Philips Oral Healthcare, Inc.

TEST REPORT FOR

Rechargeable Power Toothbrush with BLE
Model: HX9120

Tested To The Following Standards:

FCC Part 15 Subpart C Section(s)

15.207
&
15.247
(DTS 2400-2483.5 MHz)

Report No.: 98106-15

Date of issue: February 16, 2016

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.

TABLE OF CONTENTS

ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

Philips Oral Healthcare, Inc.
22100 Bothell-Everett Hwy
Bothell, WA 98021

REPRESENTATIVE: Timothy Rand
Customer Reference Number: 2191827

REPORT PREPARED BY:

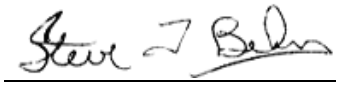
Terri Rayle
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 98106

DATE OF EQUIPMENT RECEIPT: February 4, 2016
DATE(S) OF TESTING: February 4-8, 2016

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
Bothell, WA 98021-4413

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.00

Site Registration & Accreditation Information

Location	CB #	TAIWAN	CANADA	FCC	JAPAN
Bothell	US0081	SL2-IN-E-1145R	3082C-1	318736	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
Please Note: The dates referenced on the photos are of an incorrect format, please refer to the datasheets or table headers for the correct testing date when the photos were taken.

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
Rechargeable Power Toothbrush with BLE	Philips Oral Healthcare, Inc.	HX9120	P-270

Support Equipment:

Device	Manufacturer	Model #	S/N
None			

Configuration 2

Equipment Tested:

Device	Manufacturer	Model #	S/N
Rechargeable Power Toothbrush with BLE	Philips Oral Healthcare, Inc.	HX9120	P-328

Support Equipment:

Device	Manufacturer	Model #	S/N
None			

Configuration 3

Equipment Tested:

Device	Manufacturer	Model #	S/N
Rechargeable Power Toothbrush with BLE	Philips Oral Healthcare, Inc.	HX9120	P-270
Inductive Charger	Philips Oral Healthcare, Inc.	HX6100	NA

Support Equipment:

Device	Manufacturer	Model #	S/N
None			

Configuration 4

Equipment Tested:

Device	Manufacturer	Model #	S/N
Inductive Charger	Philips Oral Healthcare, Inc.	HX6100	NA
Rechargeable Power Toothbrush with BLE	Philips Oral Healthcare, Inc.	HX9120	P-328

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 305kb/s
Maximum Duty Cycle:	63%
Number of TX Chains:	1
Antenna Type(s) and Gain:	Inverted F antenna 0dBi gain
Beamforming Type:	NA
Antenna Connection Type:	Integral
Nominal Input Voltage:	Battery Li-Ion or 115V/60Hz
Firmware / Software used for Test:	RealTerm 2.0.0.70

FCC Part 15 Subpart C

15.247(a)(2) 6dB Bandwidth

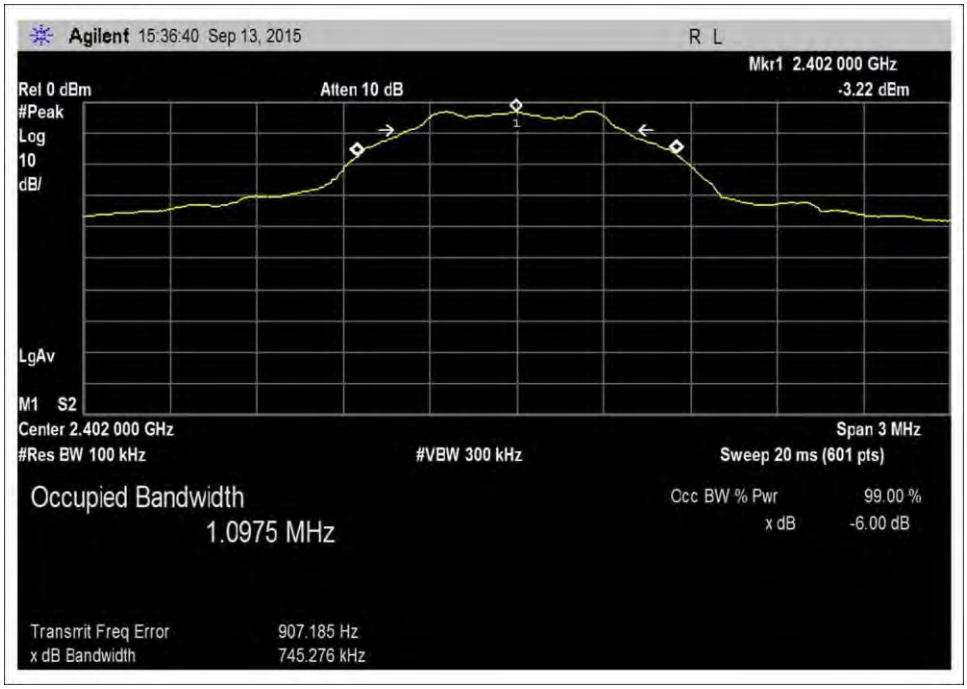
Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	S. Pittsford
Test Method:	ANSI C63.10 (2013), KDB 558074 D01 DTS Meas Guidance v03r04, January 7, 2016	Test Date(s):	2/4/2016
Configuration:	1		
Test Setup:	Frequency Range: 2402-2480MHz Frequency tested: 2402MHz, 2440MHz and 2480MHz Firmware power setting: Max Software: RealTerm 2.0.0.70 Protocol /MCS/Modulation: BLE Antenna type: Integral Inverted F antenna Antenna Gain: 0.0 dBi. Duty Cycle: 63% Test Mode: Continuously transmitting on low, mid and high channels Test Setup: EUT is transmitting through a temporary antenna connector and is attached directly to the spectrum analyzer. EUT is tested at nominal voltage and +/-15% nominal voltage.		

Environmental Conditions			
Temperature (ºC)	21	Relative Humidity (%):	32

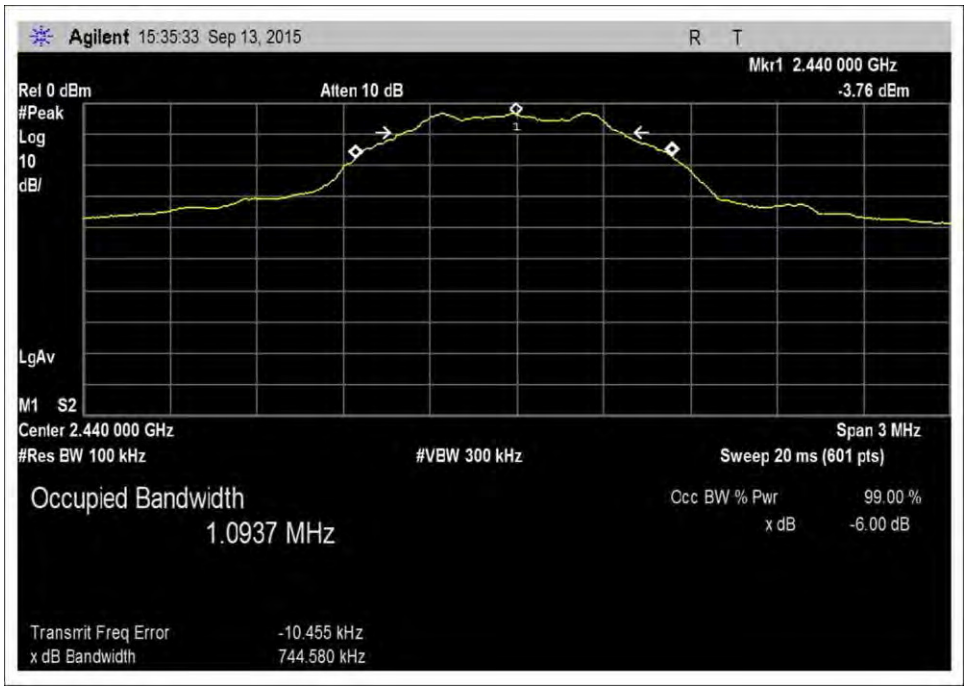
Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02872	Spectrum Analyzer	Agilent	E4440A	11/18/2015	11/18/2017

Test Data Summary					
Frequency (MHz)	**Antenna Port**	**Modulation**	**Measured (kHz)**	**Limit (kHz)**	**Results**
2402	1	GSFK	745.3	≥500	Pass
2440	1	GSFK	744.6	≥500	Pass
2480	1	GSFK	742.2	≥500	Pass

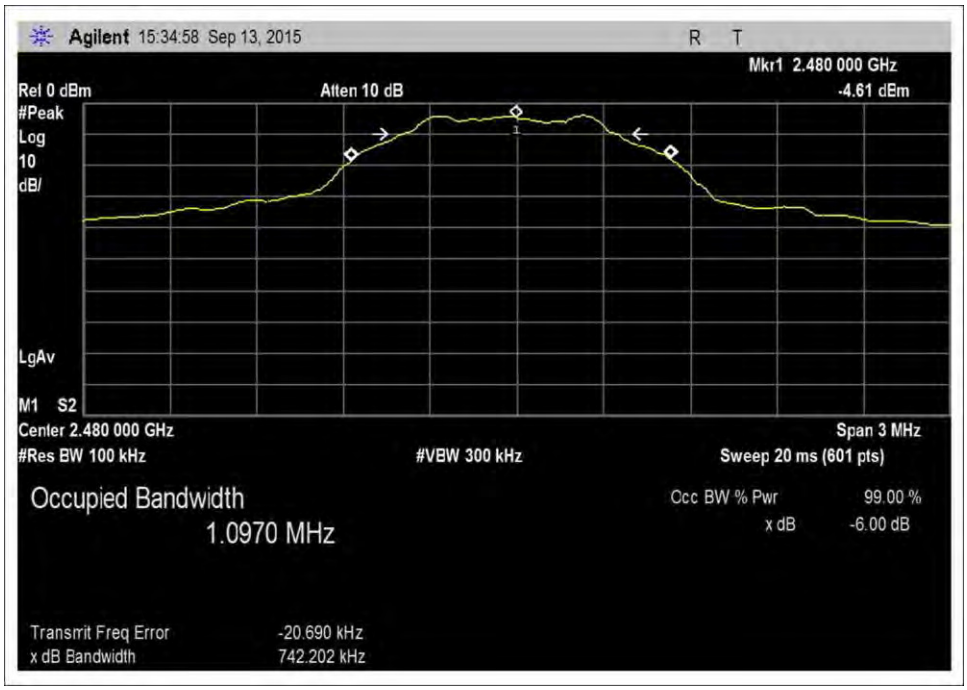
Plots



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 v03r04, January 7, 2016	Test Date(s):	2/4/2016
Configuration:	4		
Test Setup:	Frequency Range: 2402-2480MHz Frequency tested: 2402MHz, 2440MHz and 2480MHz Firmware power setting: Max Software: RealTerm 2.0.0.70 Protocol /MCS/Modulation: BLE Antenna type: Integral Inverted F antenna Antenna Gain: 0.0 dBi. Duty Cycle: 63% Test Mode: Continuously transmitting on low, mid and high channels Test Setup: The EUT is transmitting through a temporary antenna connector and is attached directly to the spectrum analyzer. EUT is tested at nominal voltage and +/-15% nominal voltage.		

