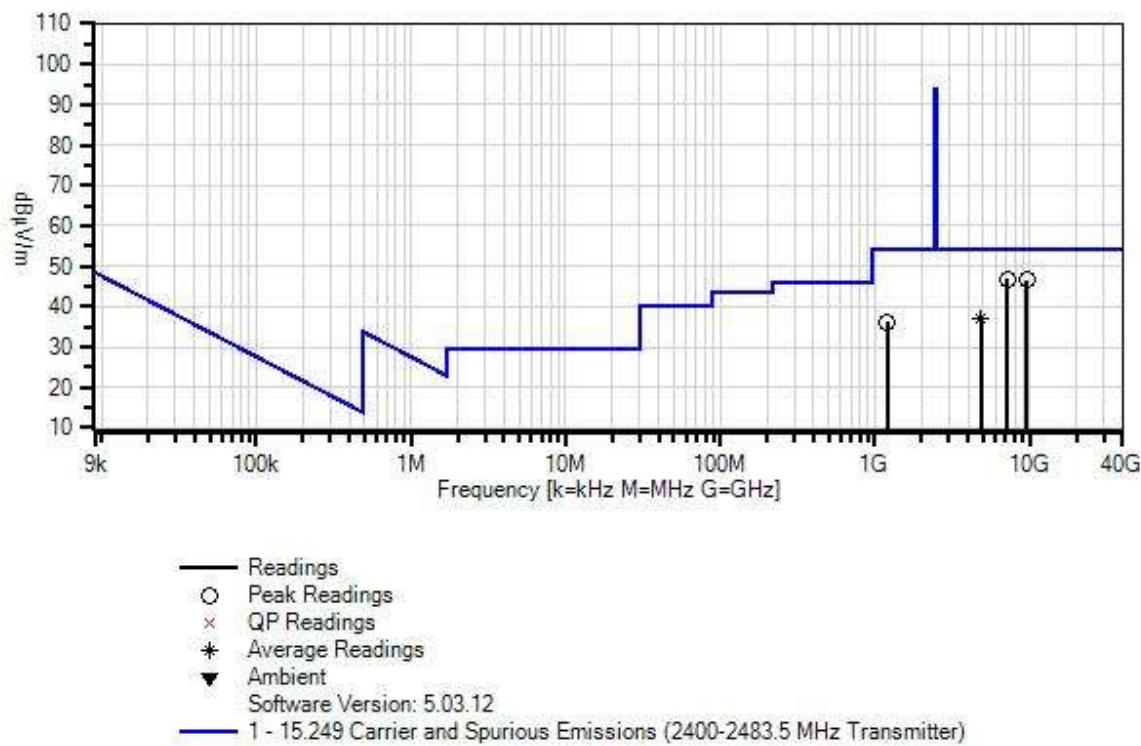
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Radiated Emission Frequency Range: 1GHz to 25GHz Firmware: 1.7.15 Application: Putty Temperature: 22.5°C Humidity: 37 % Atmospheric Pressure: 101.5kPa Highest Generation Frequency: 2.48GHz Method: ANSI C 63.10 2013 The EUT is placed on a non-conductive table and operated by an internal battery at 3.0VDC. The EUT is set in continuously transmitting as intended. Low Channel
--

Connect Yard WO#: 102173 Sequence#: 8 Date: 5/3/2019
15.249 Carrier and Spurious Emissions (2400-2483.5 MHz Transmitter) Test Distance: 3 Meters



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02157	Horn Antenna- ANSI C63.5	3115	1/15/2019	1/15/2021
T2	AN03302	Cable	32026-29094K- 29094K-72TC	1/15/2018	1/15/2020
T3	ANP01210	Cable	FSJ1P-50A-4A	12/18/2018	12/18/2020
	AN02660	Spectrum Analyzer	E4446A	10/19/2018	10/19/2020
T4	AN03607	Preamp	AMF-7D- 00101800-30- 10P	6/6/2017	6/6/2019
T5	AN03309	High Pass Filter	11SH10- 3000/T10000- O/O	3/16/2018	3/16/2020
T6	AN03013	Cable	32022-2-2909K- 36TC	6/25/2018	6/25/2020
	ANP01403	Cable	58758-23	6/25/2018	6/25/2020
	ANP06899	Cable	32022-29094K- 29094K-72TC	1/4/2018	1/4/2020
	AN02694	Horn Antenna- ANSI C63.5 Calibration	AMFW-5F- 18002650-20- 10P	5/11/2017	5/11/2019
	AN02693	Active Horn Antenna-ANSI C63.5 3m	AMFW-5F- 12001800-20- 10P	5/11/2017	5/11/2019
T7	AN02748	Low Pass Filter	11SL10- 2000/U6000- O/O	4/5/2018	4/5/2020

