Pacific Bioscience Laboratories, Inc.

ADDENDUM TO TEST REPORT 99133-12

Smart Profile with Bluetooth

Tested To The Following Standards:

FCC Part 15 Subpart C Section(s)

15.207 & 15.247
(DTS 2400-2483.5 MHz)

Report No.: 99133-12A

Date of issue: March 3, 2017

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:

Pacific Bioscience Laboratories, Inc.
17275 NE 67th Ct
Redmond, WA 98052

REPRESENTATIVE: Raj Shah
Customer Reference Number: 4200438589

REPORT PREPARED BY:

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

Project Number: 99133

DATE OF EQUIPMENT RECEIPT: February 2, 2017
DATE(S) OF TESTING: February 2-6, 2017 and March 1, 2017

Revision History

Original: Testing of the Smart Profile with Bluetooth to FCC Part 15 Subpart C Section(s) 15.207 & 15.247 (DTS 2400-2483.5 MHz)
Addendum A: To add data for testing performed to 15.207 AC Conducted Emissions. Also added the Configuration used for the testing to the Equipment Under Test Section, the new testing dates and revised the Summary Table to reflect the result.

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

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 15 Subpart C - 15.247 (DTS)

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

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
Smart Profile with Bluetooth	Pacific Bioscience Laboratories, Inc.	Smart Profile with Bluetooth	NA

Support Equipment:

Device	Manufacturer	Model #	S/N
None			

Configuration 3

Equipment Tested:

Device	Manufacturer	Model #	S/N
Smart Profile with Bluetooth	Pacific Bioscience Laboratories, Inc.	Smart Profile with Bluetooth	NA
Switching Power Supply	Clarisonic	PSM03A-050Q-3	NA
Smart Profile Charger	Pacific Bioscience Laboratories, Inc.	Smart Profile Charger	NA

Support Equipment:

Device	Manufacturer	Model #	S/N
None			

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	802.15.1
Operating Frequency Range:	2402-2480MHz
Modulation Type(s):	GFSK
Maximum Duty Cycle:	100%
Number of TX Chains:	1
Antenna Type(s) and Gain:	PCB Trace 1dBi
Beamforming Type:	NA
Antenna Connection Type:	Integral (External connector provided to facilitate testing)
Nominal Input Voltage:	2.4V DC Battery
Firmware / Software used for Test:	Iris_nRF52_EMC_256K_v0.4

FCC Part 15 Subpart C

15.247(a)(2) 6dB Bandwidth

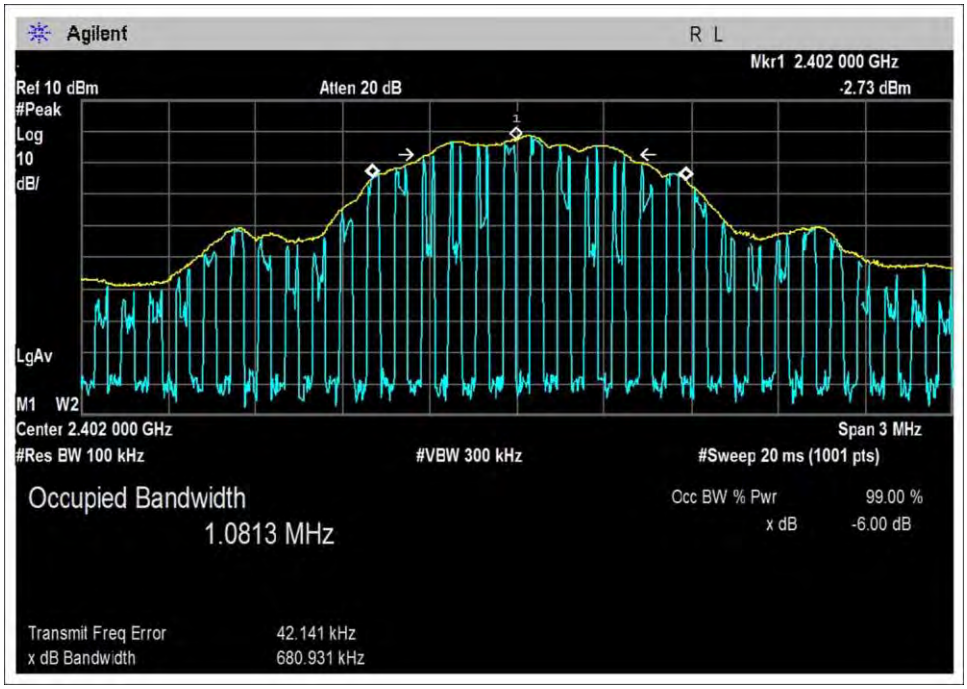
Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	S. Pittsford
Test Method:	ANSI C63.10 (2013), KDB 558074 D01 DTS Meas Guidance 4/8/2016 v03r05	Test Date(s):	2/2/2017
Configuration:	1		
Test Setup:	Frequency tested: 2402MHz, 2442MHz & 2480MHz Firmware power setting: Max Power EUT Firmware: Iris_nRF52_EMC_256K_v0.4 Protocol /MCS/Modulation: 802.15.1 Antenna type: PCB Trace Antenna Gain: 1dBi Duty Cycle: 100% Test Setup: The EUT is directly connected to the spectrum analyzer via a temporary antenna connector. The EUT has the battery replaced with a temporary power supply set to the battery's nominal voltage.		

Environmental Conditions			
Temperature (ºC)	23	Relative Humidity (%):	18

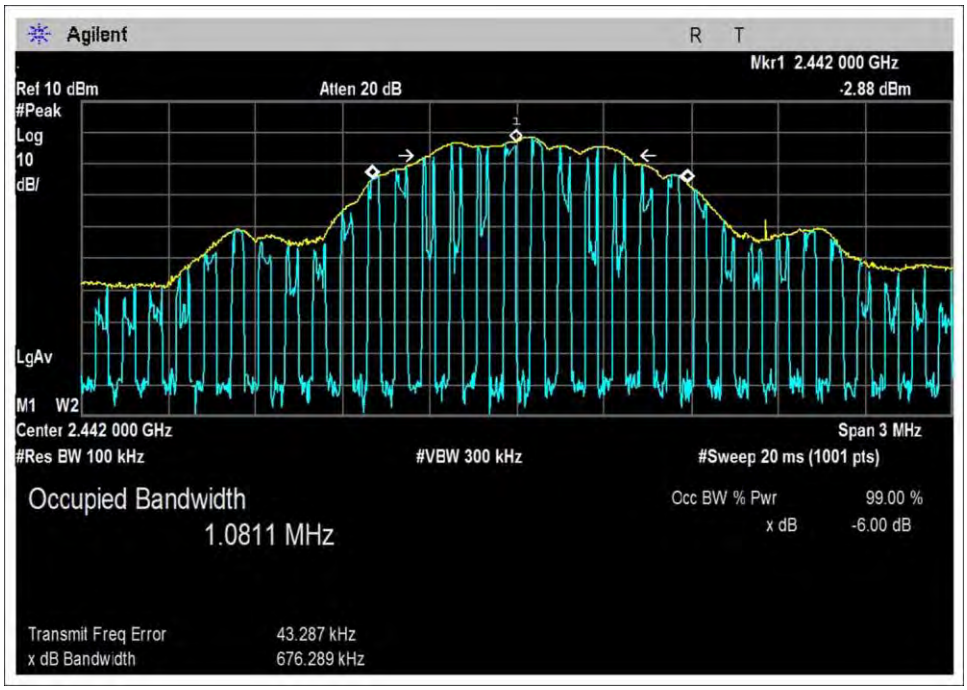
Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02872	Spectrum Analyzer	Agilent	E4440A	11/18/2015	11/18/2017

Test Data Summary					
Frequency (MHz)	**Antenna Port**	**Modulation**	**Measured (kHz)**	**Limit (kHz)**	**Results**
2402	1	GFSK	680.9	≥500	Pass
2442	1	GFSK	676.3	≥500	Pass
2480	1	GFSK	678.5	≥500	Pass

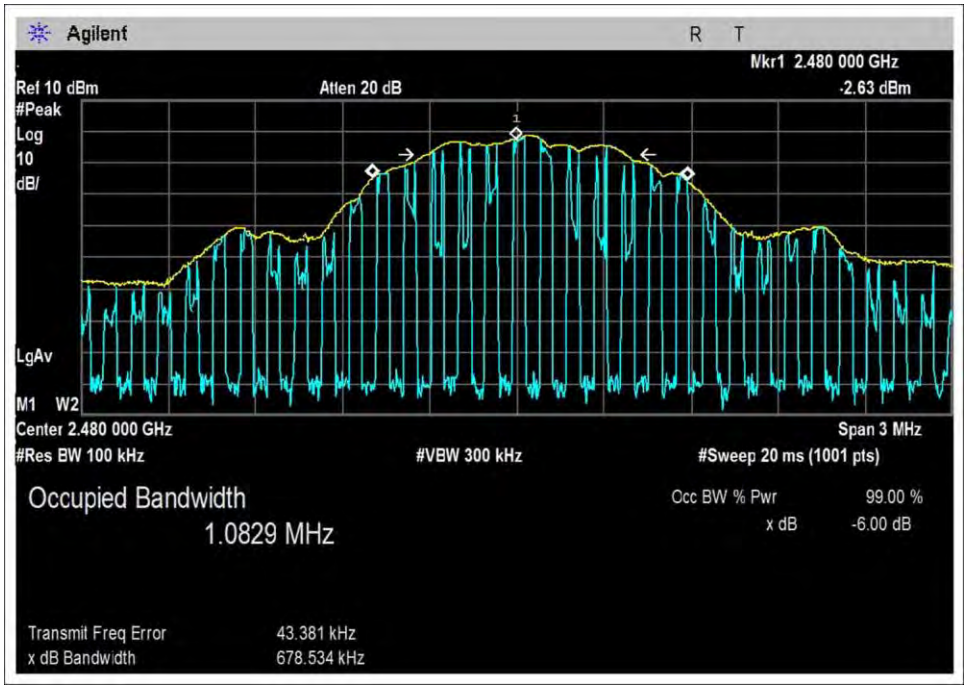
Plots



Low Channel

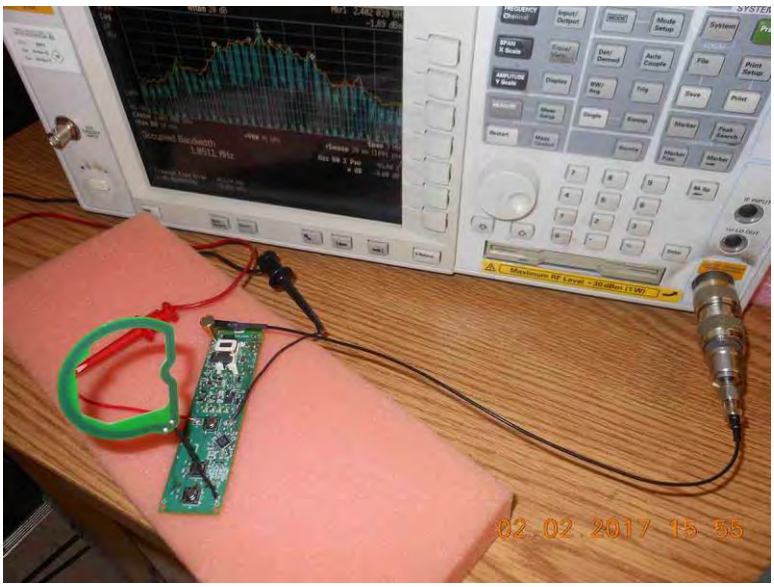


Middle Channel



High Channel

Test Setup Photo



15.247(b)(3) Output Power

Test Setup / Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	S. Pittsford
Test Method:	ANSI C63.10 (2013), KDB 558074 D01 DTS Meas Guidance 4/8/2016 v03r05	Test Date(s):	2/2/2017
Configuration:	1		
Test Setup:	Frequency tested: 2402MHz, 2442MHz & 2480MHz Firmware power setting: Max Power EUT Firmware: Iris_nRF52_EMC_256K_v0.4 Protocol /MCS/Modulation: 802.15.1 Antenna type: PCB Trace Antenna Gain: 1dBi Duty Cycle: 100% Test Setup: The EUT is directly connected to the spectrum analyzer via a temporary antenna connector. The EUT has the battery replaced with a temporary power supply set to the battery's nominal voltage.		