Environmental Conditions			
Temperature (ºC)	21	Relative Humidity (%):	32

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

Test Data Summary - Voltage Variations					
Frequency (MHz)	**Modulation / Ant Port**	**$V_{Minimum}$ (dBm)**	**$V_{Nominal}$ (dBm)**	**$V_{Maximum}$ (dBm)**	**Max Deviation from $V_{Nominal}$ (dB)**
2402	GSFK	-2.27	-2.24	-2.26	0.03
2440	GSFK	-2.76	-2.73	-2.74	0.03
2480	GSFK	-3.26	-3.27	-3.26	0.01

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

Parameter Definitions:

Measurements performed at input voltage Vnominal ± 15%.

Parameter	Value
$V_{Nominal}$:	115V/60Hz
$V_{Minimum}$:	97V/60Hz
$V_{Maximum}$:	133V/60Hz

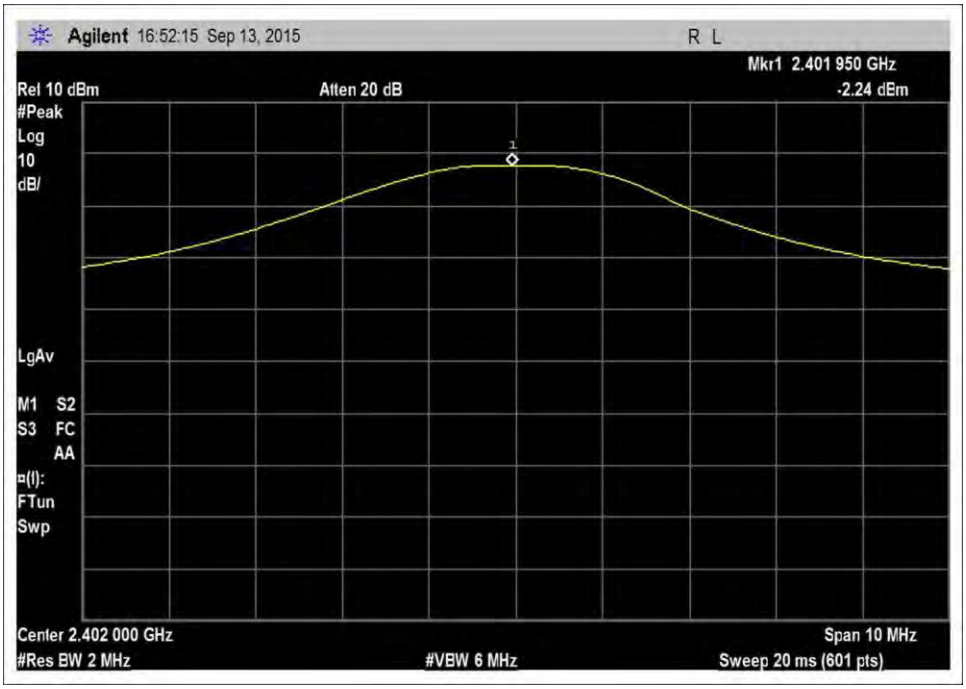
Test Data Summary - RF Conducted Measurement					
Measurement Option: RBW > DTS Bandwidth					
Frequency (MHz)	**Modulation**	**Ant. Type / Gain (dBi)**	**Measured (dBm)**	**Limit (dBm)**	**Results**
2402	GSFK	0	-2.24	≤30	Pass
2440	GSFK	0	-2.73	≤30	Pass
2480	GSFK	0	-3.26	≤30	Pass

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

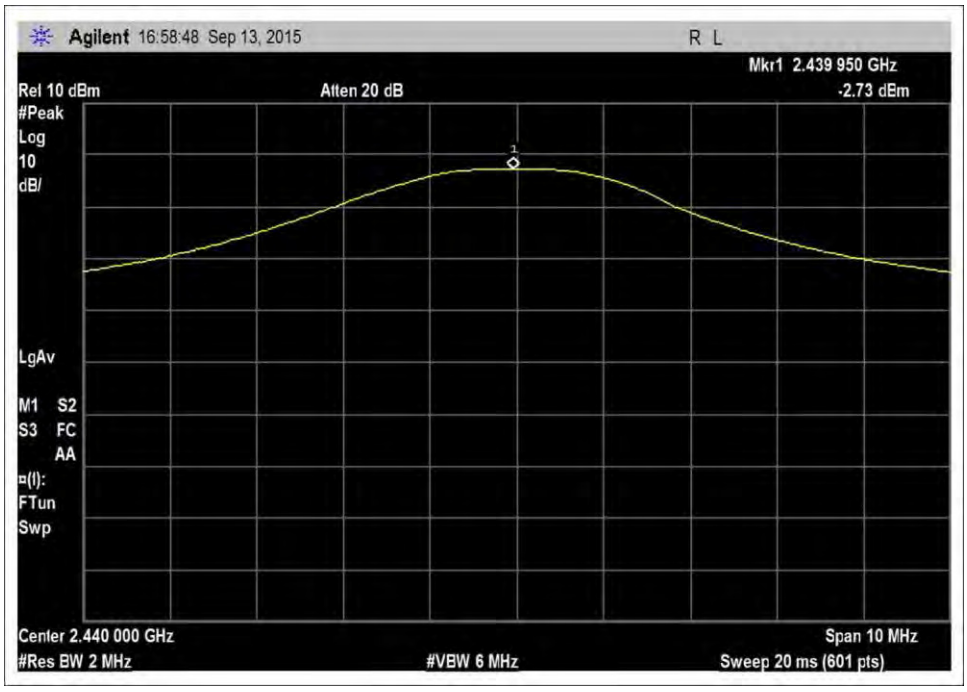
$Limit = 30 - Roundup\left(\frac{G-6}{3}\right)$