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7		Table	dB μ V/m	dB μ V/m		
	MHz	dB μ V	dB	dB	dB	dB				dB	Ant
1	7205.490M	61.6	+36.0	+2.3	+4.8	-59.0	+0.0	46.9	54.0	-7.1	Horiz
			+0.1	+1.1	+0.0						
2	9607.330M	57.0	+39.2	+2.7	+5.5	-59.3	+0.0	46.5	54.0	-7.5	Horiz
			+0.1	+1.3	+0.0						
3	4803.500M	56.3	+33.3	+1.8	+3.8	-59.0	+0.0	37.2	54.0	-16.8	Horiz
Ave			+0.1	+0.9	+0.0						
^	4803.500M	66.8	+33.3	+1.8	+3.8	-59.0	+0.0	47.7	54.0	-6.3	Horiz
			+0.1	+0.9	+0.0						
5	1201.160M	66.2	+24.2	+0.9	+1.8	-58.1	+0.0	36.1	54.0	-17.9	Vert
			+0.0	+0.4	+0.7						



Test Location: CKC Laboratories Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249-1170
Customer: **Connect Yard**
Specification: **15.249 Carrier and Spurious Emissions (2400-2483.5 MHz Transmitter)**
Work Order #: **102173** Date: 5/3/2019
Test Type: **Radiated Scan** Time: 15:09:20
Tested By: Hieu Song Nguyenpham Sequence#: 17
Software: EMITest 5.03.12

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

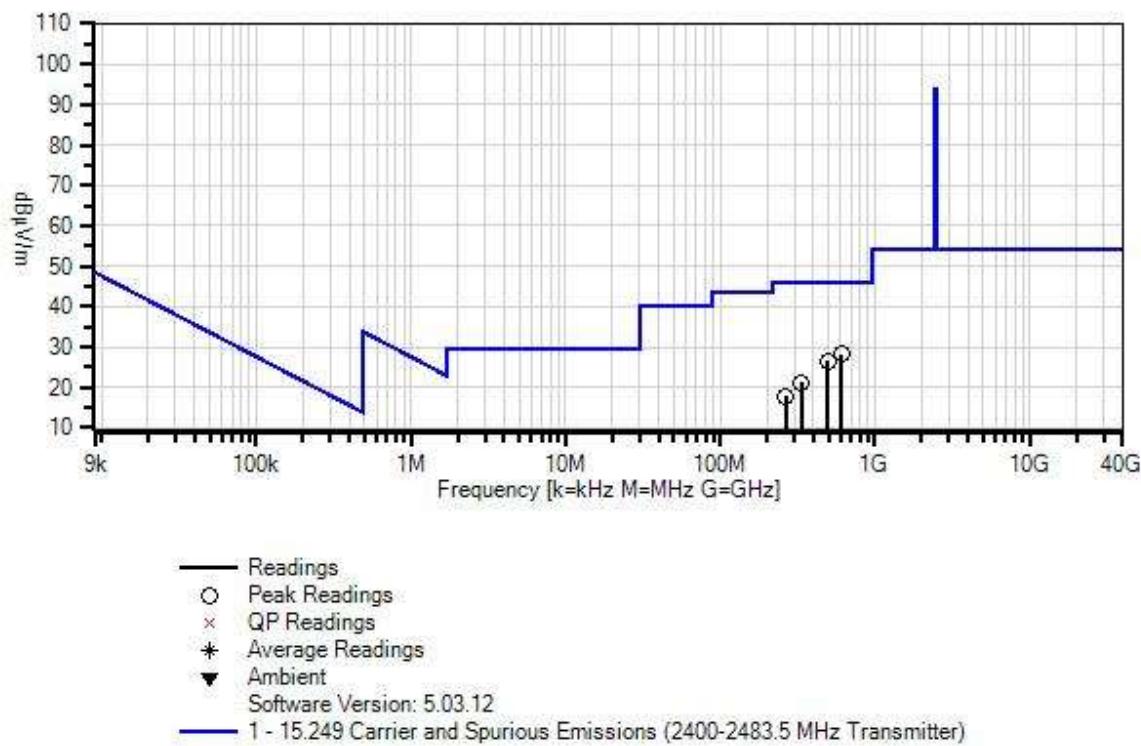
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Radiated Emission Frequency Range: 9kHz to 1000MHz Firmware: 1.7.15 Application: Putty Temperature: 22.5°C Humidity: 37 % Atmospheric Pressure: 101.5kPa Highest Generation Frequency: 2.48GHz Method: ANSI C 63.10 2013 The EUT is placed on a non-conductive table and operated by an internal battery at 3.0VDC. The EUT is set in continuously transmitting as intended. Middle Channel

Connect Yard WO#: 102173 Sequence#: 17 Date: 5/3/2019
15.249 Carrier and Spurious Emissions (2400-2483.5 MHz Transmitter) Test Distance: 3 Meters