Environmental Conditions			
Temperature (ºC)	23	Relative Humidity (%):	18

Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02872	Spectrum Analyzer	Agilent	E4440A	11/18/2015	11/18/2017

Test Data Summary - Voltage Variations

This equipment is battery powered and manufacturer declares the equipment cannot operate while charging. Power output tests were performed using a fresh battery.

Test Data Summary - RF Conducted Measurement

Measurement Option: RBW > DTS Bandwidth

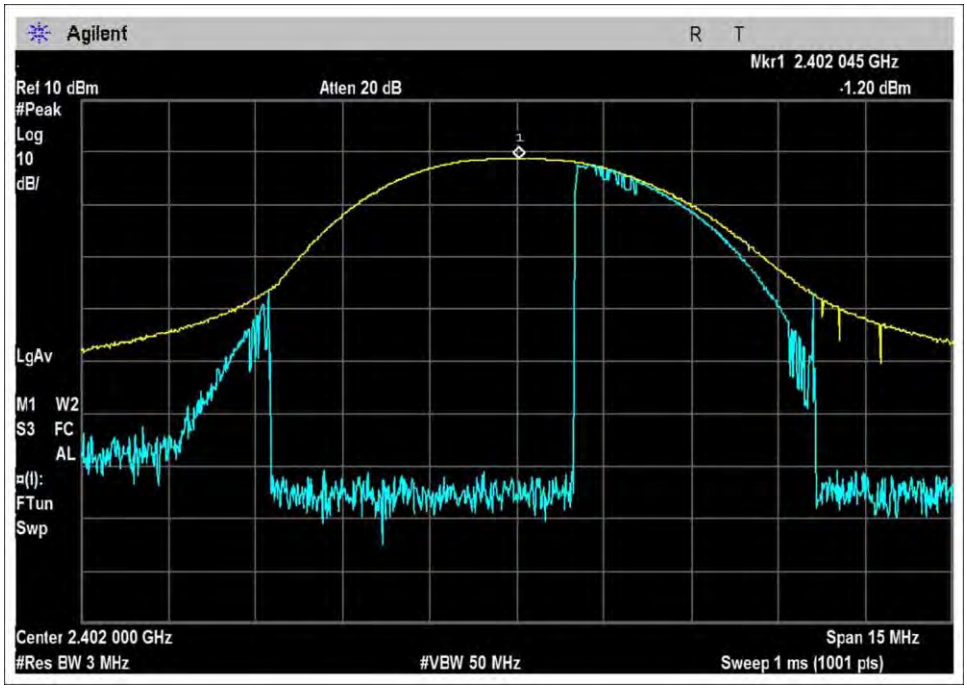
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Measured (dBm)	Limit (dBm)	Results
2402	GFSK	PCB trace 1dBi	-1.20	≤30	Pass
2442	GFSK	PCB trace 1dBi	-1.32	≤30	Pass
2480	GFSK	PCB trace 1dBi	-1.09	≤30	Pass

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

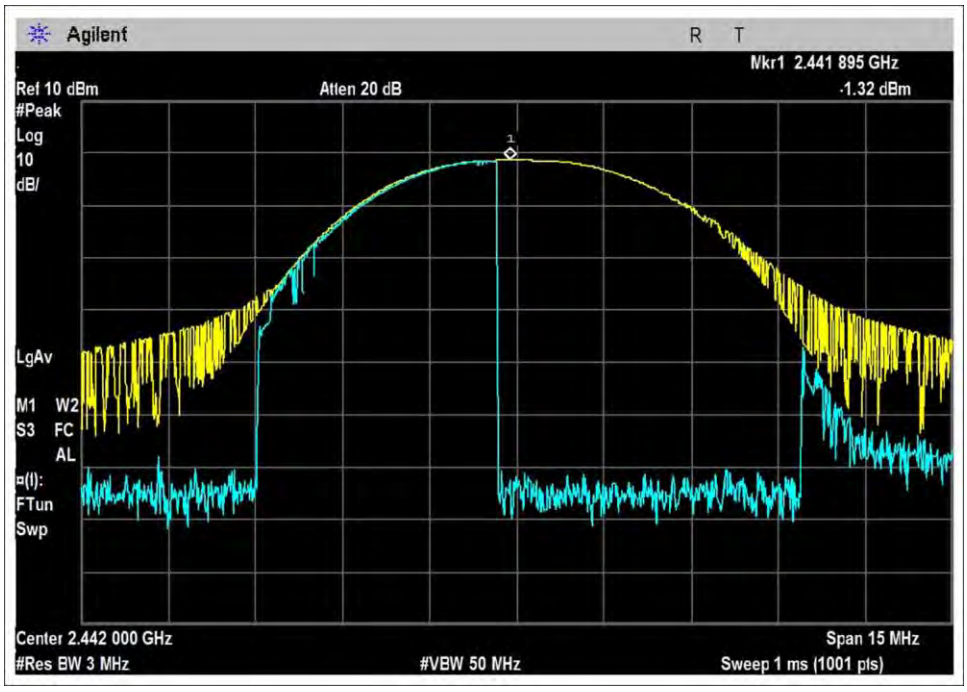
$$Limit = 30 - Roundup\left(\frac{G-6}{3}\right)$$

For directional beamforming antennas, the limit is calculated in accordance with 15.247(c)(2) and KDB 662911.

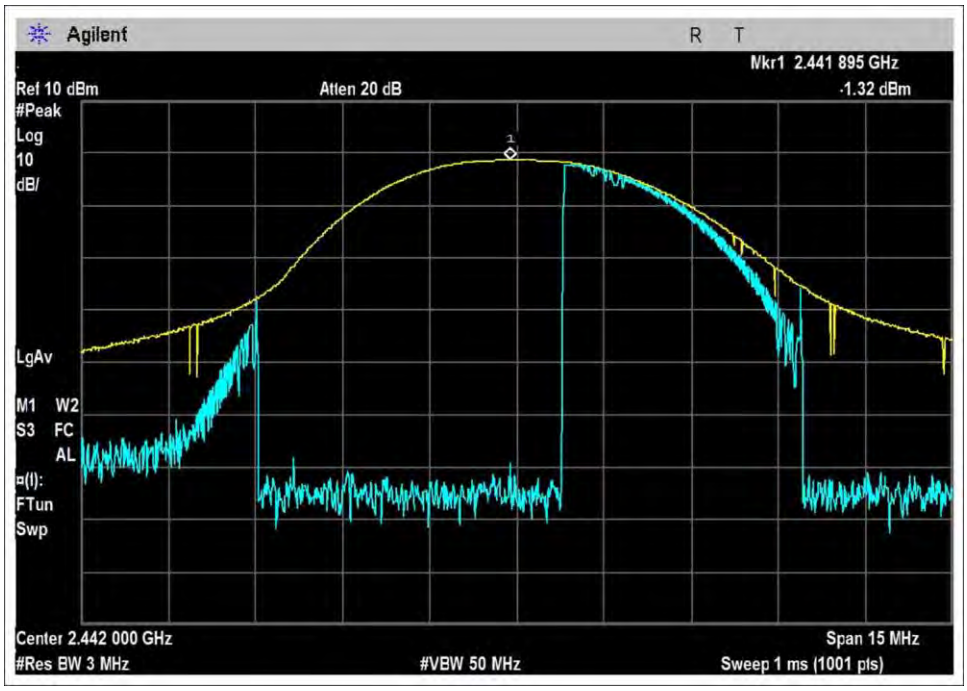
Plots



Low Channel

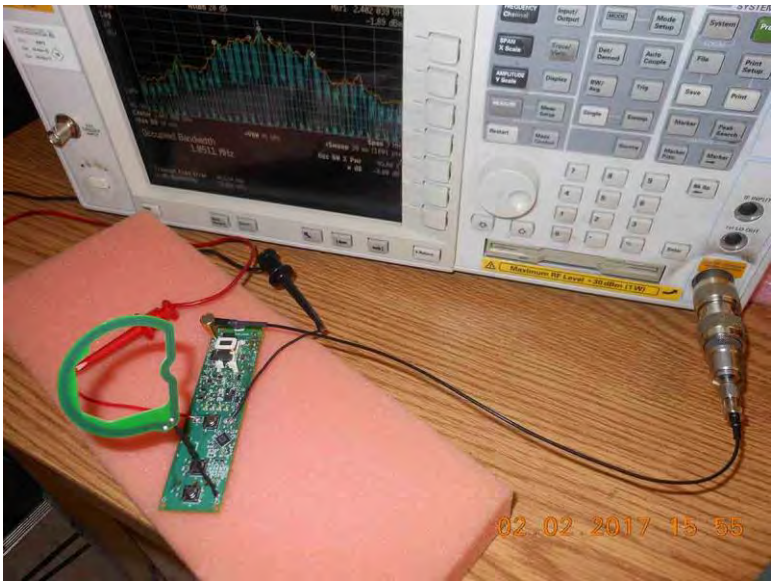


Middle Channel



High Channel

Test Setup Photo



15.247(e) Power Spectral Density

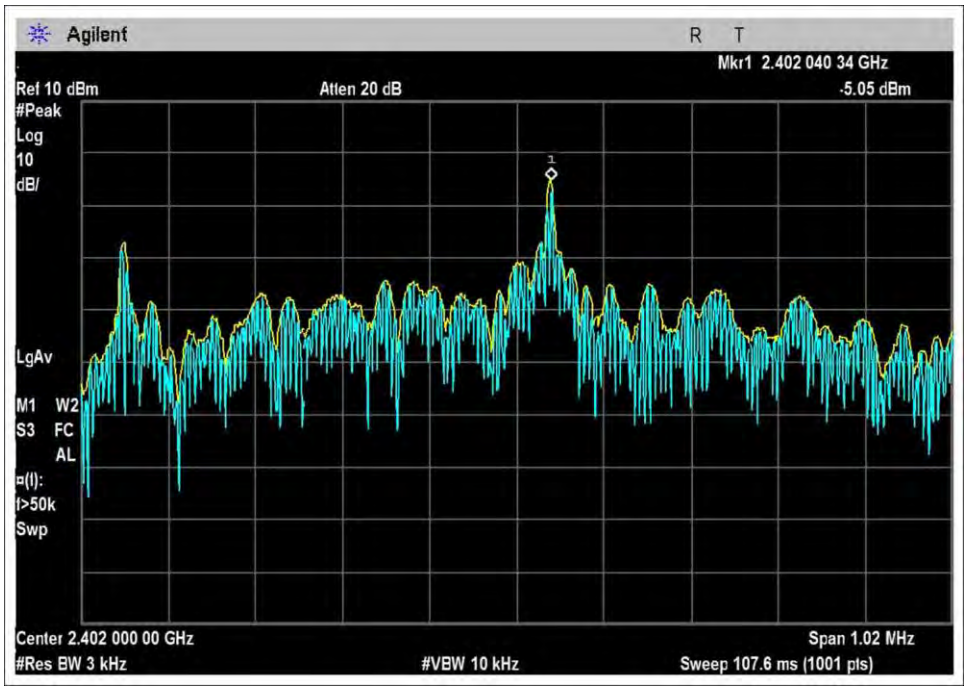
Test Setup / Conditions / Data			
Test Location:	Bothell Lab C3	Test Engineer:	S. Pittsford
Test Method:	ANSI C63.10 (2013), KDB 558074 D01 DTS Meas Guidance 4/8/2016 v03r05	Test Date(s):	2/2/2017
Configuration:	1		
Test Setup:	Frequency tested: 2402MHz, 2442MHz & 2480MHz Firmware power setting: Max Power EUT Firmware: Iris_nRF52_EMC_256K_v0.4 Protocol /MCS/Modulation: 802.15.1 Antenna type: PCB Trace Antenna Gain: 1dBi Duty Cycle: 100% Test Setup: The EUT is directly connected to the spectrum analyzer via a temporary antenna connector. The EUT has the battery replaced with a temporary power supply set to the battery's nominal voltage.		