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

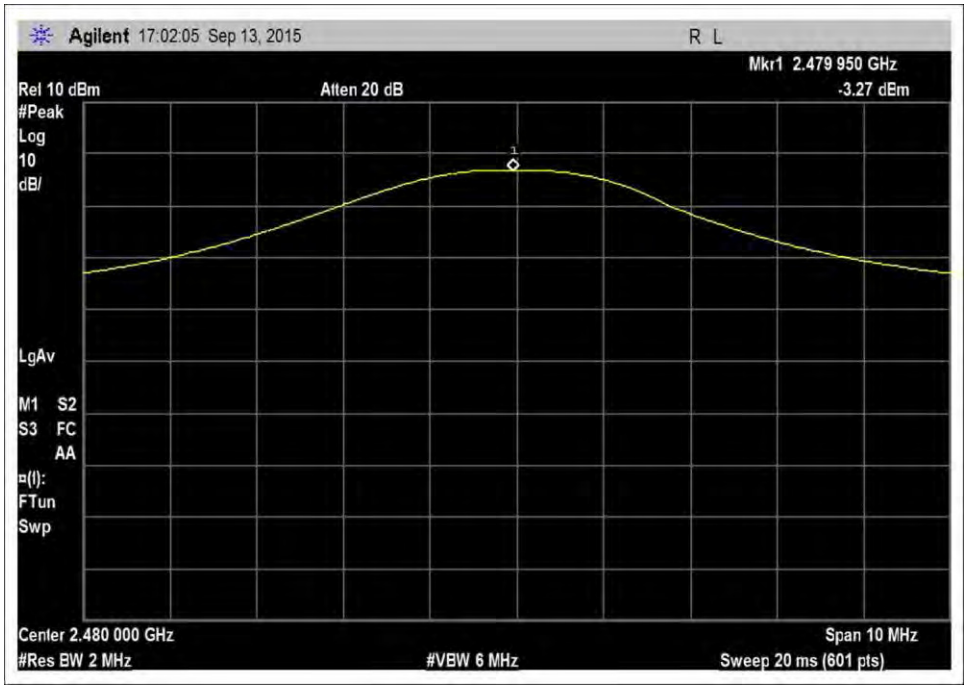
Plots



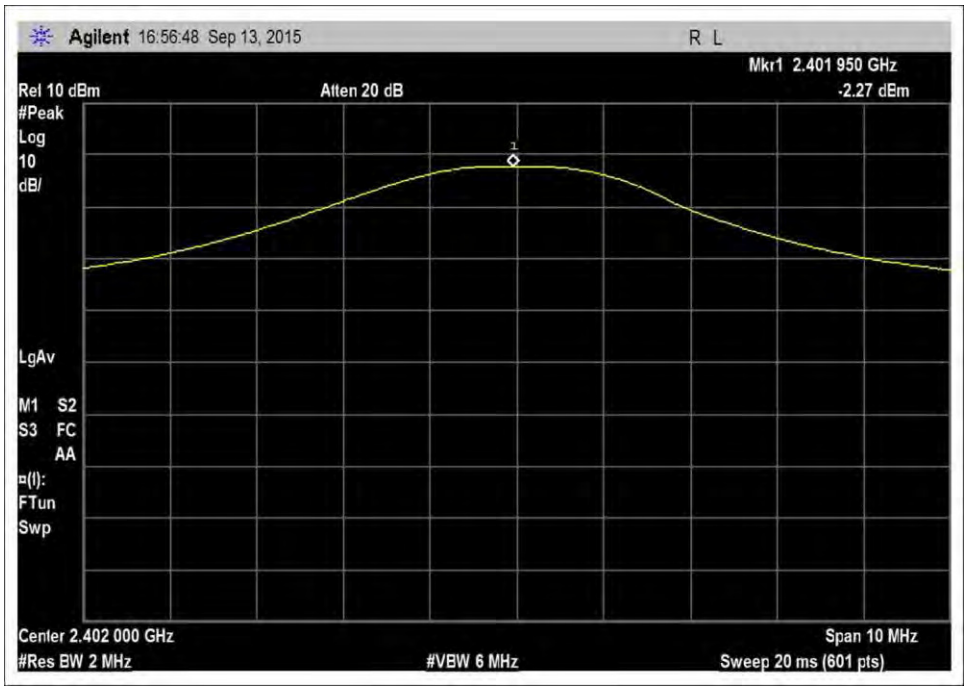
Max Power Low Vnom



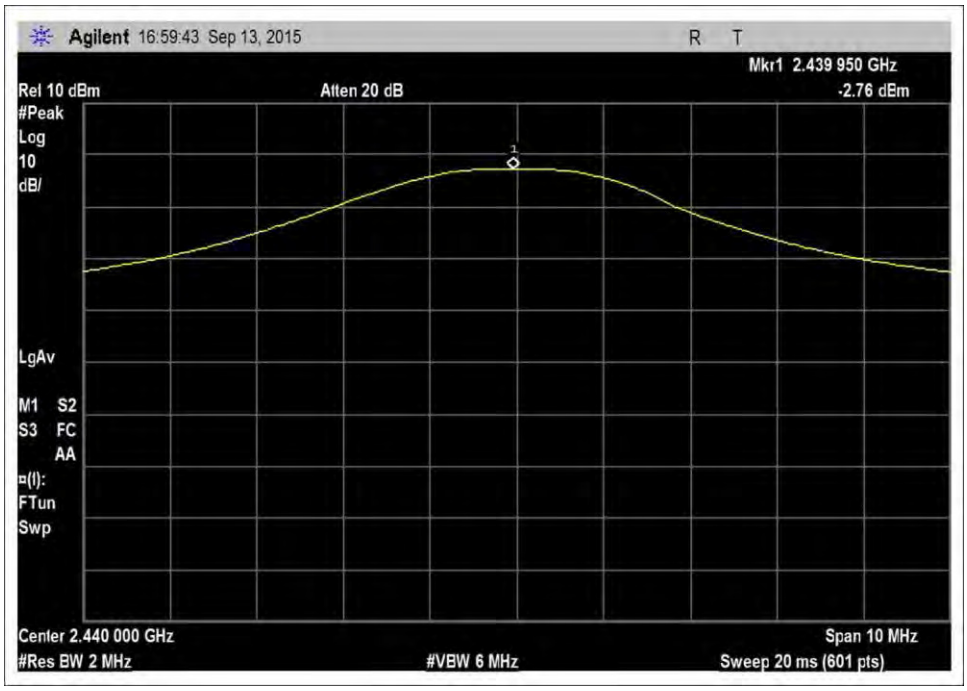
Max Power Mid Vnom



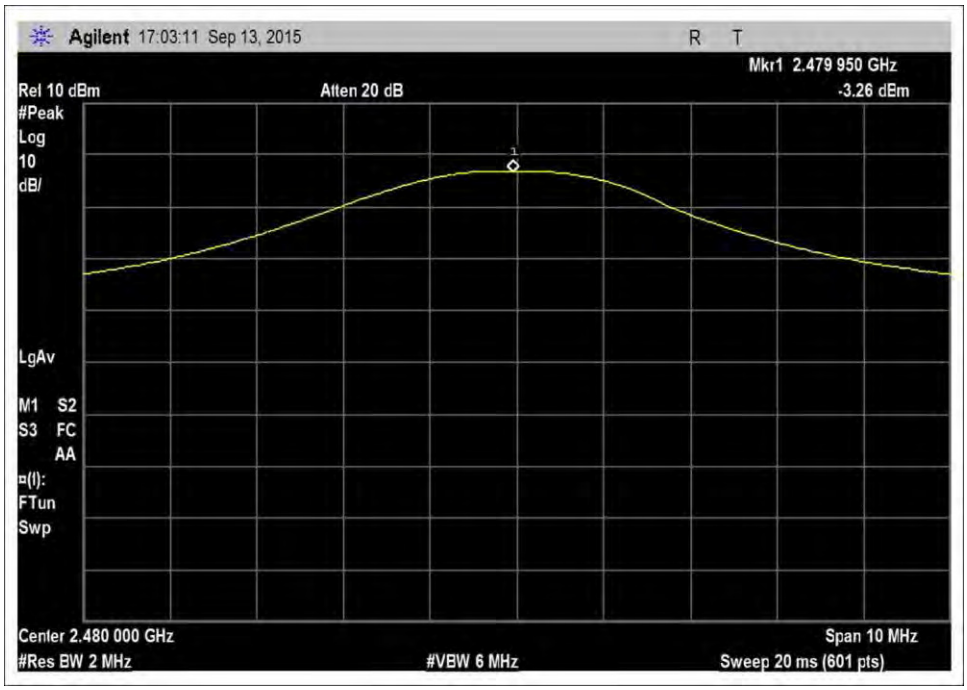
Max Power High Vnom



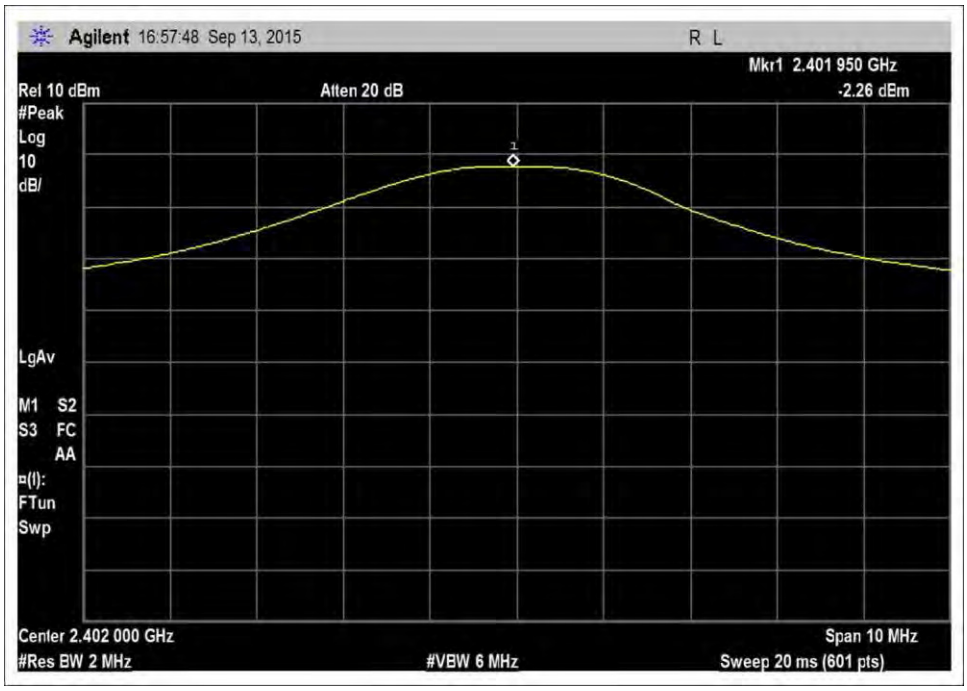
Max Power Low Vmin



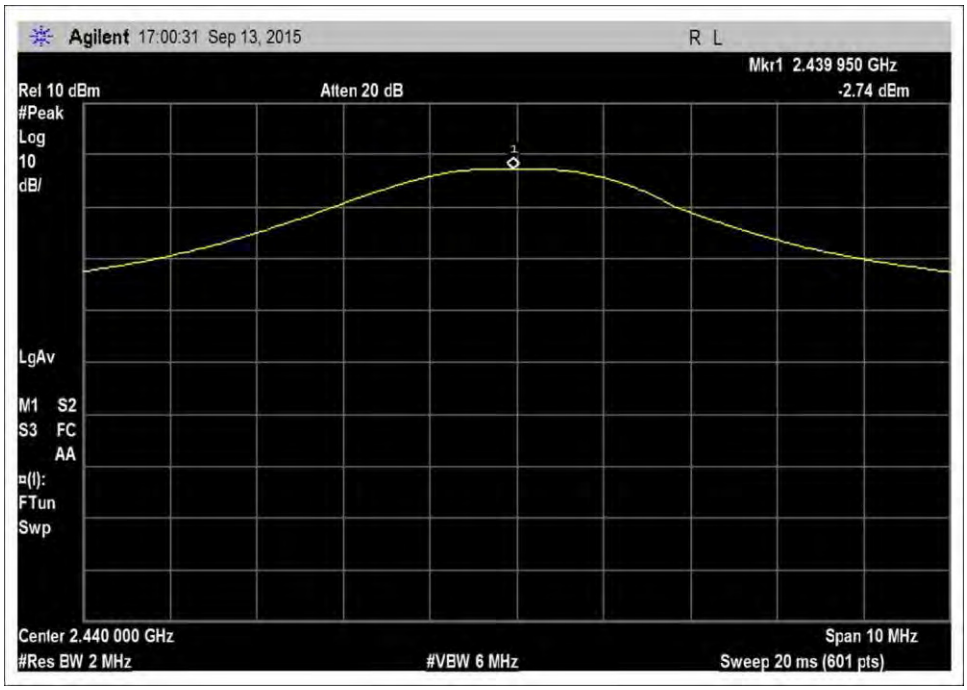
Max Power Mid Vmin



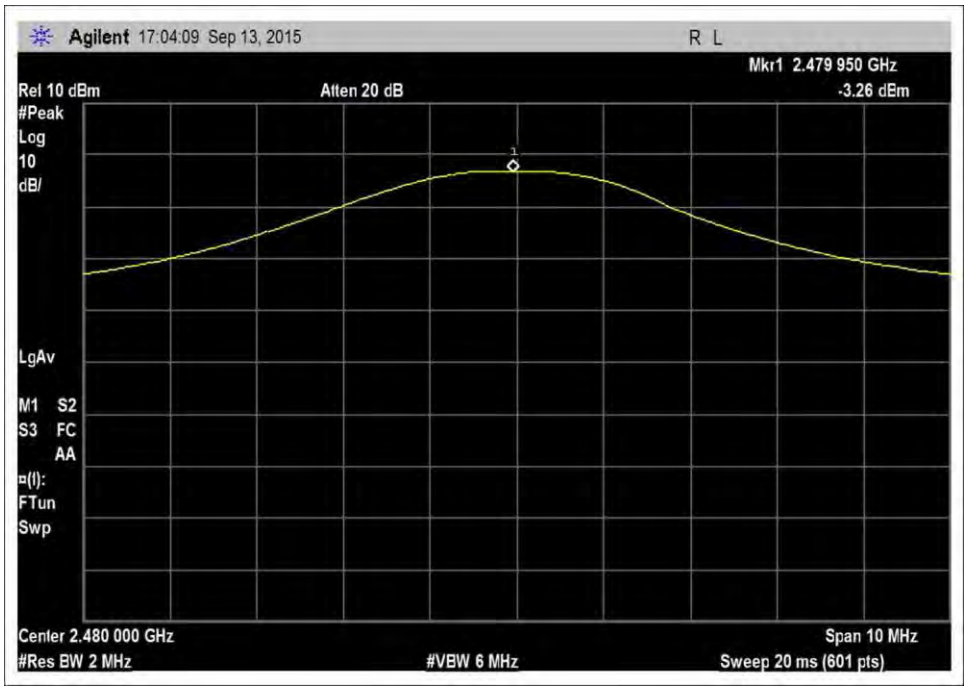
Max Power High Vmin



Max Power Low Vmax



Max Power Mid Vmax



Max Power High Vmax

Test Setup Photo

15.247(e) Power Spectral Density

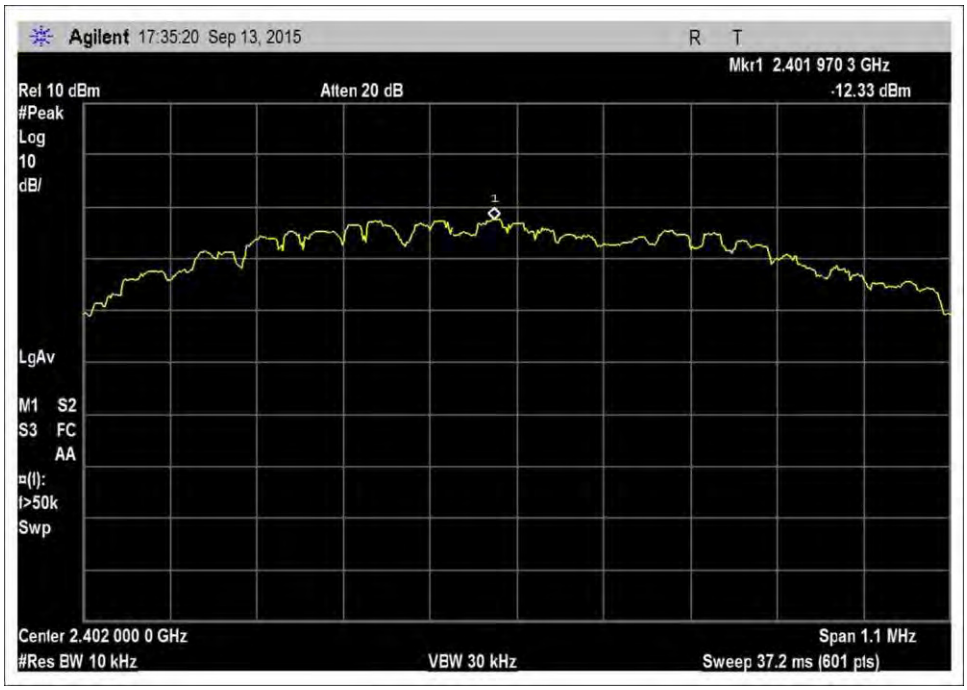
Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	S. Pittsford
Test Method:	ANSI C63.10 (2013), KDB 558074 D01 DTS Meas Guidance v03r04, January 7, 2016	Test Date(s):	2/4/2016
Configuration:	1		
Test Setup:	Frequency Range: 2402-2480MHz Frequency tested: 2402MHz, 2440MHz and 2480MHz Firmware power setting: Max Software: RealTerm 2.0.0.70 Protocol /MCS/Modulation: BLE Antenna type: Integral Inverted F antenna Antenna Gain: 0.0 dBi. Duty Cycle: 63% Test Mode: Continuously transmitting on low, mid and high channels Test Setup: The EUT is transmitting through a temporary antenna connector and is attached directly to the spectrum analyzer. EUT is tested at nominal voltage and +/-15% nominal voltage.		