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP07508	Preamp	310N	10/15/2018	10/15/2020
	AN00432	Loop Antenna	6502	2/19/2019	2/19/2021
T2	ANP06049	Attenuator	PE7002-6	5/14/2018	5/14/2020
T3	ANP00880	Cable	RG214U	5/14/2018	5/14/2020
T4	ANP01187	Cable	CNT-195	8/20/2018	8/20/2020
T5	ANP06691	Cable	PE3062-180	5/14/2018	5/14/2020
	AN02660	Spectrum Analyzer	E4446A	10/19/2018	10/19/2020
T6	AN00852	Biconilog Antenna	CBL 6111C	5/1/2018	5/1/2020

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6							
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	608.100M	30.3	-32.1 +0.9	+6.0 +19.8	+2.6	+0.6	+0.0	28.1	46.0	-17.9	Vert
2	495.600M	30.8	-32.0 +0.9	+6.0 +17.8	+2.4	+0.6	+0.0	26.5	46.0	-19.5	Vert
3	334.600M	30.0	-31.9 +0.7	+5.9 +14.2	+1.8	+0.4	+0.0	21.1	46.0	-24.9	Vert
4	264.100M	28.5	-32.0 +0.6	+6.0 +12.8	+1.6	+0.3	+0.0	17.8	46.0	-28.2	Vert



Test Location: CKC Laboratories Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249-1170
Customer: **Connect Yard**
Specification: **15.249 Carrier and Spurious Emissions (2400-2483.5 MHz Transmitter)**
Work Order #: **102173** Date: 5/3/2019
Test Type: **Radiated Scan** Time: 15:48:13
Tested By: Hieu Song Nguyenpham Sequence#: 11
Software: EMITest 5.03.12

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

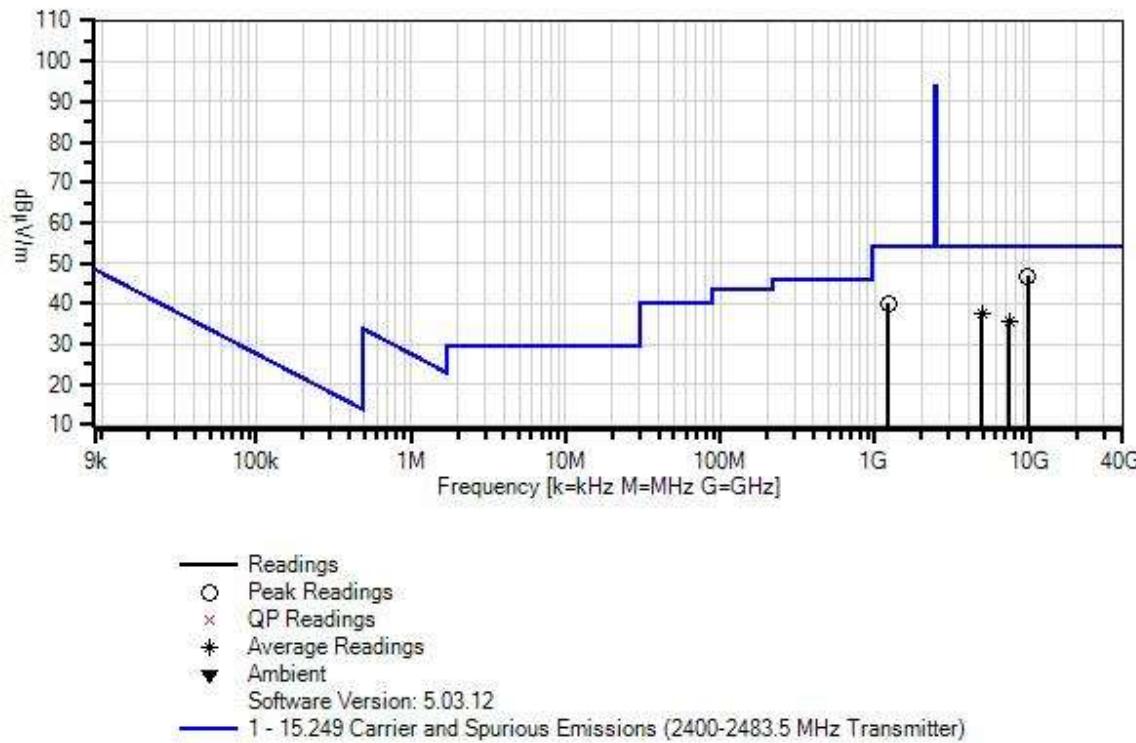
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Radiated Emission Frequency Range: 1GHz to 25GHz Firmware: 1.7.15 Application: Putty Temperature: 22.5°C Humidity: 37 % Atmospheric Pressure: 101.5kPa Highest Generation Frequency: 2.48GHz Method: ANSI C 63.10 2013 The EUT is placed on a non-conductive table and operated by an internal battery at 3.0VDC. The EUT is set in continuously transmitting as intended. Middle Channel

Connect Yard WO#: 102173 Sequence#: 11 Date: 5/3/2019
15.249 Carrier and Spurious Emissions (2400-2483.5 MHz Transmitter) Test Distance: 3 Meters