Environmental Conditions			
Temperature (ºC)	23	Relative Humidity (%):	18

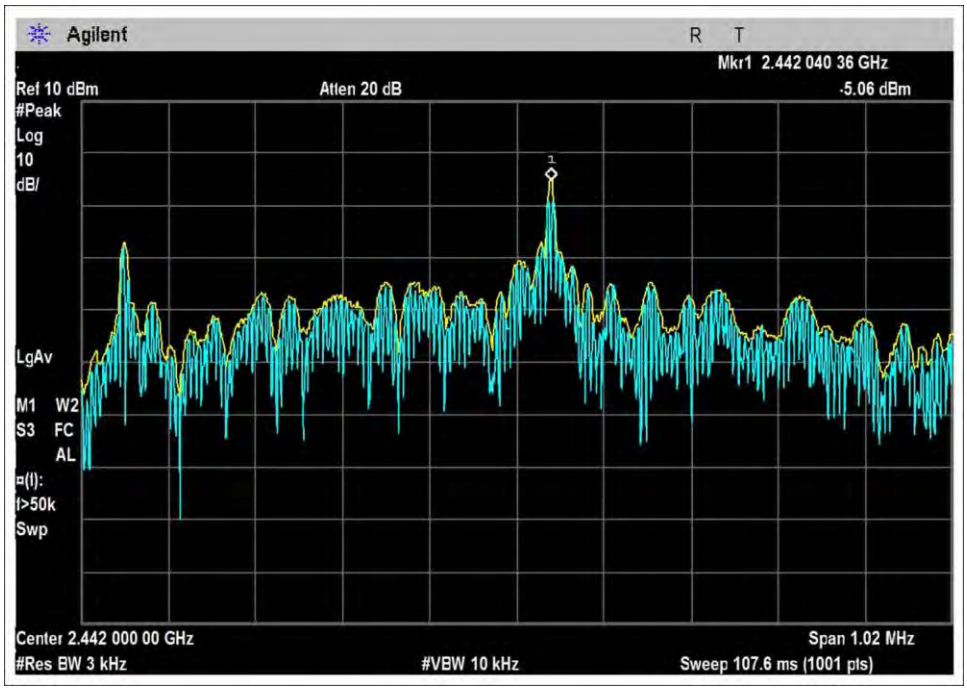
Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02872	Spectrum Analyzer	Agilent	E4440A	11/18/2015	11/18/2017

PSD Test Data Summary - RF Conducted Measurement				
Measurement Method: PKPSD				
Frequency (MHz)	**Modulation**	**Measured (dBm/3kHz)**	**Limit (dBm/3kHz)**	**Results**
2402	GFSK	-5.05	≤8	Pass
2442	GFSK	-5.06	≤8	Pass
2480	GFSK	-4.84	≤8	Pass

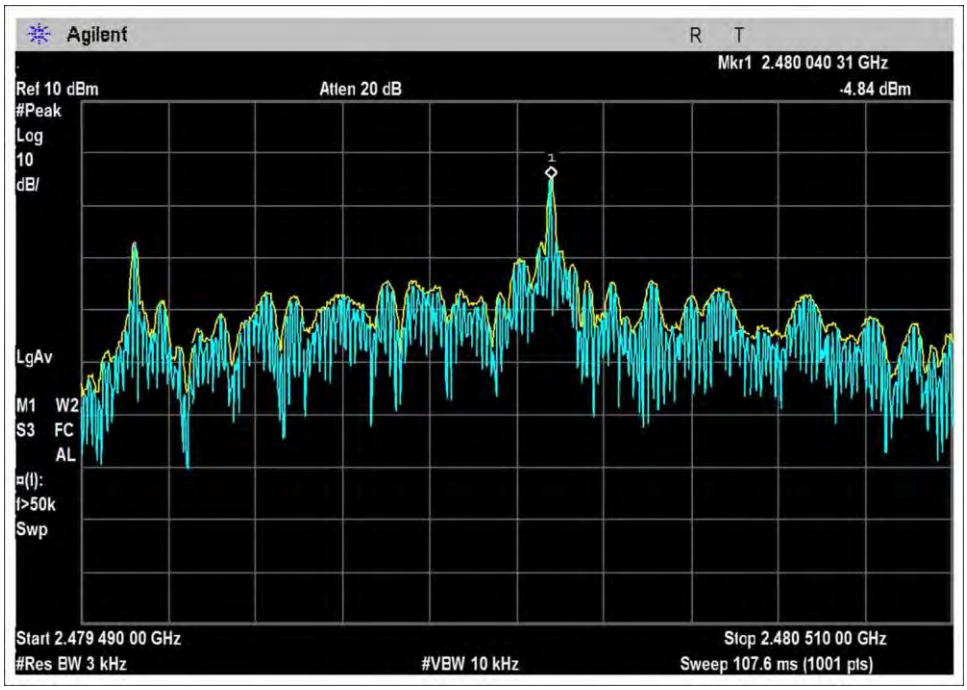
Plots



Low Channel

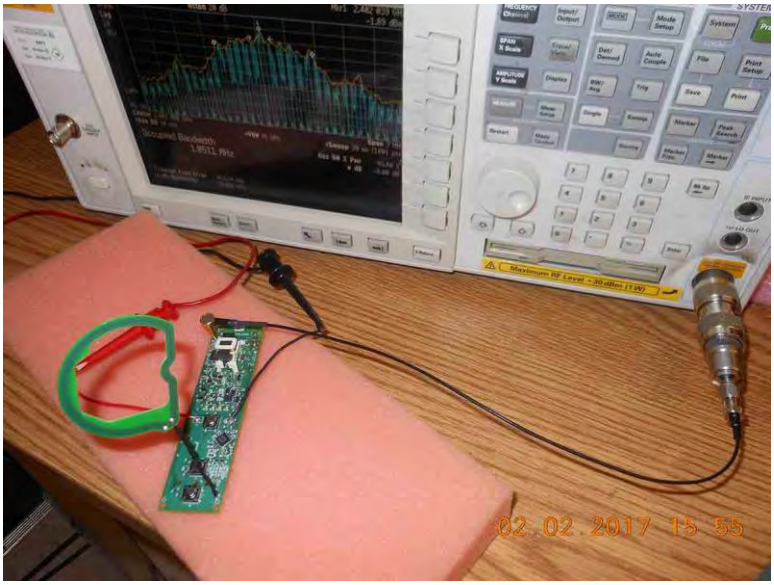


Middle Channel



High Channel

Test Setup Photo



15.247(d) RF Conducted Emissions & Band Edge

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Pacific Bioscience Laboratories, Inc.**		
Specification:	**15.247(d) Conducted Spurious Emissions**		
Work Order #:	**99133**	Date:	2/3/2017
Test Type:	**Conducted Emissions**	Time:	09:59:13
Tested By:	Michael Atkinson	Sequence#:	5
Software:	EMITest 5.03.02		2.8VDC

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

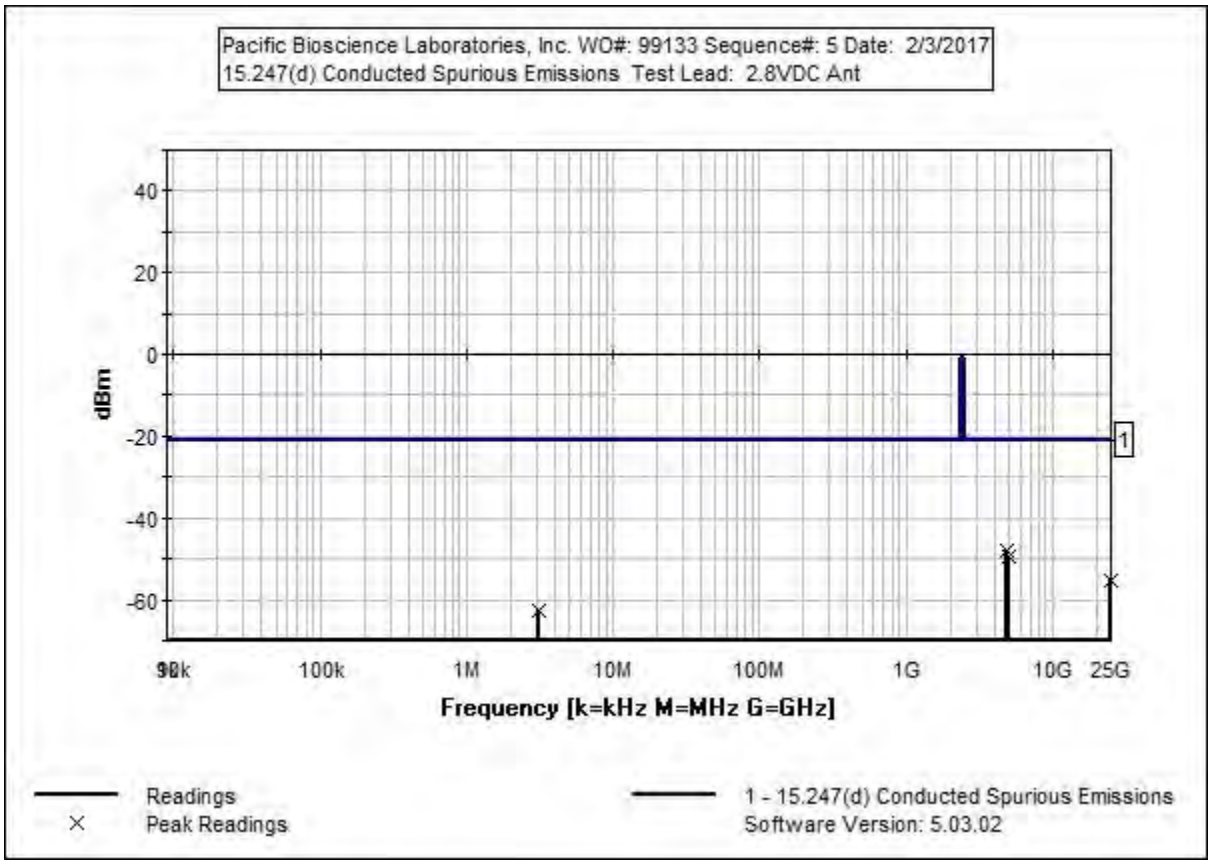
Test Conditions / Notes:

Frequency Range: 9k-25GHz
Frequency tested: 2402MHz, 2442MHz & 2480MHz
Firmware power setting: Max Power
EUT Firmware: Iris_nRF52_EMC_256K_v0.4
Protocol /MCS/Modulation: 802.15.1

Antenna type: PCB Trace
Antenna Gain: 1dBi

Duty Cycle: 100%

Test Setup:
The EUT is directly connected to the spectrum analyzer via a temporary antenna connector.
The EUT has the battery replaced with a temporary power supply set to the batteries nominal voltage.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02872	Spectrum Analyzer	E4440A	11/18/2015	11/18/2017

Measurement Data: Reading listed by margin. Test Lead: Ant

#	Freq MHz	Rdng dBµV	T1 dB	dB	dB	dB	Dist Table	Corr dBm	Spec dBm	Margin dB	Polar Ant
1	4890.000M	-47.8	+0.0				+0.0	-47.8	-21.1 Mid	-26.7	Ant
2	4810.000M	-48.1	+0.0				+0.0	-48.1	-21.1 Low	-27.0	Ant
3	4980.000M	-49.2	+0.0				+0.0	-49.2	-21.1 High	-28.1	Ant
4	24750.000 M	-55.5	+0.0				+0.0	-55.5	-21.1	-34.4	Ant
5	3.106M	-62.7	+0.0				+0.0	-62.7	-21.1	-41.6	Ant

Band Edge

Band Edge Summary				
Limit applied: Max Power/100kHz - 20dB.				
Frequency (MHz)	**Modulation**	**Measured (dBm)**	**Limit (dBm)**	**Results**
2400.0	GFSK	-50.7	<-21.1	Pass
2483.5	GFSK	-52.1	<-21.1	Pass

Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE • Bothell, WA 98021 • 1-800-500-4EMC (4362)
Customer: **Pacific Bioscience Laboratories, Inc.**
Specification: **15.247(d) Conducted Spurious Emissions**
Work Order #: **99133** Date: 2/3/2017
Test Type: **Conducted Emissions** Time: 09:01:50
Tested By: Michael Atkinson Sequence#: 4
Software: EMITest 5.03.02 2.8VDC

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

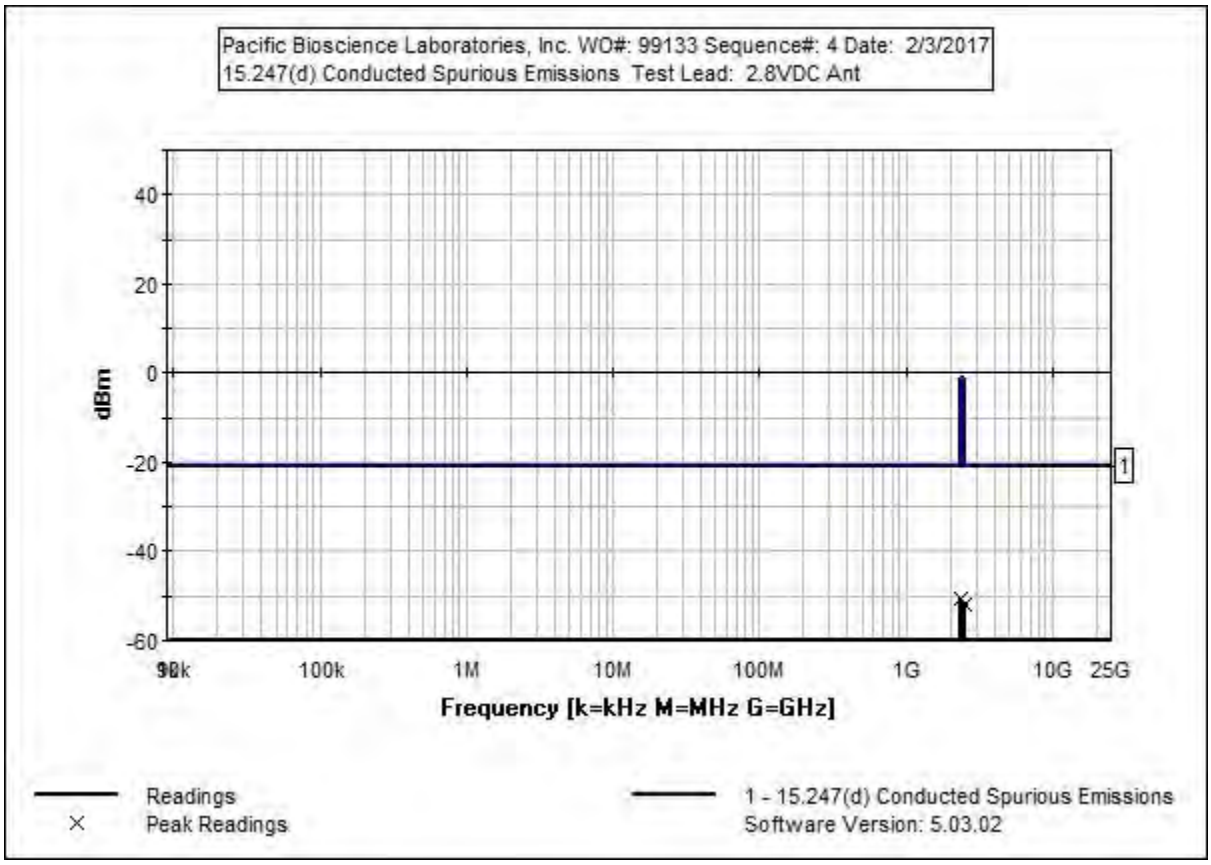
Test Conditions / Notes:

Frequency Range: Band Edge
Frequency tested: 2402MHz, 2442MHz & 2480MHz
Firmware power setting: Max Power
EUT Firmware: Iris_nRF52_EMC_256K_v0.4
Protocol /MCS/Modulation: 802.15.1

Antenna type: PCB Trace
Antenna Gain: 1dBi

Duty Cycle: 100%

Test Setup:
The EUT is directly connected to the spectrum analyzer via a temporary antenna connector.
The EUT Has the battery replaced with a temporary power supply set to the batteries nominal voltage.



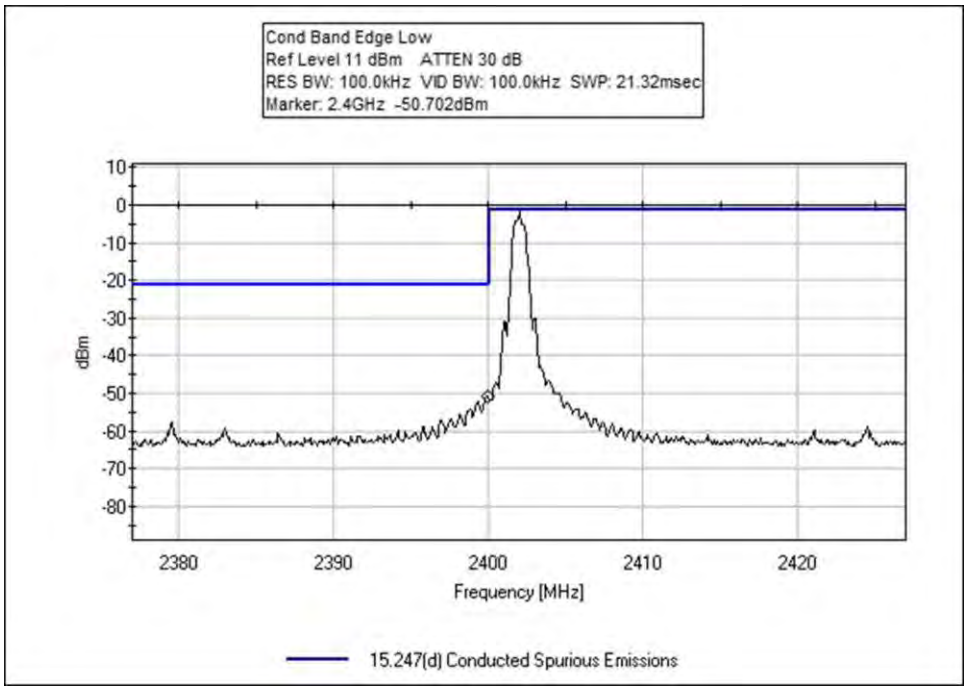
Test Equipment:

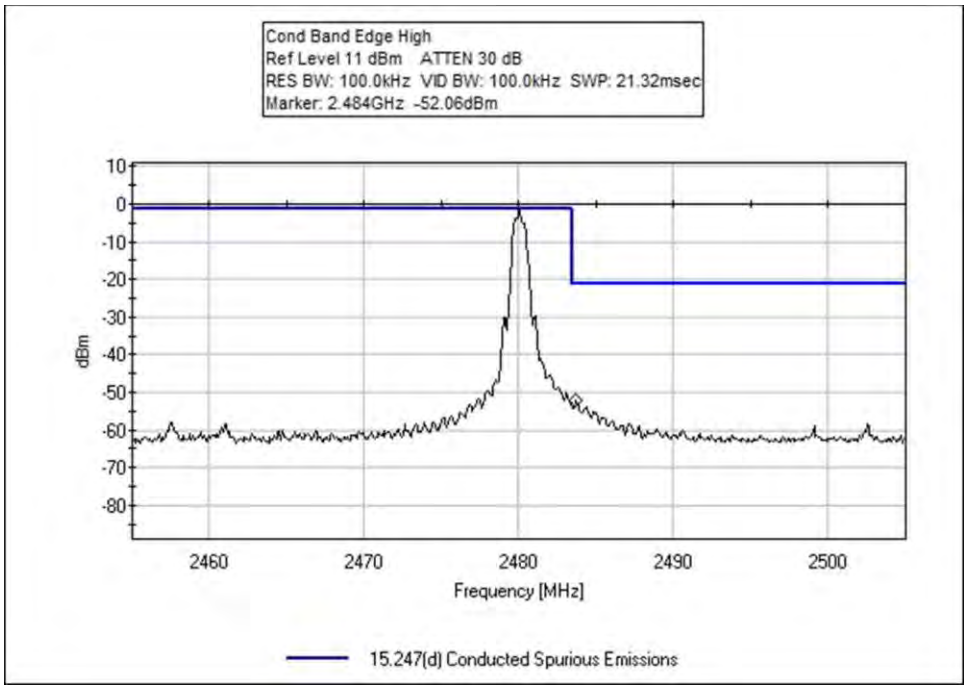
ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02872	Spectrum Analyzer	E4440A	11/18/2015	11/18/2017

Measurement Data: Reading listed by margin. Test Lead: Ant

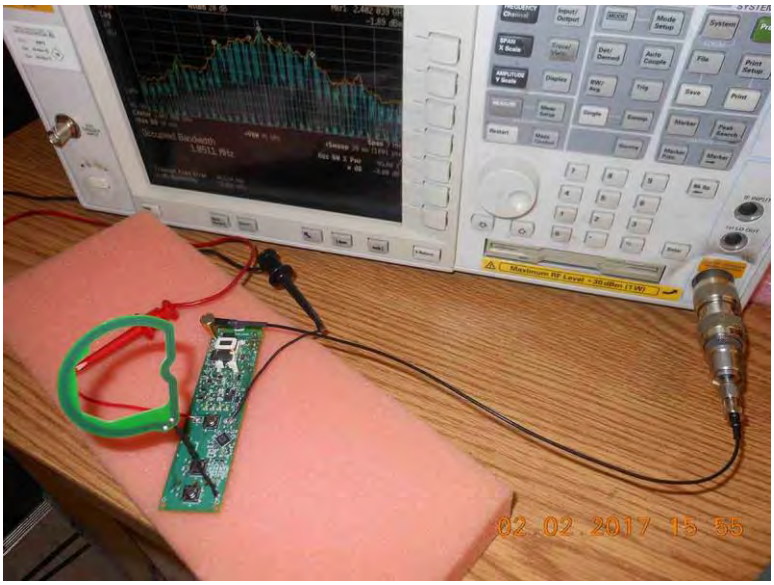
#	Freq MHz	Rdng dBµV	T1 dB	dB	dB	dB	Dist Table	Corr dBm	Spec dBm	Margin dB	Polar Ant
1	2400.000M	-50.7	+0.0				+0.0	-50.7	-21.1	-29.6	Ant
2	2483.500M	-52.1	+0.0				+0.0	-52.1	-21.1	-31.0	Ant

Band Edge Plots





Test Setup Photo



15.247(d) Radiated Emissions & Band Edge

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Pacific Bioscience Laboratories, Inc.**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**99133**	Date:	2/6/2017
Test Type:	**Maximized Emissions**	Time:	09:23:24
Tested By:	Steven Pittsford	Sequence#:	1
Software:	EMITest 5.03.02		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