Environmental Conditions			
Temperature (ºC)	22	Relative Humidity (%):	32

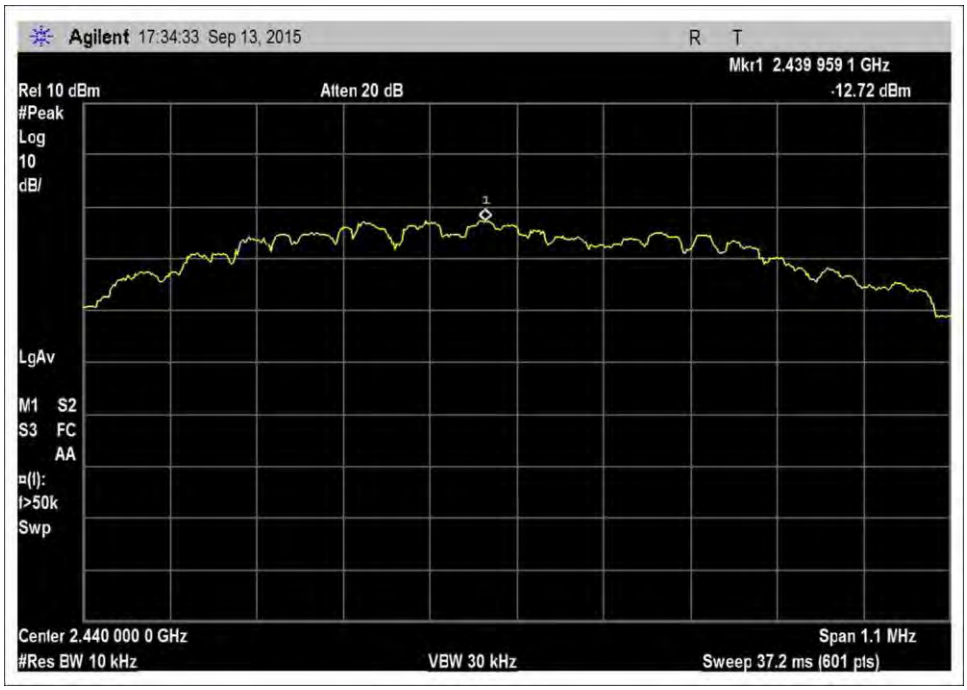
Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02872	Spectrum Analyzer	Agilent	E4440A	11/18/2015	11/18/2017

Test Data Summary - RF Conducted Measurement				
Measurement Method: PKPSD				
Frequency (MHz)	**Modulation**	**Measured (dBm/10kHz)**	**Limit (dBm/3kHz)**	**Results**
2402	GSFK	-12.33	≤8	Pass
2440	GSFK	-12.72	≤8	Pass
2480	GSFK	-13.17	≤8	Pass

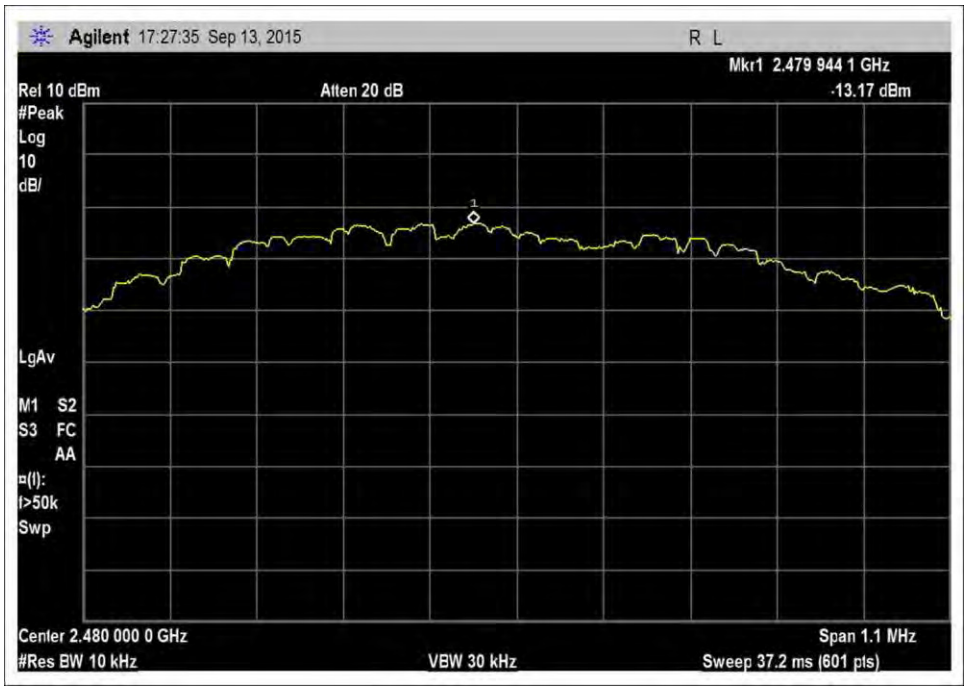
Plots



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 Dr. SE, Suite A • Bothell, WA 98021 • (425) 402-1717		
Customer:	**Philips Oral Healthcare, Inc.**		
Specification:	**15.247(d) Conducted Spurious Emissions**		
Work Order #:	**98106**	Date:	2/4/2016
Test Type:	**Conducted Emissions**	Time:	13:54:33
Tested By:	Steven Pittsford	Sequence#:	2
Software:	EMITest 5.03.00		120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

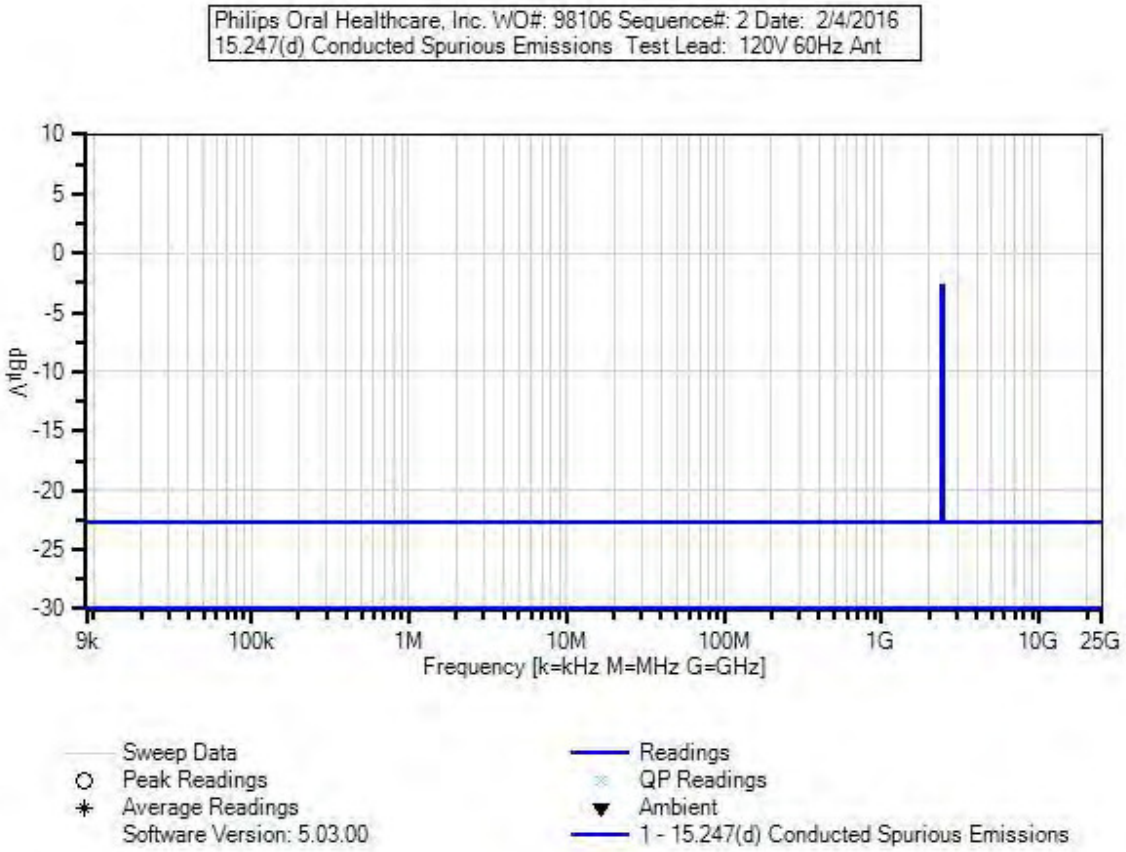
Test Conditions / Notes:

Frequency Range: 9k-25GHz
Frequency tested: 2402MHz, 2440MHz and 2480MHz
Firmware power setting: Max
Software: RealTerm 2.0.0.70
Protocol /MCS/Modulation: BLE

ANSI C63.10 (2013) KDB 558074 D01 DTS Meas Guidance v03r04, January 7, 2016
Antenna type: Integral Inverted F antenna
Antenna Gain: 0.0 dBi.