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02157	Horn Antenna- ANSI C63.5	3115	1/15/2019	1/15/2021
T2	AN03302	Cable	32026-29094K- 29094K-72TC	1/15/2018	1/15/2020
T3	ANP01210	Cable	FSJ1P-50A-4A	12/18/2018	12/18/2020
	AN02660	Spectrum Analyzer	E4446A	10/19/2018	10/19/2020
T4	AN03607	Preamp	AMF-7D- 00101800-30- 10P	6/6/2017	6/6/2019
T5	AN03309	High Pass Filter	11SH10- 3000/T10000- O/O	3/16/2018	3/16/2020
T6	AN03013	Cable	32022-2-2909K- 36TC	6/25/2018	6/25/2020
	ANP01403	Cable	58758-23	6/25/2018	6/25/2020
	ANP06899	Cable	32022-29094K- 29094K-72TC	1/4/2018	1/4/2020
	AN02694	Horn Antenna- ANSI C63.5 Calibration	AMFW-5F- 18002650-20- 10P	5/11/2017	5/11/2019
	AN02693	Active Horn Antenna-ANSI C63.5 3m	AMFW-5F- 12001800-20- 10P	5/11/2017	5/11/2019
T7	AN02748	Low Pass Filter	11SL10- 2000/U6000- O/O	4/5/2018	4/5/2020

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7		Table	dB μ V/m	dB μ V/m		
	MHz	dB μ V	dB	dB	dB	dB				dB	Ant
1	9759.560M	57.0	+39.3	+2.7	+5.5	-59.1	+0.0	46.9	54.0	-7.1	Horiz
			+0.1	+1.4	+0.0						
2	1220.200M	70.1	+24.2	+0.9	+1.8	-58.0	+0.0	40.1	54.0	-13.9	Vert
			+0.0	+0.4	+0.7						
3	4880.100M	56.4	+33.5	+1.9	+3.8	-59.2	+0.0	37.4	54.0	-16.6	Horiz
Ave			+0.1	+0.9	+0.0						
^	4880.100M	66.3	+33.5	+1.9	+3.8	-59.2	+0.0	47.3	54.0	-6.7	Horiz
			+0.1	+0.9	+0.0						
5	7319.410M	50.5	+36.4	+2.3	+4.8	-59.4	+0.0	35.8	54.0	-18.2	Horiz
Ave			+0.1	+1.1	+0.0						
^	7319.410M	63.0	+36.4	+2.3	+4.8	-59.4	+0.0	48.3	54.0	-5.7	Horiz
			+0.1	+1.1	+0.0						



Test Location: CKC Laboratories Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249-1170
Customer: **Connect Yard**
Specification: **15.249 Carrier and Spurious Emissions (2400-2483.5 MHz Transmitter)**
Work Order #: **102173** Date: 5/3/2019
Test Type: **Radiated Scan** Time: 15:28:15
Tested By: Hieu Song Nguyenpham Sequence#: 20
Software: EMITest 5.03.12

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

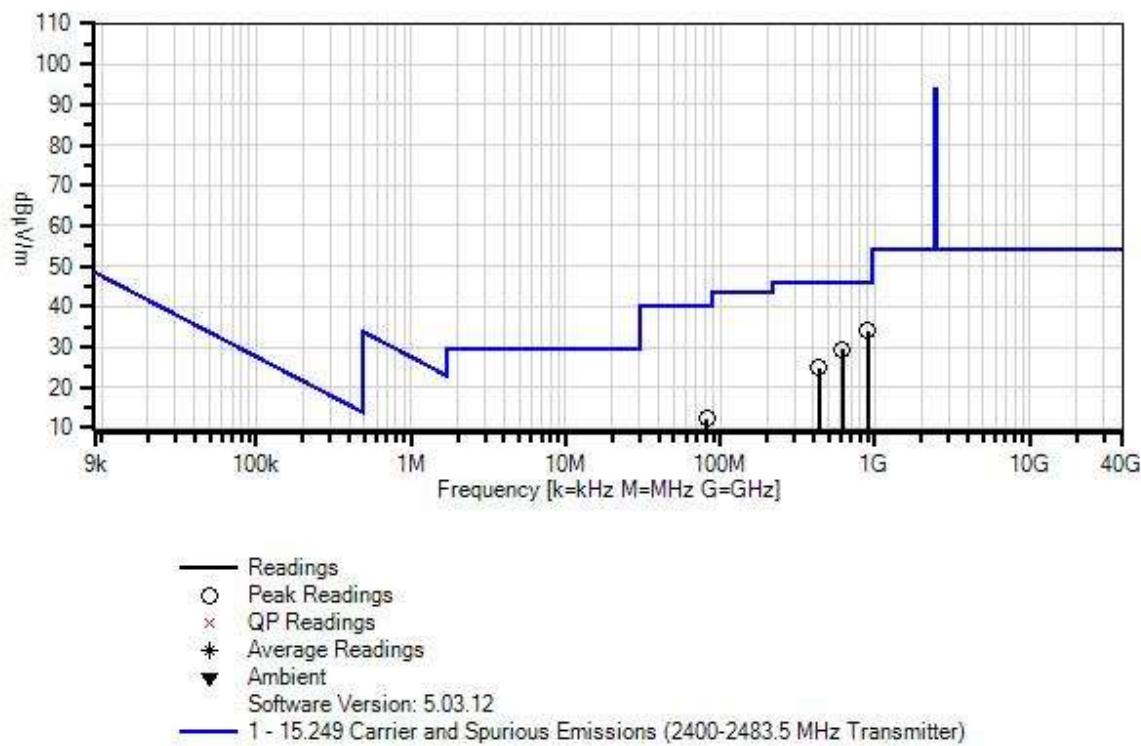
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Radiated Emission Frequency Range: 9kHz to 1000MHz Firmware: 1.7.15 Application: Putty Temperature: 22.5°C Humidity: 37 % Atmospheric Pressure: 101.5kPa Highest Generation Frequency: 2.48GHz Method: ANSI C 63.10 2013 The EUT is placed on a non-conductive table and operated by an internal battery at 3.0VDC. The EUT is set in continuously transmitting as intended. High Channel