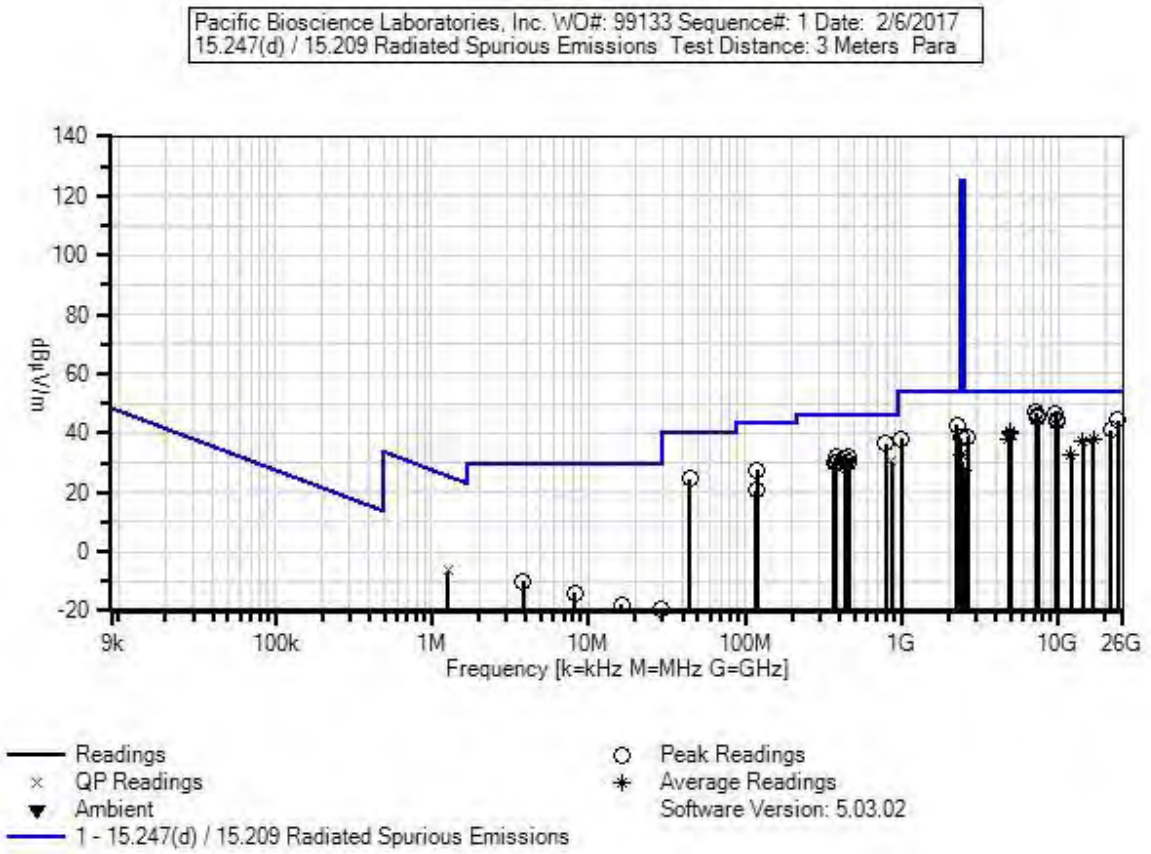
Frequency Range: 9k-25GHz
Frequency tested: 2402MHz, 2442MHz & 2480MHz
Firmware power setting: Max Power
EUT Firmware: Iris_nRF52_EMC_256K_v0.4
Protocol /MCS/Modulation: 802.15.1

Antenna type: PCB Trace
Antenna Gain: 1dBi

Duty Cycle: 100%

Test Setup:
The EUT is tested in X, Y & Z Axis.
The EUT has a fresh battery installed.

No Emissions observed above 10GHz data represents noise floor figures.


Pacific Bioscience Laboratories, Inc. WO#: 99133 Sequence#: 1 Date: 2/6/2017
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Para
140
120
100
80
60
40
20
0
-20
dBµV/m
9k
100k
1M
10M
100M
1G
10G
26G
Frequency [k=kHz M=MHz G=GHz]
Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurious Emissions
Peak Readings
Average Readings
Software Version: 5.03.02

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03540	Preamp	83017A	4/30/2015	4/30/2017
T2	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	8/12/2015	8/12/2017
T3	ANP05305	Cable	ETSI-50T	2/15/2016	2/15/2018
T4	ANP06540	Cable	Heliax	10/29/2015	10/29/2017
T5	ANP06935	Cable	32026-29801-29801-18	3/11/2016	3/11/2018
T6	AN02872	Spectrum Analyzer	E4440A	11/18/2015	11/18/2017
T7	ANP06678	Cable	32026-29801-29801-144	9/19/2016	9/19/2018
T8	ANP06957	Cable	32026-29094K-29094K-72TC	9/19/2016	9/19/2018
T9	AN02742	Active Horn Antenna	AMFW-5F-18002650-20-10P	10/7/2016	10/7/2018
T10	ANP05963	Cable	RG-214	2/15/2016	2/15/2018
T11	ANP05360	Cable	RG214	11/30/2016	11/30/2018
T12	AN02307	Preamp	8447D	2/15/2016	2/15/2018
T13	AN01991	Biconilog Antenna	CBL6111C	3/11/2016	3/11/2018
T14	ANP05657	Attenuator	PE7004-6	12/22/2015	12/22/2017
T15	AN00052	Loop Antenna	6502	4/8/2016	4/8/2018

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

#	Freq	Rdng	T1 T5 T9 T13	T2 T6 T10 T14	T3 T7 T11 T15	T4 T8 T12	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	7205.975M	39.4	-34.5 +0.6 +0.0 +0.0	+35.7 +0.0 +0.0 +0.0	+4.5 +0.0 +0.0 +0.0	+1.2 +0.0 +0.0	+0.0	46.9	54.0 Y-Axis	-7.1	Vert 149
2	9607.667M	36.0	-35.0 +0.8 +0.0 +0.0	+37.4 +0.0 +0.0 +0.0	+6.1 +0.0 +0.0 +0.0	+1.5 +0.0 +0.0	+0.0	46.8	54.0 X-Axis	-7.2	Vert 149
3	7325.375M	37.5	-34.6 +0.6 +0.0 +0.0	+36.2 +0.0 +0.0 +0.0	+4.7 +0.0 +0.0 +0.0	+1.2 +0.0 +0.0	+0.0 269	45.6	54.0 X-Axis	-8.4	Vert 153
4	7440.692M	36.7	-34.7 +0.6 +0.0 +0.0	+36.6 +0.0 +0.0 +0.0	+4.8 +0.0 +0.0 +0.0	+1.3 +0.0 +0.0	+0.0	45.3	54.0 Z-Axis	-8.7	Horiz 155
5	9919.558M	34.6	-35.2 +0.8 +0.0 +0.0	+37.2 +0.0 +0.0 +0.0	+6.1 +0.0 +0.0 +0.0	+1.3 +0.0 +0.0	+0.0 360	44.8	54.0 X-Axis	-9.2	Horiz 155

6	789.800M	29.7	+0.0 +0.0 +0.0 +24.1	+0.0 +0.0 +2.3 +6.0	+0.0 +0.0 +1.9 +0.0	+0.3 +0.0 -27.8	+0.0	36.5	46.0 Y-Axis	-9.5	Horiz
7	24137.000 M	43.6	+0.0 +0.0 -12.4 +0.0	+0.0 +0.0 +0.0 +0.0	+0.0 +8.5 +0.0 +0.0	+0.0 +4.5 +0.0	+0.0	44.2	54.0	-9.8	Vert 143
8	9770.308M	33.4	-35.1 +0.7 +0.0 +0.0	+37.3 +0.0 +0.0 +0.0	+6.1 +0.0 +0.0 +0.0	+1.4 +0.0 +0.0	+0.0 323	43.8	54.0 Y-Axis	-10.2	Horiz 157
9	2273.900M	46.1	-34.7 +0.4 +0.0 +0.0	+27.7 +0.0 +0.0 +0.0	+2.7 +0.0 +0.0 +0.0	+0.6 +0.0 +0.0	+0.0	42.8	54.0 X-Axis	-11.2	Vert 122
10	21862.000 M	42.8	+0.0 +0.0 -14.2 +0.0	+0.0 +0.0 +0.0 +0.0	+0.0 +8.3 +0.0 +0.0	+0.0 +4.2 +0.0	+0.0	41.1	54.0	-12.9	Vert 143
11	4884.100M Ave	36.0	-34.2 +0.5 +0.0 +0.0	+32.7 +0.0 +0.0 +0.0	+4.4 +0.0 +0.0 +0.0	+0.9 +0.0 +0.0	+0.0 154	40.3	54.0 Y-Axis	-13.7	Vert 157
^	4884.100M	45.5	-34.2 +0.5 +0.0 +0.0	+32.7 +0.0 +0.0 +0.0	+4.4 +0.0 +0.0 +0.0	+0.9 +0.0 +0.0	+0.0 154	49.8	54.0 Y-Axis	-4.2	Vert 157
13	379.200M	34.6	+0.0 +0.0 +0.0 +15.6	+0.0 +0.0 +1.8 +6.0	+0.0 +0.0 +1.2 +0.0	+0.3 +0.0 -27.5	+0.0	32.0	46.0 X-Axis	-14.0	Vert
14	461.600M	32.8	+0.0 +0.0 +0.0 +17.3	+0.0 +0.0 +1.9 +6.0	+0.0 +0.0 +1.4 +0.0	+0.3 +0.0 -27.9	+0.0	31.8	46.0 X-Axis	-14.2	Vert
15	4960.158M Ave	35.2	-34.2 +0.5 +0.0 +0.0	+32.8 +0.0 +0.0 +0.0	+4.4 +0.0 +0.0 +0.0	+0.9 +0.0 +0.0	+0.0 171	39.6	54.0 Y-Axis	-14.4	Vert 165
^	4960.158M	44.6	-34.2 +0.5 +0.0 +0.0	+32.8 +0.0 +0.0 +0.0	+4.4 +0.0 +0.0 +0.0	+0.9 +0.0 +0.0	+0.0 171	49.0	54.0 Y-Axis	-5.0	Vert 165
17	434.200M	33.2	+0.0 +0.0 +0.0 +16.8	+0.0 +0.0 +1.8 +6.0	+0.0 +0.0 +1.3 +0.0	+0.3 +0.0 -27.8	+0.0	31.6	46.0 X-Axis	-14.4	Vert
18	44.600M	34.5	+0.0 +0.0 +0.0 +11.1	+0.0 +0.0 +0.5 +6.0	+0.0 +0.0 +0.4 +0.0	+0.1 +0.0 -27.9	+0.0	24.7	40.0 X-Axis	-15.3	Vert

19	861.000M	22.7	+0.0	+0.0	+0.0	+0.3	+0.0	30.5	46.0	-15.5	Horiz
	QP		+0.0	+0.0	+0.0	+0.0			Y-Axis		
			+0.0	+2.3	+2.0	-27.5					
			+24.7	+6.0	+0.0						
^	861.000M	28.7	+0.0	+0.0	+0.0	+0.3	+0.0	36.5	46.0	-9.5	Horiz
			+0.0	+0.0	+0.0	+0.0			Y-Axis		
			+0.0	+2.3	+2.0	-27.5					
			+24.7	+6.0	+0.0						
21	2390.000M	41.4	-34.6	+27.7	+2.8	+0.6	+0.0	38.3	54.0	-15.7	Horiz
			+0.4	+0.0	+0.0	+0.0	45		Y-Axis		147
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0						
22	372.700M	33.0	+0.0	+0.0	+0.0	+0.3	+0.0	30.3	46.0	-15.7	Horiz
			+0.0	+0.0	+0.0	+0.0			Z-Axis		
			+0.0	+1.8	+1.2	-27.4					
			+15.4	+6.0	+0.0						
23	16814.192	20.0	-34.5	+40.9	+8.6	+2.1	+0.0	38.1	54.0	-15.9	Vert
	M		+1.0	+0.0	+0.0	+0.0					
	Ave		+0.0	+0.0	+0.0	+0.0					147
			+0.0	+0.0	+0.0						
^	16814.192	32.9	-34.5	+40.9	+8.6	+2.1	+0.0	51.0	54.0	-3.0	Vert
	M		+1.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					147
			+0.0	+0.0	+0.0						
25	4804.000M	33.9	-34.2	+32.7	+4.3	+0.9	+0.0	38.1	54.0	-15.9	Vert
	Ave		+0.5	+0.0	+0.0	+0.0	180		X-Axis		149
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0						
^	4804.000M	44.6	-34.2	+32.7	+4.3	+0.9	+0.0	48.8	54.0	-5.2	Vert
			+0.5	+0.0	+0.0	+0.0	180		X-Axis		149
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0						
27	376.000M	32.8	+0.0	+0.0	+0.0	+0.3	+0.0	30.1	46.0	-15.9	Vert
			+0.0	+0.0	+0.0	+0.0			X-Axis		
			+0.0	+1.8	+1.2	-27.5					
			+15.5	+6.0	+0.0						
28	991.900M	28.2	+0.0	+0.0	+0.0	+0.4	+0.0	38.1	54.0	-15.9	Vert
			+0.0	+0.0	+0.0	+0.0			X-Axis		
			+0.0	+2.5	+2.3	-27.0					
			+25.6	+6.1	+0.0						
29	118.900M	35.9	+0.0	+0.0	+0.0	+0.1	+0.0	27.6	43.5	-15.9	Horiz
			+0.0	+0.0	+0.0	+0.0			Y-Axis		
			+0.0	+1.2	+0.6	-27.6					
			+11.4	+6.0	+0.0						
30	458.400M	31.1	+0.0	+0.0	+0.0	+0.3	+0.0	30.1	46.0	-15.9	Horiz
			+0.0	+0.0	+0.0	+0.0			Y-Axis		
			+0.0	+1.9	+1.4	-27.9					
			+17.3	+6.0	+0.0						
31	384.000M	32.4	+0.0	+0.0	+0.0	+0.3	+0.0	29.9	46.0	-16.1	Horiz
			+0.0	+0.0	+0.0	+0.0			Y-Axis		
			+0.0	+1.8	+1.2	-27.5					
			+15.7	+6.0	+0.0						