Duty Cycle: 63%

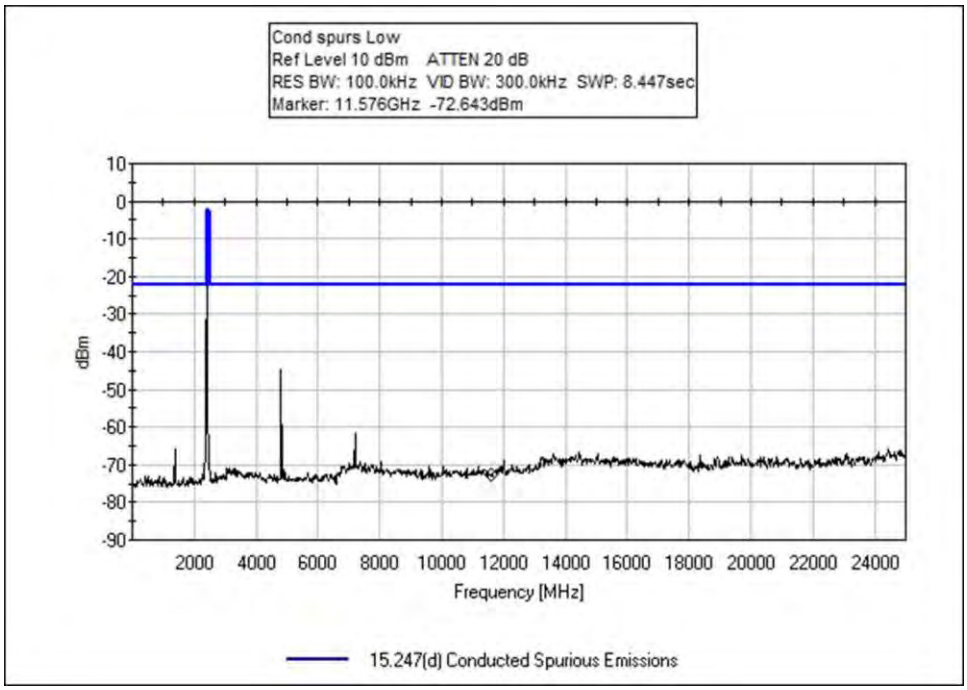
Test Mode: Continuously transmitting on low, mid and high channels
Test Setup: the EUT is transmitting through a temporary antenna connector and is attached directly to the spectrum analyzer. Emissions for EUT off the charger represents emissions for both on and off charger.
The EUTs battery is fully charged.

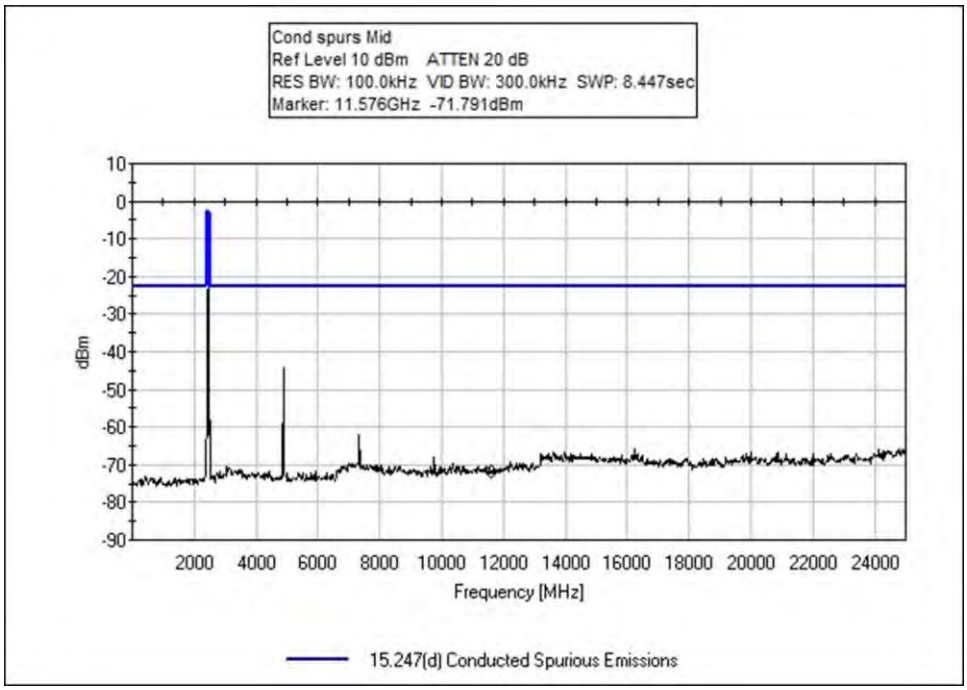


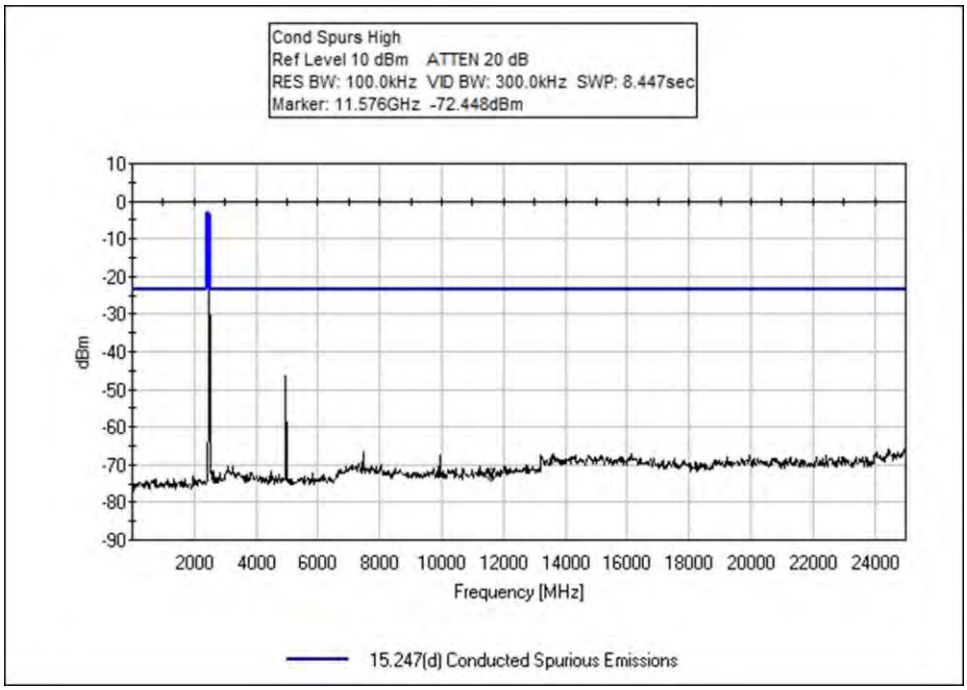
Test Equipment:

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

Plots


Cond spurs Low
Ref Level 10 dBm ATTEN 20 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 8.447sec
Marker: 11.576GHz -72.643dBm
dBm
Frequency [MHz]
15.247(d) Conducted Spurious Emissions


Cond spurs Mid
Ref Level 10 dBm ATTEN 20 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 8.447sec
Marker: 11.576GHz -71.791dBm
dBm
Frequency [MHz]
15.247(d) Conducted Spurious Emissions


Cond Spurs High
Ref Level 10 dBm ATTEN 20 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 8.447sec
Marker: 11.576GHz -72.448dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
dBm
2000 4000 6000 8000 10000 12000 14000 16000 18000 20000 22000 24000
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

Band Edge Summary

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

Frequency (MHz)	Modulation	Measured (dBm)	Limit (dBm)	Results
2400.0	GSFK	-38.9	<-22.2	Pass
2483.5	GSFK	-46.3	<-23.3	Pass

Band Edge Setup / Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Dr. SE, Suite A • Bothell, WA 98021 • (425) 402-1717
Customer: **Philips Oral Healthcare, Inc.**
Specification: **15.247(d) Conducted Spurious Emissions**
Work Order #: **98106** Date: 2/4/2016
Test Type: **Conducted Emissions** Time: 13:54:33
Tested By: Steven Pittsford Sequence#: 2
Software: EMITest 5.03.00 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

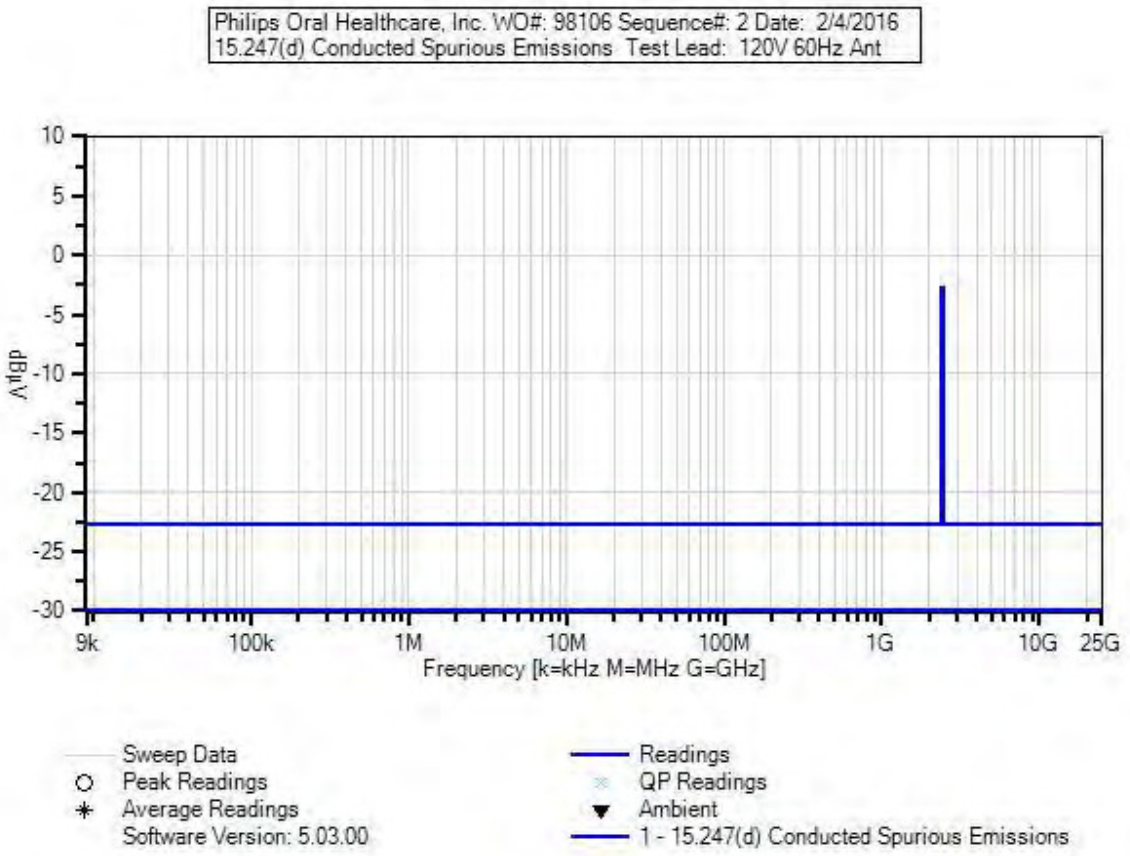
Test Conditions / Notes:

Frequency tested: 2402MHz and 2480MHz
Firmware power setting: Max
Software: RealTerm 2.0.0.70
Protocol /MCS/Modulation: BLE

Antenna type: Integral Inverted F antenna
Antenna Gain: 0.0 dBi.