Connect Yard WO#: 102173 Sequence#: 20 Date: 5/3/2019
15.249 Carrier and Spurious Emissions (2400-2483.5 MHz Transmitter) Test Distance: 3 Meters



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP07508	Preamp	310N	10/15/2018	10/15/2020
	AN00432	Loop Antenna	6502	2/19/2019	2/19/2021
T2	ANP06049	Attenuator	PE7002-6	5/14/2018	5/14/2020
T3	ANP00880	Cable	RG214U	5/14/2018	5/14/2020
T4	ANP01187	Cable	CNT-195	8/20/2018	8/20/2020
T5	ANP06691	Cable	PE3062-180	5/14/2018	5/14/2020
	AN02660	Spectrum Analyzer	E4446A	10/19/2018	10/19/2020
T6	AN00852	Biconilog Antenna	CBL 6111C	5/1/2018	5/1/2020

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

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6							
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	901.100M	31.5	-31.8	+5.9	+3.3	+0.9	+0.0	34.0	46.0	-12.0	Vert
			+1.4	+22.8							
2	618.800M	31.4	-32.1	+6.0	+2.6	+0.6	+0.0	29.3	46.0	-16.7	Vert
			+1.0	+19.8							
3	431.600M	30.6	-31.9	+6.0	+2.2	+0.5	+0.0	24.8	46.0	-21.2	Vert
			+0.9	+16.5							
4	81.400M	29.3	-32.1	+5.9	+0.8	+0.1	+0.0	12.2	40.0	-27.8	Vert
			+0.3	+7.9							

Test Location: CKC Laboratories Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249-1170
 Customer: **Connect Yard**
 Specification: **15.249 Carrier and Spurious Emissions (2400-2483.5 MHz Transmitter)**
 Work Order #: **102173** Date: 5/3/2019
 Test Type: **Radiated Scan** Time: 15:39:42
 Tested By: Hieu Song Nguyenpham Sequence#: 5
 Software: EMITest 5.03.12

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

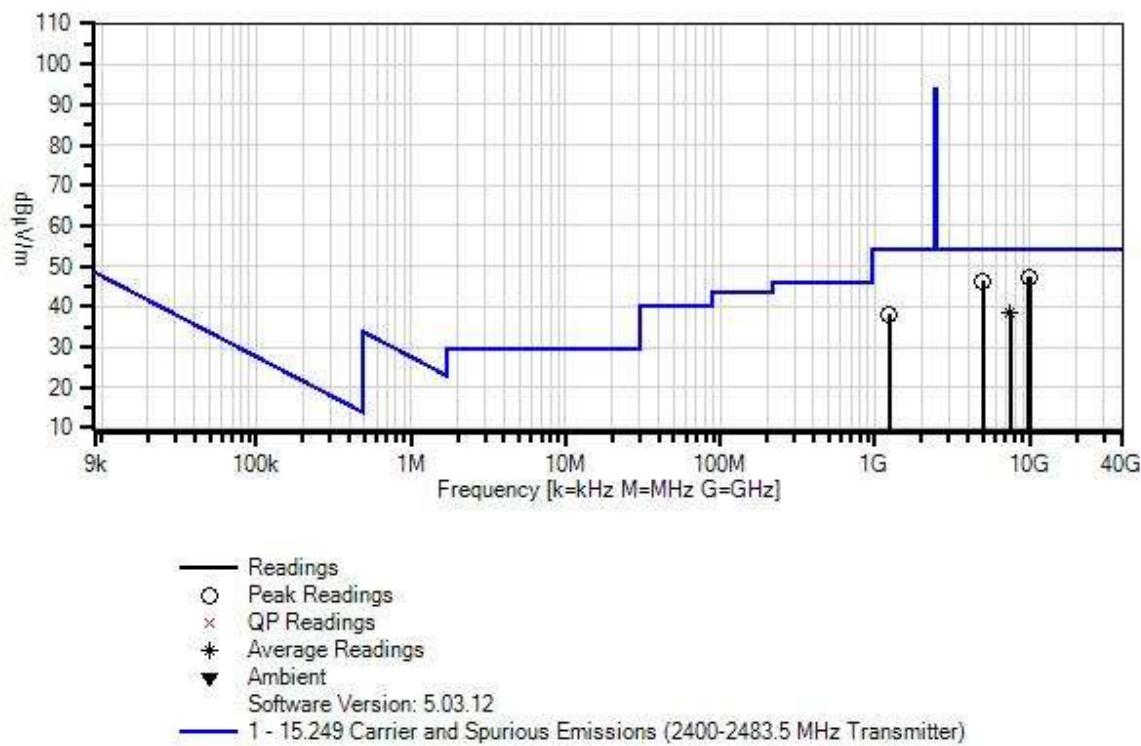
Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Radiated Emission Frequency Range: 1GHz to 25GHz Firmware: 1.7.15 Application: Putty Temperature: 22.5°C Humidity: 37 % Atmospheric Pressure: 101.5kPa Highest Generation Frequency: 2.48GHz Method: ANSI C 63.10 2013
The EUT is placed on a non-conductive table and operated by an internal battery at 3.0VDC. The EUT is set in continuously transmitting as intended.