32	14412.192 M Ave	21.0	-35.0 +1.0 +0.0 +0.0	+40.7 +0.0 +0.0 +0.0	+7.7 +0.0 +0.0	+1.8 +0.0 +0.0	+0.0	37.2	54.0	-16.8	Vert 147
^	14412.192 M	31.6	-35.0 +1.0 +0.0 +0.0	+40.7 +0.0 +0.0 +0.0	+7.7 +0.0 +0.0	+1.8 +0.0 +0.0	+0.0	47.8	54.0	-6.2	Vert 147
34	434.200M	30.7	+0.0 +0.0 +0.0 +16.8	+0.0 +0.0 +1.8 +6.0	+0.0 +0.0 +1.3 +0.0	+0.3 +0.0 -27.8	+0.0	29.1	46.0 X-Axis	-16.9	Vert
35	2400.000M Ave	36.1	-34.6 +0.4 +0.0 +0.0	+27.7 +0.0 +0.0 +0.0	+2.8 +0.0 +0.0	+0.6 +0.0 +0.0	+0.0 45	33.0	54.0 Y-Axis	-21.0	Horiz 147
^	2400.000M	62.3	-34.6 +0.4 +0.0 +0.0	+27.7 +0.0 +0.0 +0.0	+2.8 +0.0 +0.0	+0.6 +0.0 +0.0	+0.0 45	65.7	54.0 Y-Axis	+11.7	Horiz 147
37	12010.192 M Ave	19.7	-35.0 +0.8 +0.0 +0.0	+39.2 +0.0 +0.0 +0.0	+6.4 +0.0 +0.0	+1.5 +0.0 +0.0	+0.0	32.6	54.0	-21.4	Vert 147
^	12010.192 M	32.1	-35.0 +0.8 +0.0 +0.0	+39.2 +0.0 +0.0 +0.0	+6.4 +0.0 +0.0	+1.5 +0.0 +0.0	+0.0	45.0	54.0	-9.0	Vert 147
39	117.300M	29.1	+0.0 +0.0 +0.0 +11.3	+0.0 +0.0 +1.2 +6.0	+0.0 +0.0 +0.6 +0.0	+0.1 +0.0 -27.6	+0.0	20.7	43.5 Y-Axis	-22.8	Vert
40	2483.500M Ave	30.6	-34.5 +0.4 +0.0 +0.0	+27.7 +0.0 +0.0 +0.0	+2.9 +0.0 +0.0	+0.6 +0.0 +0.0	+0.0 93	27.7	54.0 Y-Axis	-26.3	Horiz 130
^	2483.500M	57.3	-34.5 +0.4 +0.0 +0.0	+27.7 +0.0 +0.0 +0.0	+2.9 +0.0 +0.0	+0.6 +0.0 +0.0	+0.0 93	60.8	54.0 Y-Axis	+6.8	Horiz 130
42	1.264M QP	23.9	+0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0	+0.1 +0.0 +0.0 +9.7	+0.0 +0.0 +0.0	-40.0	-6.3	25.6 X-Axis	-31.9	Para
^	1.264M	28.8	+0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0	+0.1 +0.0 +0.0 +9.7	+0.0 +0.0 +0.0	-40.0	-1.4	25.6 X-Axis	-27.0	Para
44	2655.800M	40.8	-34.5 +0.4 +0.0 +0.0	+28.4 +0.0 +0.0 +0.0	+3.0 +0.0 +0.0	+0.7 +0.0 +0.0	+0.0 93	38.8	74.0 Y-Axis	-35.2	Horiz 130

45	3.818M	20.6	+0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0	+0.1 +0.0 +0.0 +9.5	+0.0 +0.0 +0.0	-40.0	-9.8	29.5 X-Axis	-39.3	Para
46	8.257M	16.7	+0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0	+0.2 +0.0 +0.0 +9.3	+0.0 +0.0 +0.0	-40.0	-13.8	29.5 X-Axis	-43.3	Para
47	162.290k	48.4	+0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +9.7	+0.0 +0.0 +0.0	-80.0	-21.9	23.4 X-Axis	-45.3	Para
48	16.204M	13.3	+0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0	+0.3 +0.0 +0.0 +8.5	+0.0 +0.0 +0.0	-40.0	-17.9	29.5 X-Axis	-47.4	Para
49	28.890M	14.1	+0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0	+0.3 +0.0 +0.0 +6.0	+0.0 +0.0 +0.0	-40.0	-19.6	29.5 X-Axis	-49.1	Para

Band Edge

Band Edge Summary					
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
2390.0	GFSK	PCB Trace	38.3	<54	Pass
2400.0	GFSK	PCB Trace	33.0	<54	Pass
2483.5	GFSK	PCB Trace	27.7	<54	Pass

Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE • Bothell, WA 98021 • 1-800-500-4EMC (4362)
Customer: **Pacific Bioscience Laboratories, Inc.**
Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
Work Order #: **99133** Date: 2/6/2017
Test Type: **Maximized Emissions** Time: 09:23:24
Tested By: Steven Pittsford Sequence#: 1
Software: EMITest 5.03.02

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

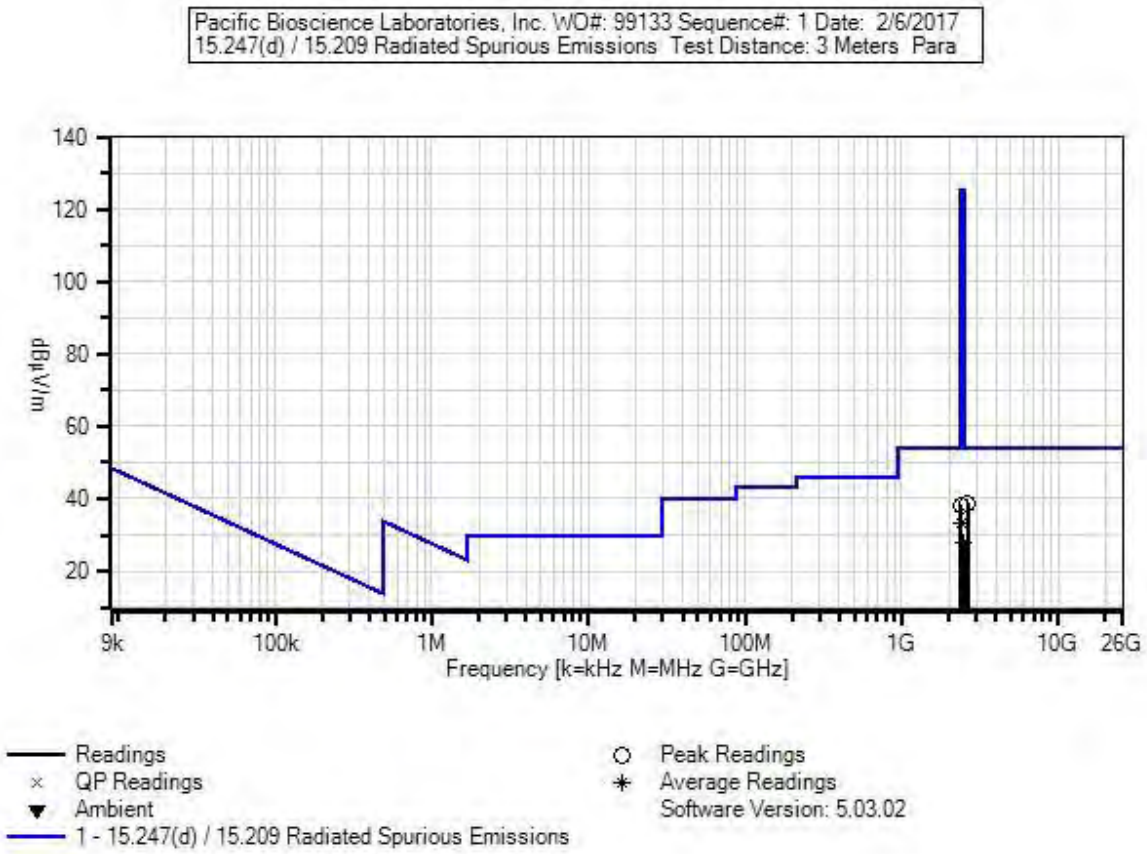
Frequency Range: Band Edge
Frequency tested: 2402MHz, 2442MHz & 2480MHz
Firmware power setting: Max Power
EUT Firmware: Iris_nRF52_EMC_256K_v0.4
Protocol /MCS/Modulation: 802.15.1

Antenna type: PCB Trace
Antenna Gain: 1dBi

Duty Cycle: 100%

Test Setup:
The EUT is tested in X, Y & Z Axis.
The EUT has a fresh battery installed.

Limit line in plots are corrected for system losses.


Pacific Bioscience Laboratories, Inc. WO#: 99133 Sequence#: 1 Date: 2/6/2017
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Para
140
120
100
80
60
40
20
dBµV/m
9k
100k
1M
10M
100M
1G
10G
26G
Frequency [k=kHz M=MHz G=GHz]
Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurious Emissions
Peak Readings
Average Readings
Software Version: 5.03.02

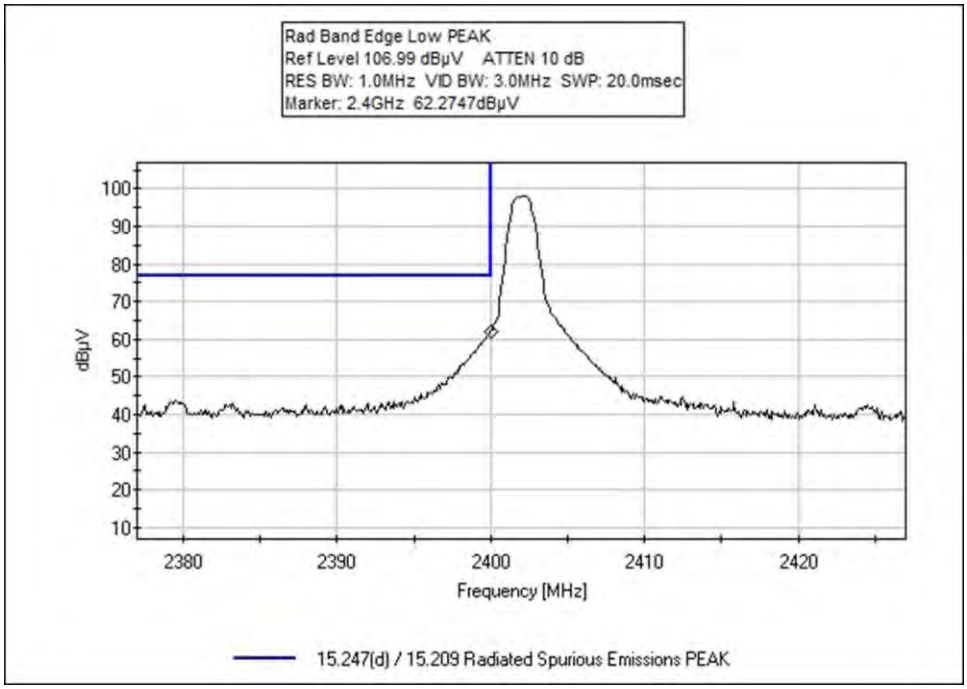
Test Equipment:

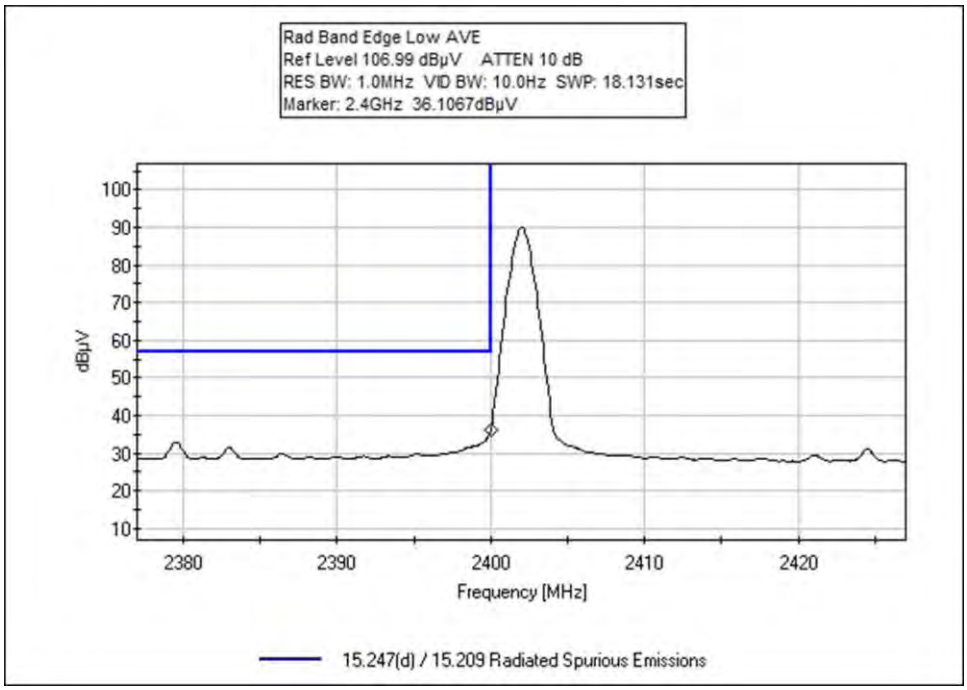
ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03540	Preamp	83017A	4/30/2015	4/30/2017
T2	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	8/12/2015	8/12/2017
T3	ANP05305	Cable	ETSI-50T	2/15/2016	2/15/2018
T4	ANP06540	Cable	Heliax	10/29/2015	10/29/2017
T5	ANP06935	Cable	32026-29801-29801-18	3/11/2016	3/11/2018
T6	AN02872	Spectrum Analyzer	E4440A	11/18/2015	11/18/2017
	ANP06678	Cable	32026-29801-29801-144	9/19/2016	9/19/2018
	ANP06957	Cable	32026-29094K-29094K-72TC	9/19/2016	9/19/2018
	AN02742	Active Horn Antenna	AMFW-5F-18002650-20-10P	10/7/2016	10/7/2018
	ANP05963	Cable	RG-214	2/15/2016	2/15/2018
	ANP05360	Cable	RG214	11/30/2016	11/30/2018
	AN02307	Preamp	8447D	2/15/2016	2/15/2018
	AN01991	Biconilog Antenna	CBL6111C	3/11/2016	3/11/2018
	ANP05657	Attenuator	PE7004-6	12/22/2015	12/22/2017
T7	AN00052	Loop Antenna	6502	4/8/2016	4/8/2018

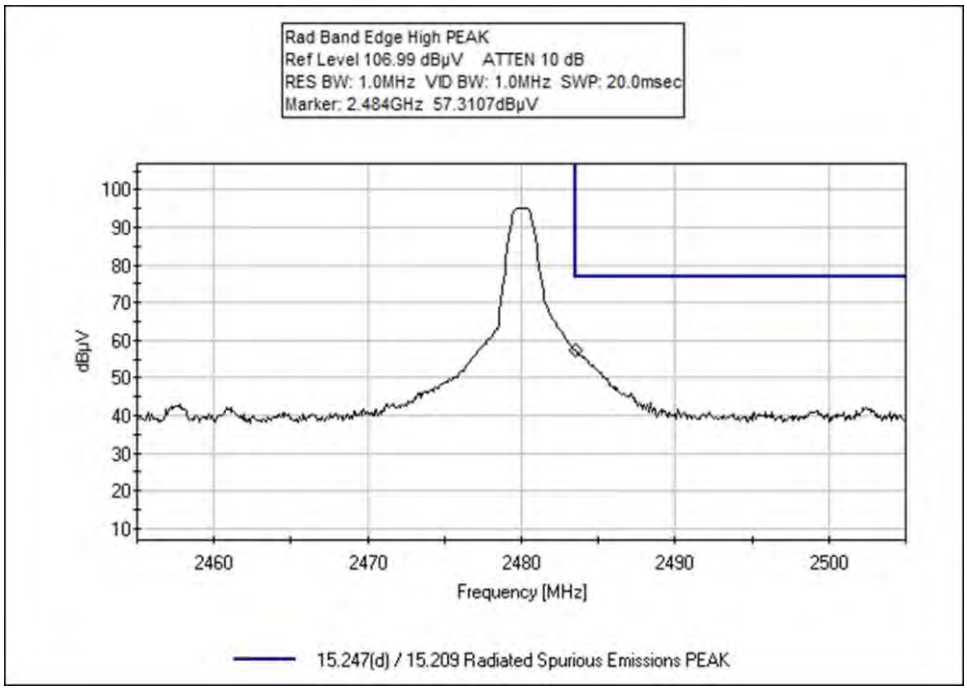
Measurement Data: Reading listed by margin. Test Distance: 3 Meters

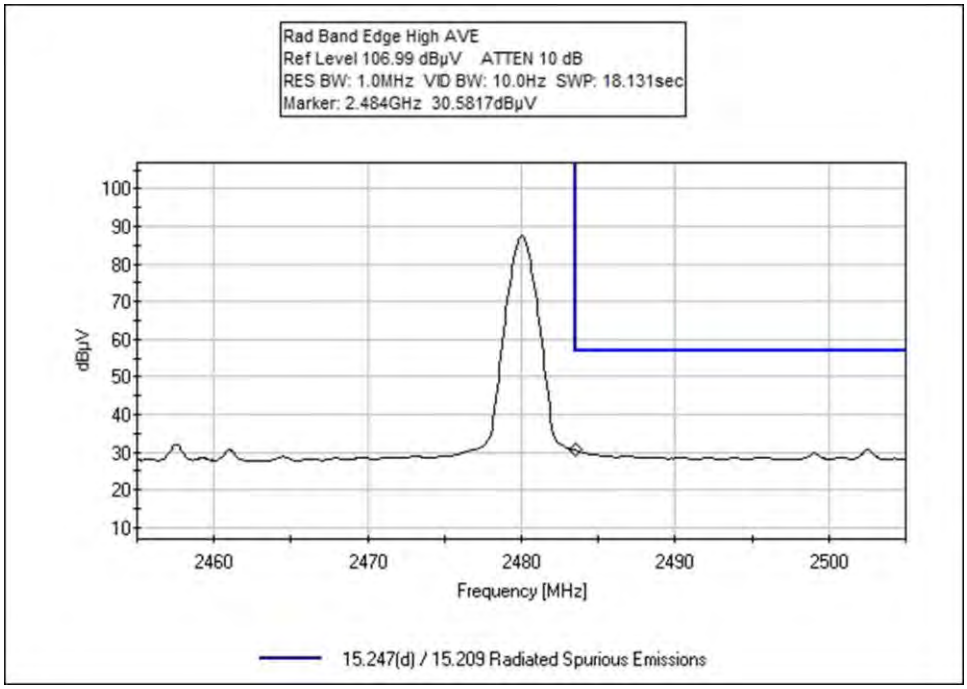
#	Freq	Rdng	T1 T5	T2 T6	T3 T7	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	2390.000M	41.4	-34.6 +0.4	+27.7 +0.0	+2.8 +0.0	+0.6	+0.0 45	38.3	54.0 Y-Axis	-15.7	Horiz 147
2	2400.000M Ave	36.1	-34.6 +0.4	+27.7 +0.0	+2.8 +0.0	+0.6	+0.0 45	33.0	54.0 Y-Axis	-21.0	Horiz 147
^	2400.000M	62.3	-34.6 +0.4	+27.7 +0.0	+2.8 +0.0	+0.6	+0.0 45	65.7	54.0 Y-Axis	+11.7	Horiz 147
4	2483.500M Ave	30.6	-34.5 +0.4	+27.7 +0.0	+2.9 +0.0	+0.6	+0.0 93	27.7	54.0 Y-Axis	-26.3	Horiz 130
^	2483.500M	57.3	-34.5 +0.4	+27.7 +0.0	+2.9 +0.0	+0.6	+0.0 93	60.8	54.0 Y-Axis	+6.8	Horiz 130
6	2655.800M	40.8	-34.5 +0.4	+28.4 +0.0	+3.0 +0.0	+0.7	+0.0 93	38.8	74.0 Y-Axis	-35.2	Horiz 130

Band Edge Plots






Rad Band Edge High PEAK
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 1.0MHz SWP: 20.0msec
Marker: 2.484GHz 57.3107dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions PEAK


Rad Band Edge High AVE
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 10.0Hz SWP: 18.131sec
Marker: 2.484GHz 30.5817dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

Test Setup Photos

Below 1GHz

Above 1GHz

X Axis

Y Axis

Z Axis

15.207 AC Conducted Emissions

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Pacific Bioscience Laboratories, Inc.**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**99133**	Date:	3/1/2017
Test Type:	**Conducted Emissions**	Time:	3:09:04 PM
Tested By:	Steven Pittsford	Sequence#:	7
Software:	EMITest 5.03.02		115VAC 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

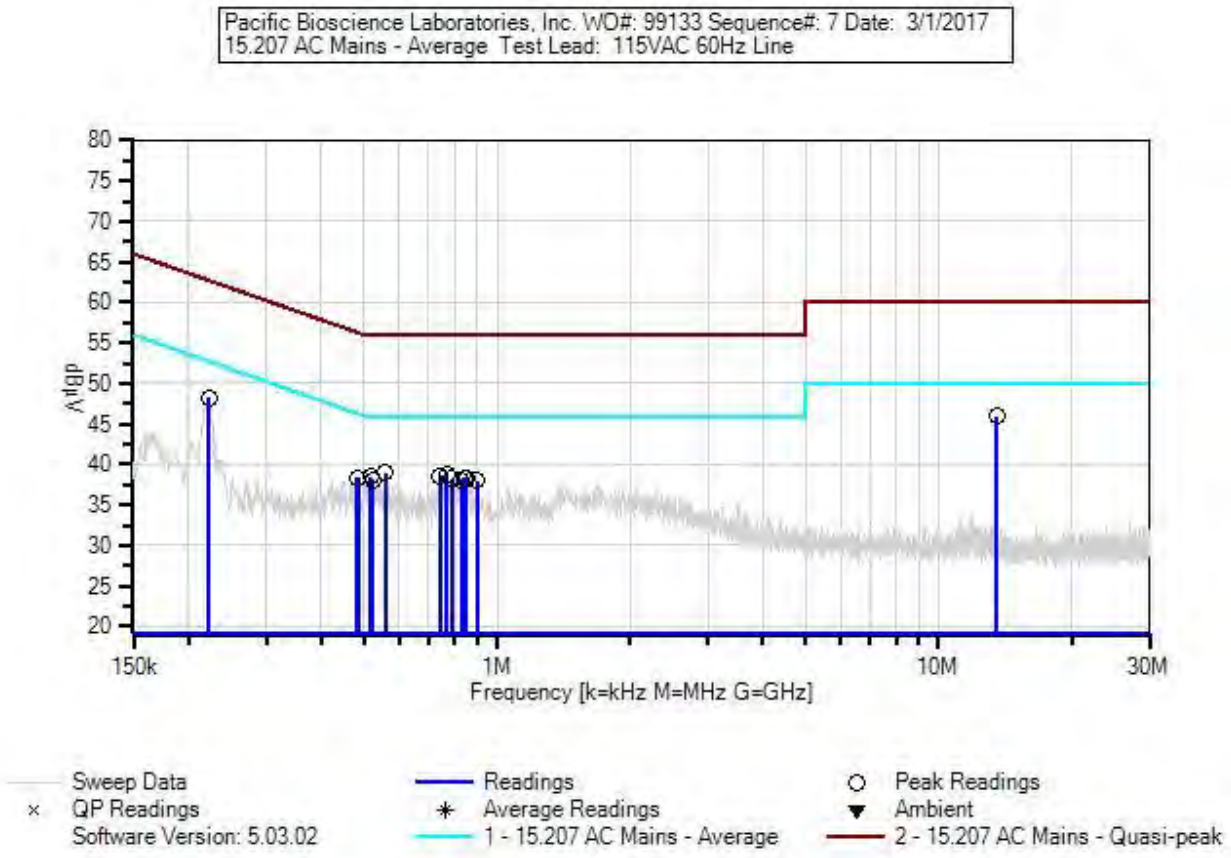
Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

Temperature: 23°C
Humidity: 28%
Pressure: 102.2kPa
Frequency: 0.15-30MHz

The EUT is charging, charger connected to AC mains. Transmitters are transmitting at 100% duty cycle.