Duty Cycle: 63%

Test Mode: Continuously transmitting on low and high channels
Test Setup: EUT is transmitting through a temporary antenna connector and is attached directly to the spectrum analyzer.
Emissions for EUT off the charger represents emissions for both on and off charger.



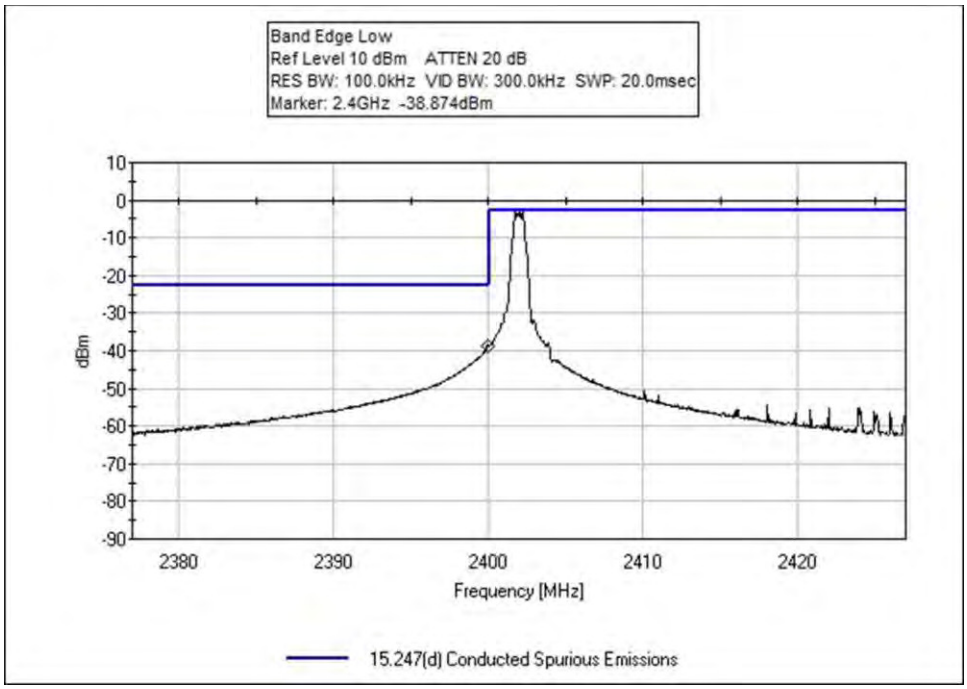
Test Equipment:

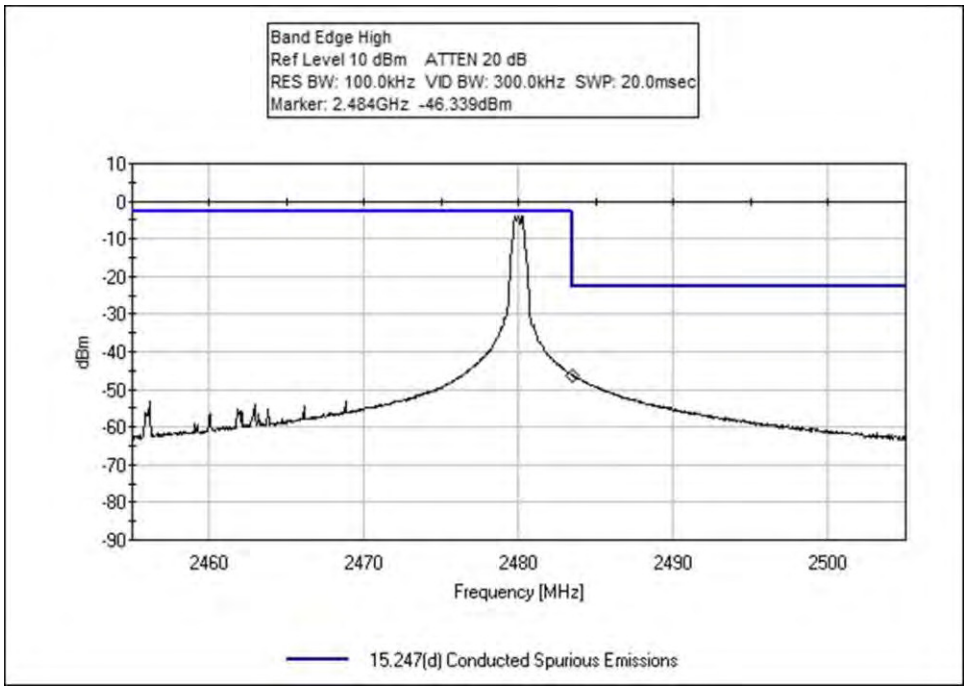
ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
	AN02872	Spectrum Analyzer	E4440A	11/18/2015	11/18/2017

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

#	Freq MHz	Rdng dBµV	dB	dB	dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	2400.000M	-38.9					+0.0	-38.9	-22.7	-16.2	Ant
2	2483.500M	-46.3					+0.0	-46.3	-22.7	-23.6	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 Dr. SE, Suite A • Bothell, WA 98021 • (425) 402-1717		
Customer:	**Philips Oral Healthcare, Inc.**		
Specification:	**15.247(d) / 15.209 Radiated Spurs (AVG for BE)**		
Work Order #:	**98106**	Date:	2/8/2016
Test Type:	**Radiated Scan**	Time:	13:10:45
Tested By:	Steven Pittsford	Sequence#:	6
Software:	EMITest 5.03.00		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

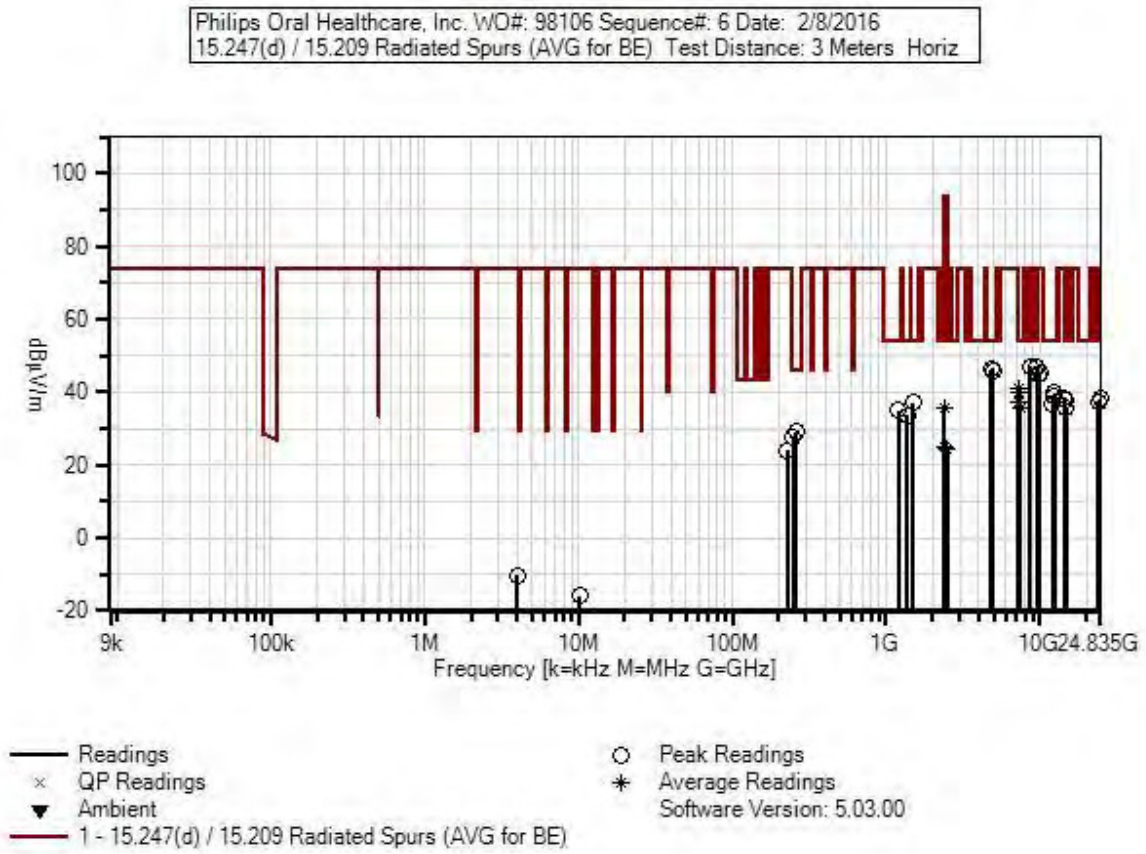
Frequency Range: 9k-25GHz

Frequency tested: 2402MHz, 2440MHz and 2480MHz
Firmware power setting: Max
Software: RealTerm 2.0.0.70
Protocol /MCS/Modulation: BLE

Antenna type: Integral Inverted F antenna
Antenna Gain: 0.0 dBi.

Duty Cycle: 63%
ANSI C63.10 (2013) KDB 558074 D01 DTS Meas Guidance v03r04, January 7, 2016

Test Mode: Continuously transmitting on low, mid and high channels
Test Setup: The EUT is set on a Styrofoam test bench inside the semi-anechoic chamber.
The EUT is tested in X, Y & Z orientations. Only the worst case is reported.
Emissions for EUT off the charger represents emissions for both on and off charger.
The EUTs battery is fully charged.