High Channel

Connect Yard WO#: 102173 Sequence#: 5 Date: 5/3/2019
15.249 Carrier and Spurious Emissions (2400-2483.5 MHz Transmitter) Test Distance: 3 Meters



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02157	Horn Antenna- ANSI C63.5	3115	1/15/2019	1/15/2021
T2	AN03302	Cable	32026-29094K- 29094K-72TC	1/15/2018	1/15/2020
T3	ANP01210	Cable	FSJ1P-50A-4A	12/18/2018	12/18/2020
	AN02660	Spectrum Analyzer	E4446A	10/19/2018	10/19/2020
T4	AN03607	Preamp	AMF-7D- 00101800-30- 10P	6/6/2017	6/6/2019
T5	AN03309	High Pass Filter	11SH10- 3000/T10000- O/O	3/16/2018	3/16/2020
T6	AN03013	Cable	32022-2-2909K- 36TC	6/25/2018	6/25/2020
	ANP01403	Cable	58758-23	6/25/2018	6/25/2020
	ANP06899	Cable	32022-29094K- 29094K-72TC	1/4/2018	1/4/2020
	AN02694	Horn Antenna- ANSI C63.5 Calibration	AMFW-5F- 18002650-20- 10P	5/11/2017	5/11/2019
	AN02693	Active Horn Antenna-ANSI C63.5 3m	AMFW-5F- 12001800-20- 10P	5/11/2017	5/11/2019
T7	AN02748	Low Pass Filter	11SL10- 2000/U6000- O/O	4/5/2018	4/5/2020

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7		Table	dB μ V/m	dB μ V/m		
	MHz	dB μ V	dB	dB	dB	dB				dB	Ant
1	9921.700M	57.4	+39.4 +0.1	+2.7 +1.3	+5.6 +0.0	-59.2	+0.0	47.3	54.0	-6.7	Horiz
2	4960.400M	65.1	+33.7 +0.1	+1.9 +0.9	+3.8 +0.0	-59.1	+0.0	46.4	54.0	-7.6	Horiz
3	7439.410M Ave	52.3	+36.9 +0.1	+2.4 +1.1	+4.8 +0.0	-59.2	+0.0	38.4	54.0	-15.6	Horiz
^	7439.410M	64.7	+36.9 +0.1	+2.4 +1.1	+4.8 +0.0	-59.2	+0.0	50.8	54.0	-3.2	Horiz
5	1239.940M	68.2	+24.3 +0.0	+0.9 +0.4	+1.8 +0.7	-58.1	+0.0	38.2	54.0	-15.8	Vert