Test Method: ANSI C63.10 (2013)


Pacific Bioscience Laboratories, Inc. WO#: 99133 Sequence#: 7 Date: 3/1/2017
15.207 AC Mains - Average Test Lead: 115VAC 60Hz Line
80
75
70
65
60
55
50
45
40
35
30
25
20
dBµV
150k
1M
10M
30M
Frequency [k=kHz M=MHz G=GHz]
Sweep Data
QP Readings
Software Version: 5.03.02
Readings
Average Readings
1 - 15.207 AC Mains - Average
Peak Readings
Ambient
2 - 15.207 AC Mains - Quasi-peak

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02872	Spectrum Analyzer	E4440A	11/18/2015	11/18/2017
T1	AN02611	High Pass Filter	HE9615-150K-50-720B	2/18/2016	2/18/2018
T2	ANP06540	Cable	Heliax	10/29/2015	10/29/2017
T3	ANP05305	Cable	ETSI-50T	2/15/2016	2/15/2018
T4	ANP06219	Attenuator	768-10	4/12/2016	4/12/2018
	AN01311	50uH LISN-Line1 (N)	3816/2	3/7/2016	3/7/2018
T5	AN01311	50uH LISN-Line2 (L)	3816/2	3/7/2016	3/7/2018

Measurement Data: Reading listed by margin. Test Lead: Line

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	13.562M	36.5	+0.1 +0.0	+0.0	+0.2	+9.1	+0.0	45.9	50.0	-4.1	Line
2	222.720k	38.8	+0.2 +0.1	+0.0	+0.0	+9.1	+0.0	48.2	52.7	-4.5	Line
3	557.235k	29.7	+0.2 +0.0	+0.0	+0.0	+9.1	+0.0	39.0	46.0	-7.0	Line
4	767.397k	29.4	+0.2 +0.0	+0.0	+0.1	+9.1	+0.0	38.8	46.0	-7.2	Line
5	743.400k	29.2	+0.2 +0.0	+0.0	+0.1	+9.1	+0.0	38.6	46.0	-7.4	Line
6	518.693k	29.2	+0.2 +0.0	+0.0	+0.0	+9.1	+0.0	38.5	46.0	-7.5	Line
7	848.844k	29.0	+0.2 +0.0	+0.0	+0.1	+9.1	+0.0	38.4	46.0	-7.6	Line
8	852.480k	28.9	+0.2 +0.0	+0.0	+0.1	+9.1	+0.0	38.3	46.0	-7.7	Line
9	841.572k	28.9	+0.2 +0.0	+0.0	+0.1	+9.1	+0.0	38.3	46.0	-7.7	Line
10	789.941k	28.8	+0.2 +0.0	+0.0	+0.1	+9.1	+0.0	38.2	46.0	-7.8	Line
11	522.329k	28.8	+0.2 +0.0	+0.0	+0.0	+9.1	+0.0	38.1	46.0	-7.9	Line
12	829.210k	28.7	+0.2 +0.0	+0.0	+0.1	+9.1	+0.0	38.1	46.0	-7.9	Line
13	483.060k	29.0	+0.2 +0.0	+0.0	+0.0	+9.1	+0.0	38.3	46.3	-8.0	Line
14	484.514k	29.0	+0.2 +0.0	+0.0	+0.0	+9.1	+0.0	38.3	46.3	-8.0	Line
15	902.721k	28.6	+0.2 +0.0	+0.0	+0.1	+9.1	+0.0	38.0	46.0	-8.0	Line

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Pacific Bioscience Laboratories, Inc.**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**99133**	Date:	3/1/2017
Test Type:	**Conducted Emissions**	Time:	3:12:38 PM
Tested By:	Steven Pittsford	Sequence#:	8
Software:	EMITest 5.03.02		115VAC 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

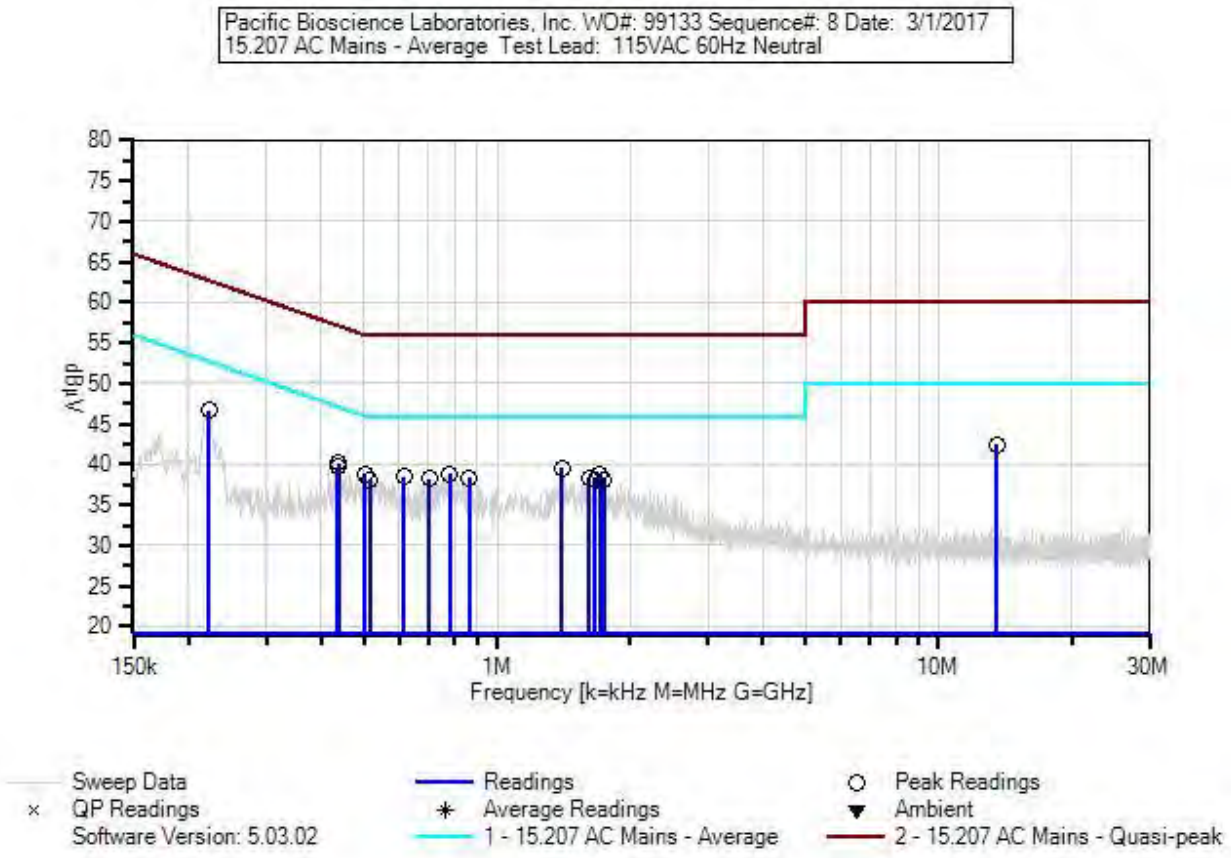
Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

Temperature: 23°C
Humidity: 28%
Pressure: 102.2kPa

The EUT is charging, charger connected to AC mains. Transmitters are transmitting at 100% duty cycle.

Test Method: ANSI C63.10 (2013)


Pacific Bioscience Laboratories, Inc. WO#: 99133 Sequence#: 8 Date: 3/1/2017
15.207 AC Mains - Average Test Lead: 115VAC 60Hz Neutral
80
75
70
65
60
55
50
45
40
35
30
25
20
dBµV
150k
1M
10M
30M
Frequency [k=kHz M=MHz G=GHz]
Sweep Data
QP Readings
Software Version: 5.03.02
Readings
Average Readings
1 - 15.207 AC Mains - Average
Peak Readings
Ambient
2 - 15.207 AC Mains - Quasi-peak

Test Equipment:

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T2	ANP06540	Cable	Heliax	10/29/2015	10/29/2017
T3	ANP05305	Cable	ETSI-50T	2/15/2016	2/15/2018
T4	ANP06219	Attenuator	768-10	4/12/2016	4/12/2018
T5	AN01311	50uH LISN-Line1 (N)	3816/2	3/7/2016	3/7/2018
	AN01311	50uH LISN-Line2 (L)	3816/2	3/7/2016	3/7/2018

Measurement Data: Reading listed by margin. Test Lead: Neutral

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	222.720k	37.4	+0.2 +0.0	+0.0	+0.0	+9.1	+0.0	46.7	52.7	-6.0	Neutr
2	1.405M	30.1	+0.2 +0.0	+0.0	+0.1	+9.1	+0.0	39.5	46.0	-6.5	Neutr
3	437.246k	30.9	+0.2 +0.0	+0.0	+0.0	+9.1	+0.0	40.2	47.1	-6.9	Neutr
4	782.669k	29.4	+0.2 +0.0	+0.0	+0.1	+9.1	+0.0	38.8	46.0	-7.2	Neutr
5	501.240k	29.4	+0.2 +0.0	+0.0	+0.0	+9.1	+0.0	38.7	46.0	-7.3	Neutr
6	1.706M	29.3	+0.2 +0.0	+0.0	+0.1	+9.1	+0.0	38.7	46.0	-7.3	Neutr
7	614.684k	29.1	+0.2 +0.0	+0.0	+0.1	+9.1	+0.0	38.5	46.0	-7.5	Neutr
8	435.064k	30.4	+0.2 +0.0	+0.0	+0.0	+9.1	+0.0	39.7	47.2	-7.5	Neutr
9	865.570k	29.0	+0.2 +0.0	+0.0	+0.1	+9.1	+0.0	38.4	46.0	-7.6	Neutr
10	13.562M	33.0	+0.1 +0.0	+0.0	+0.2	+9.1	+0.0	42.4	50.0	-7.6	Neutr
11	1.617M	28.9	+0.2 +0.0	+0.0	+0.1	+9.1	+0.0	38.3	46.0	-7.7	Neutr
12	700.494k	28.8	+0.2 +0.0	+0.0	+0.1	+9.1	+0.0	38.2	46.0	-7.8	Neutr
13	515.784k	28.8	+0.2 +0.0	+0.0	+0.0	+9.1	+0.0	38.1	46.0	-7.9	Neutr
14	1.664M	28.6	+0.2 +0.0	+0.0	+0.1	+9.1	+0.0	38.0	46.0	-8.0	Neutr
15	1.745M	28.6	+0.2 +0.0	+0.0	+0.1	+9.1	+0.0	38.0	46.0	-8.0	Neutr

Test Setup Photo

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

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

Reported uncertainties 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.