Philips Oral Healthcare, Inc. WO#: 98106 Sequence#: 6 Date: 2/8/2016
15.247(d) / 15.209 Radiated Spurs (AVG for BE) Test Distance: 3 Meters Horiz
100
80
60
40
20
0
-20
dBµV/m
9k
100k
1M
10M
100M
1G
10G24.835G
Frequency [k=kHz M=MHz G=GHz]
Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurs (AVG for BE)
Peak Readings
Average Readings
Software Version: 5.03.00

Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	AN02872	Spectrum Analyzer	E4440A	11/18/2015	11/18/2017
T2	AN00052	Loop Antenna	6502	5/20/2014	5/20/2016
T3	ANP05305	Cable	ETSI-50T	2/20/2014	2/20/2016
T4	ANP06540	Cable	Heliax	10/29/2015	10/29/2017
T5	AN03540	Preamp	83017A	4/30/2015	4/30/2017
T6	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	8/12/2015	8/12/2017
T7	AN02741	Active Horn Antenna	AMFW-5F-12001800-20-10P	1/14/2015	1/14/2017
T8	AN02742	Active Horn Antenna	AMFW-5F-18002650-20-10P	1/14/2015	1/14/2017
T9	AN02763-69	Waveguide	Multiple	5/21/2014	5/21/2016
T10	AN03122	Cable	32026-2-29801-36	5/13/2014	5/13/2016
T11	ANP06678	Cable	32026-29801-29801-144	9/18/2014	9/18/2016
T12	AN02307	Preamp	8447D	3/14/2014	3/14/2016
T13	AN01996	Biconilog Antenna	CBL6111C	7/16/2014	7/16/2016
T14	ANP05360	Cable	RG214	12/1/2014	12/1/2016
T15	ANP05963	Cable	RG-214	2/21/2014	2/21/2016

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	4879.350M	43.1	+0.0 -34.2 +0.0 +0.0	+0.0 +32.7 +0.0 +0.0	+3.9 +0.0 +0.0 +0.0	+0.9 +0.0	+0.0	46.4	54.0 Mid	-7.6	Horiz
2	4804.694M	42.9	+0.0 -34.2 +0.0 +0.0	+0.0 +32.7 +0.0 +0.0	+3.8 +0.0 +0.0 +0.0	+0.9 +0.0	+0.0	46.1	54.0 Low	-7.9	Horiz
3	4959.825M	42.1	+0.0 -34.2 +0.0 +0.0	+0.0 +32.8 +0.0 +0.0	+4.0 +0.0 +0.0 +0.0	+0.9 +0.0	+0.0	45.6	54.0 High	-8.4	Horiz
4	7319.339M Ave	33.3	+0.0 -34.6 +0.0 +0.0	+0.0 +36.1 +0.0 +0.0	+4.8 +0.0 +0.0 +0.0	+1.2 +0.0	+0.0	40.8	54.0 Mid	-13.2	Horiz

5	12401.390 M	44.5	+0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0	+7.1 -13.3 +0.0 +0.0	+1.6 +0.0 +0.0	+0.0 254	39.9	54.0 High	-14.1	Horiz 192
6	12198.770 M	43.9	+0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0	+7.0 -13.4 +0.0 +0.0	+1.5 +0.0 +0.0	+0.0	39.0	54.0 Mid	-15.0	Horiz 192
7	7319.288M Ave	30.0	+0.0 -34.6 +0.0 +0.0	+0.0 +36.1 +0.0 +0.0	+4.8 +0.0 +0.0 +0.0	+1.2 +0.0 +0.0	+0.0	37.5	54.0 Mid	-16.5	Horiz
^	7319.300M	44.4	+0.0 -34.6 +0.0 +0.0	+0.0 +36.1 +0.0 +0.0	+4.8 +0.0 +0.0 +0.0	+1.2 +0.0 +0.0	+0.0	51.9	54.0 Mid	-2.1	Horiz
9	1495.000M	44.9	+0.0 -35.6 +0.0 +0.0	+0.0 +25.3 +0.0 +0.0	+2.1 +0.0 +0.0 +0.0	+0.5 +0.0 +0.0	+0.0	37.2	54.0	-16.8	Horiz
10	260.700M	41.5	+0.0 +0.0 +0.0 +12.9	+0.0 +0.0 +0.0 +1.0	+0.0 +0.0 +0.0 +0.7	+0.2 +0.0 -27.1	+0.0 229	29.2	46.0	-16.8	Horiz 147
11	12011.420 M	41.5	+0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0	+6.8 -13.1 +0.0 +0.0	+1.5 +0.0 +0.0	+0.0 360	36.7	54.0 Low	-17.3	Horiz 197
12	7441.050M Ave	27.9	+0.0 -34.7 +0.0 +0.0	+0.0 +36.6 +0.0 +0.0	+4.7 +0.0 +0.0 +0.0	+1.3 +0.0 +0.0	+0.0	35.8	54.0 High	-18.2	Horiz
^	7441.050M	41.5	+0.0 -34.7 +0.0 +0.0	+0.0 +36.6 +0.0 +0.0	+4.7 +0.0 +0.0 +0.0	+1.3 +0.0 +0.0	+0.0	49.4	54.0 High	-4.6	Horiz
14	247.200M	40.1	+0.0 +0.0 +0.0 +12.5	+0.0 +0.0 +0.0 +1.0	+0.0 +0.0 +0.0 +0.7	+0.2 +0.0 -27.1	+0.0 348	27.4	46.0	-18.6	Horiz 147
15	1198.000M	45.2	+0.0 -36.6 +0.0 +0.0	+0.0 +24.2 +0.0 +0.0	+1.9 +0.0 +0.0 +0.0	+0.4 +0.0 +0.0	+0.0	35.1	54.0	-18.9	Horiz
16	1360.000M	42.4	+0.0 -36.0 +0.0 +0.0	+0.0 +24.7 +0.0 +0.0	+2.0 +0.0 +0.0 +0.0	+0.4 +0.0 +0.0	+0.0	33.5	54.0	-20.5	Vert
17	8587.000M	37.8	+0.0 -34.8 +0.0 +0.0	+0.0 +36.8 +0.0 +0.0	+5.5 +0.0 +0.0 +0.0	+1.7 +0.0 +0.0	+0.0	47.0	73.7	-26.7	Vert

18	9605.925M	36.8	+0.0	+0.0	+6.3	+1.5	+0.0	47.0	73.7	-26.7	Vert
			-35.0	+37.4	+0.0	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0						
19	9919.075M	35.6	+0.0	+0.0	+6.3	+1.3	+0.0	45.2	73.7	-28.5	Horiz
			-35.2	+37.2	+0.0	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0						
20	9759.300M	34.9	+0.0	+0.0	+6.3	+1.4	+0.0	44.8	73.7	-28.9	Horiz
			-35.1	+37.3	+0.0	+0.0			Mid		
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0						
21	2390.000M	28.3	+0.0	+0.0	+2.7	+0.6	+0.0	24.7	54.0	-29.3	Horiz
	Ave		-34.6	+27.7	+0.0	+0.0	360				147
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0						
^	2390.000M	60.3	+0.0	+0.0	+2.7	+0.6	+0.0	56.7	54.0	+2.7	Horiz
			-34.6	+27.7	+0.0	+0.0	360				147
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0						
23	2483.500M	28.1	+0.0	+0.0	+2.7	+0.6	+0.0	24.6	54.0	-29.4	Horiz
	Ave		-34.5	+27.7	+0.0	+0.0	360				147
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0						
^	2483.500M	70.1	+0.0	+0.0	+2.7	+0.6	+0.0	66.6	54.0	+12.6	Horiz
			-34.5	+27.7	+0.0	+0.0	360				147
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0						
25	7205.350M	33.6	+0.0	+0.0	+4.8	+1.2	+0.0	40.8	73.7	-32.9	Vert
	Ave		-34.5	+35.7	+0.0	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0						
^	7205.350M	44.6	+0.0	+0.0	+4.8	+1.2	+0.0	51.8	73.7	-21.9	Vert
			-34.5	+35.7	+0.0	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0						
27	7206.775M	32.8	+0.0	+0.0	+4.8	+1.2	+0.0	40.0	73.7	-33.7	Vert
	Ave		-34.5	+35.7	+0.0	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0						
^	7206.775M	44.0	+0.0	+0.0	+4.8	+1.2	+0.0	51.2	73.7	-22.5	Vert
			-34.5	+35.7	+0.0	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0						
29	14410.550	42.9	+0.0	+0.0	+8.1	+1.8	+0.0	38.4	73.7	-35.3	Horiz
	M		+0.0	+0.0	-14.4	+0.0					
			+0.0	+0.0	+0.0	+0.0	61		Low		197
			+0.0	+0.0	+0.0						
30	24792.500	37.4	+0.0	+0.0	+0.0	+0.0	+0.0	38.3	73.7	-35.4	Horiz
	M		+0.0	+0.0	+0.0	-12.3					
			+2.7	+2.7	+7.8	+0.0	8		High		157
			+0.0	+0.0	+0.0						

31	24763.920 M	37.2	+0.0 +0.0 +2.8 +0.0	+0.0 +0.0 +2.7 +0.0	+0.0 +0.0 +7.8 +0.0	+0.0 -12.3 +0.0	+0.0	38.2	73.7 Mid	-35.5	Horiz 157
32	14638.580 M	41.5	+0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0	+8.3 -14.1 +0.0 +0.0	+1.8 +0.0 +0.0	+0.0 360	37.5	73.7 Mid	-36.2	Horiz 192
33	24017.440 M	37.9	+0.0 +0.0 +2.9 +0.0	+0.0 +0.0 +2.6 +0.0	+0.0 +0.0 +7.7 +0.0	+0.0 -13.8 +0.0	+0.0	37.3	73.7 Low	-36.4	Horiz 165
34	14881.390 M	39.7	+0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0	+8.4 -14.1 +0.0 +0.0	+1.8 +0.0 +0.0 +0.0	+0.0 360	35.8	73.7 High	-37.9	Horiz 200
35	2400.000M Ave	39.3	+0.0 -34.6 +0.0 +0.0	+0.0 +27.7 +0.0 +0.0	+2.7 +0.0 +0.0 +0.0	+0.6 +0.0 +0.0	+0.0 360	35.7	73.7	-38.0	Horiz 147
^	2400.000M	78.2	+0.0 -34.6 +0.0 +0.0	+0.0 +27.7 +0.0 +0.0	+2.7 +0.0 +0.0 +0.0	+0.6 +0.0 +0.0 +0.0	+0.0 360	74.6	73.7	+0.9	Horiz 147
37	227.700M	38.1	+0.0 +0.0 +0.0 +11.3	+0.0 +0.0 +0.0 +0.9	+0.0 +0.0 +0.0 +0.7	+0.2 +0.0 +0.0 -27.2	+0.0 360	24.0	73.7	-49.7	Horiz 147
38	4.001M	20.1	+0.0 +0.0 +0.0 +0.0	+9.5 +0.0 +0.0 +0.0	+0.1 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0	-40.0	-10.3	73.7	-84.0	Perp
39	10.176M	14.7	+0.0 +0.0 +0.0 +0.0	+9.3 +0.0 +0.0 +0.0	+0.1 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0	-40.0	-15.9	73.7	-89.6	Perp
40	23.672M	13.6	+0.0 +0.0 +0.0 +0.0	+5.5 +0.0 +0.0 +0.0	+0.2 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0	-40.0	-20.7	73.7	-94.4	Perp
41	16.191k	45.4	+0.0 +0.0 +0.0 +0.0	+13.6 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0	-80.0	-21.0	73.7	-94.7	Perp
42	150.000k	46.1	+0.0 +0.0 +0.0 +0.0	+9.6 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0	-80.0	-24.3	73.7	-98.0	Perp