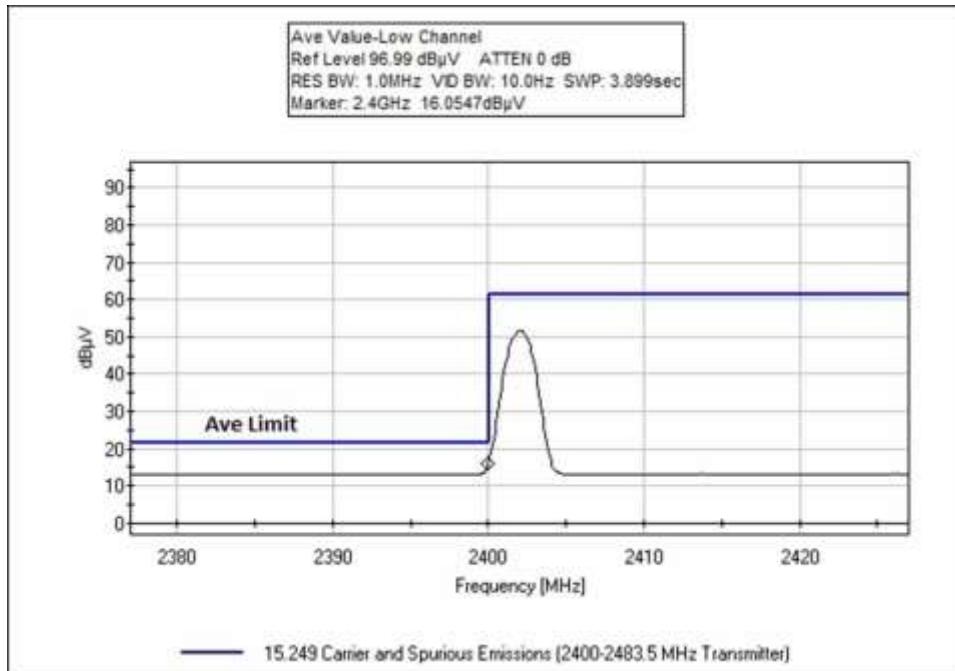
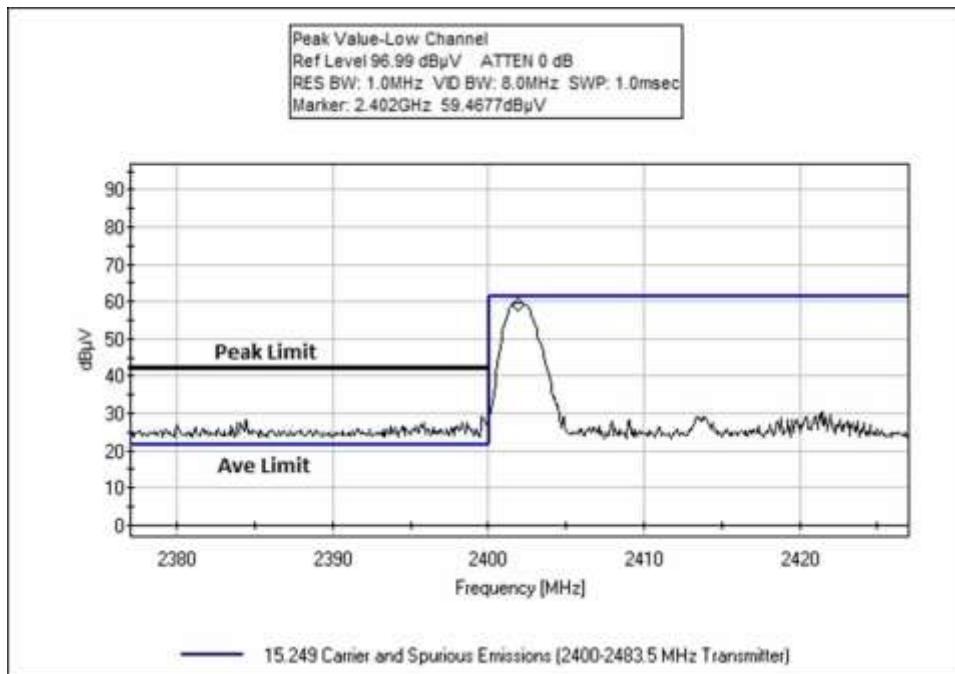
Band Edge

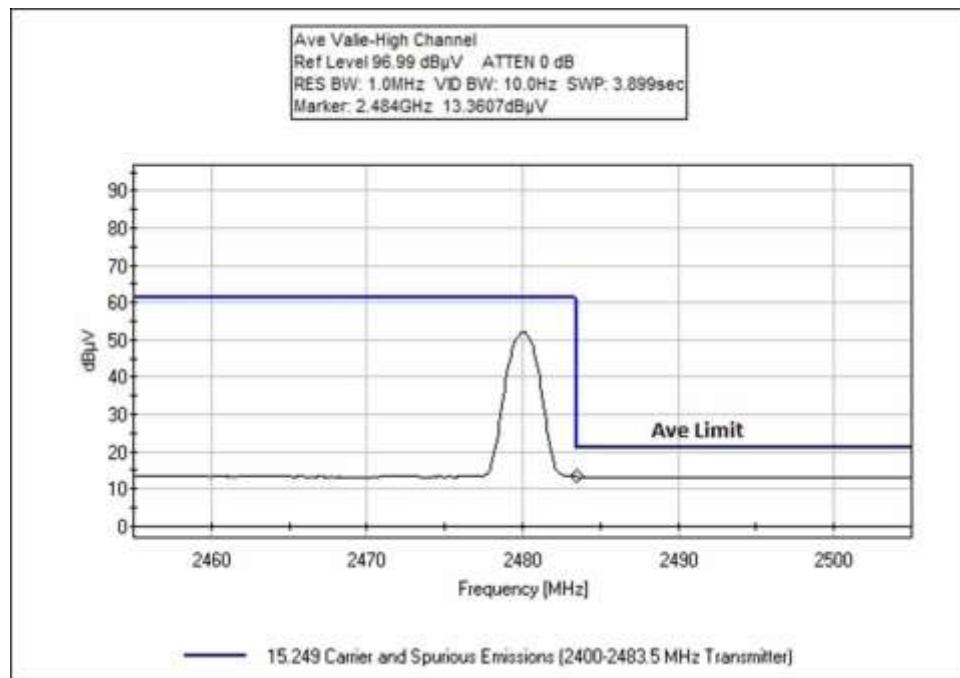
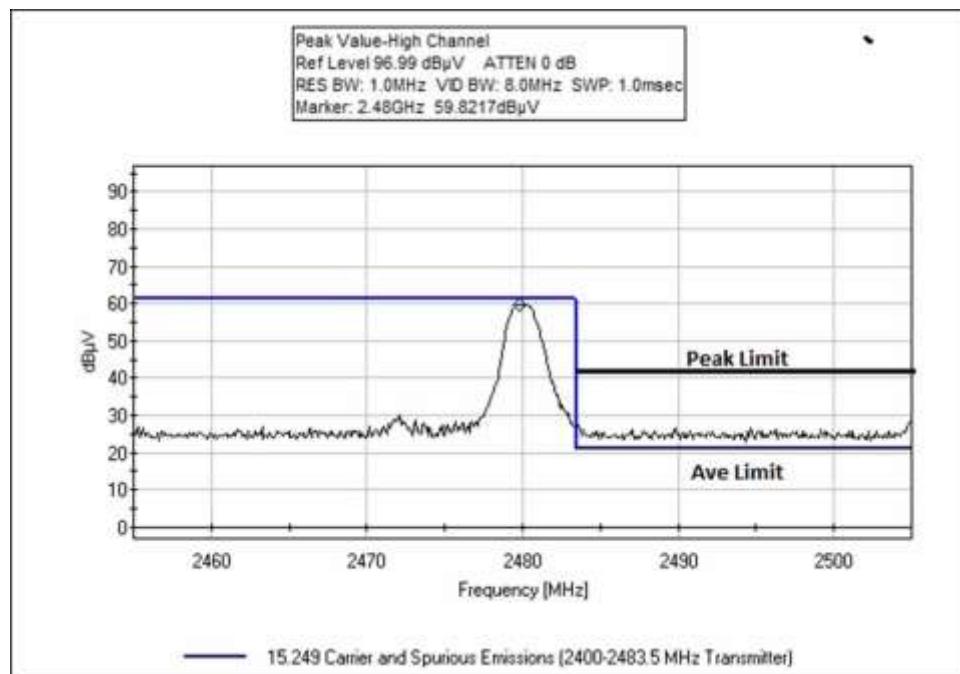
Band Edge Summary

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
2400	GFSK	Integral	48.0547	<54	Pass
2483.5	GFSK	Integral	45.3607	<54	Pass

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

Band Edge Plots





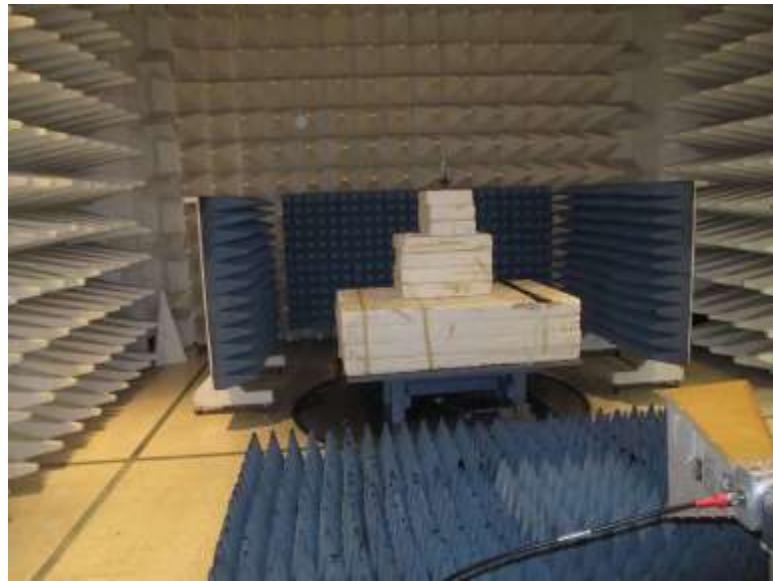
Test Setup Photo(s)



Below 1GHz



Below 1GHz



Above 1GHz



Above 1GHz

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

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

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

Emissions Test Details

TESTING PARAMETERS

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

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

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

CORRECTION FACTORS

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

SAMPLE CALCULATIONS	
Meter reading	($\text{dB}\mu\text{V}$)
+ Antenna Factor	(dB/m)
+ Cable Loss	(dB)
- Distance Correction	(dB)
- Preamplifier Gain	(dB)
= Corrected Reading	($\text{dB}\mu\text{V}/\text{m}$)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

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

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

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

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

Peak

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

Quasi-Peak

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

Average

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