Band Edge Summary					
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
2390.0	GFSK	Integral Inverted F	24.7	<54	Pass
2400.0	GFSK	Integral Inverted F	38.1	<73.7	Pass
2483.5	GFSK	Integral Inverted F	24.7	<54	Pass

Band Edge Setup / Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Dr. SE, Suite A • Bothell, WA 98021 • (425) 402-1717
Customer: **Philips Oral Healthcare, Inc.**
Specification: **15.247(d) / 15.209 Radiated Spurs (AVG for BE)**
Work Order #: **98106** Date: 2/8/2016
Test Type: **Radiated Scan** Time: 13:10:45
Tested By: Steven Pittsford Sequence#: 6
Software: EMITest 5.03.00

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

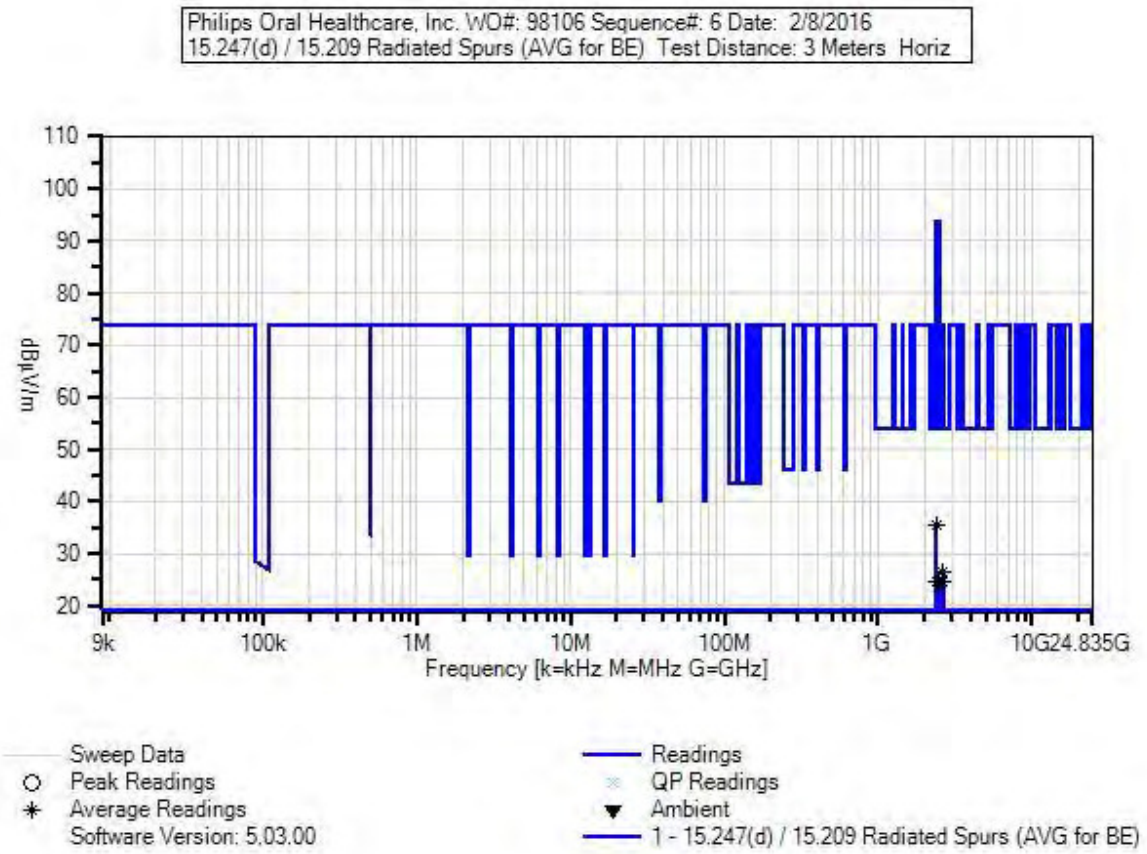
Test Conditions / Notes:

Frequency tested: 2402MHzand 2480MHz
Firmware power setting: Max
Software: RealTerm 2.0.0.70
Protocol /MCS/Modulation: BLE

Antenna type: Integral Inverted F antenna
Antenna Gain: 0.0 dBi.

Duty Cycle: 63%

ANSI C63.10 (2013)
Test Mode: Continuously transmitting on low and high channels
Test Setup: The EUT is set on a Styrofoam test bench inside the semi-anechoic chamber.
The EUT is tested in X, Y & Z orientations. Only the worst case is reported.
Emissions for EUT off the charger represents emissions for both on and off charger.


Philips Oral Healthcare, Inc. WO#: 98106 Sequence#: 6 Date: 2/8/2016
15.247(d) / 15.209 Radiated Spurs (AVG for BE) Test Distance: 3 Meters Horiz
110
100
90
80
70
60
50
40
30
20
dBµV/m
9k
100k
1M
10M
100M
1G
10G24.835G
Frequency [k=kHz M=MHz G=GHz]
Sweep Data
Peak Readings
Average Readings
Software Version: 5.03.00
Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurs (AVG for BE)

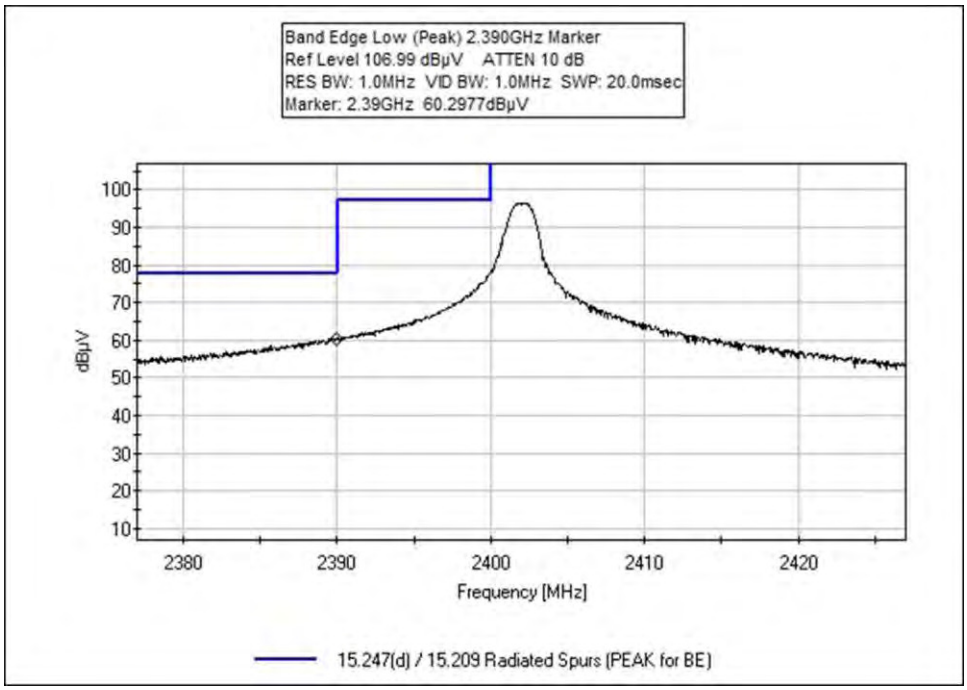
Test Equipment:

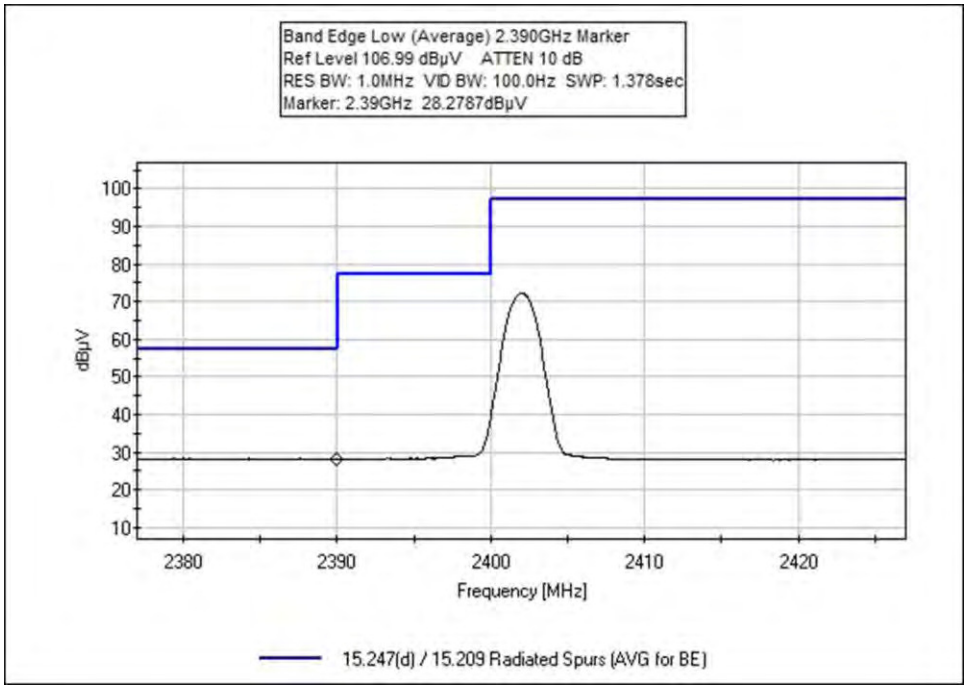
ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	AN02872	Spectrum Analyzer	E4440A	11/18/2015	11/18/2017
	AN00052	Loop Antenna	6502	5/20/2014	5/20/2016
T2	ANP05305	Cable	ETSI-50T	2/20/2014	2/20/2016
T3	ANP06540	Cable	Heliax	10/29/2015	10/29/2017
T4	AN03540	Preamp	83017A	4/30/2015	4/30/2017
T5	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	8/12/2015	8/12/2017
	AN02741	Active Horn Antenna	AMFW-5F-12001800-20-10P	1/14/2015	1/14/2017
	AN02742	Active Horn Antenna	AMFW-5F-18002650-20-10P	1/14/2015	1/14/2017
	AN02763-69	Waveguide	Multiple	5/21/2014	5/21/2016
	AN03122	Cable	32026-2-29801-36	5/13/2014	5/13/2016
	ANP06678	Cable	32026-29801-29801-144	9/18/2014	9/18/2016
	AN02307	Preamp	8447D	3/14/2014	3/14/2016
	AN01996	Biconilog Antenna	CBL6111C	7/16/2014	7/16/2016
	ANP05360	Cable	RG214	12/1/2014	12/1/2016
	ANP05963	Cable	RG-214	2/21/2014	2/21/2016

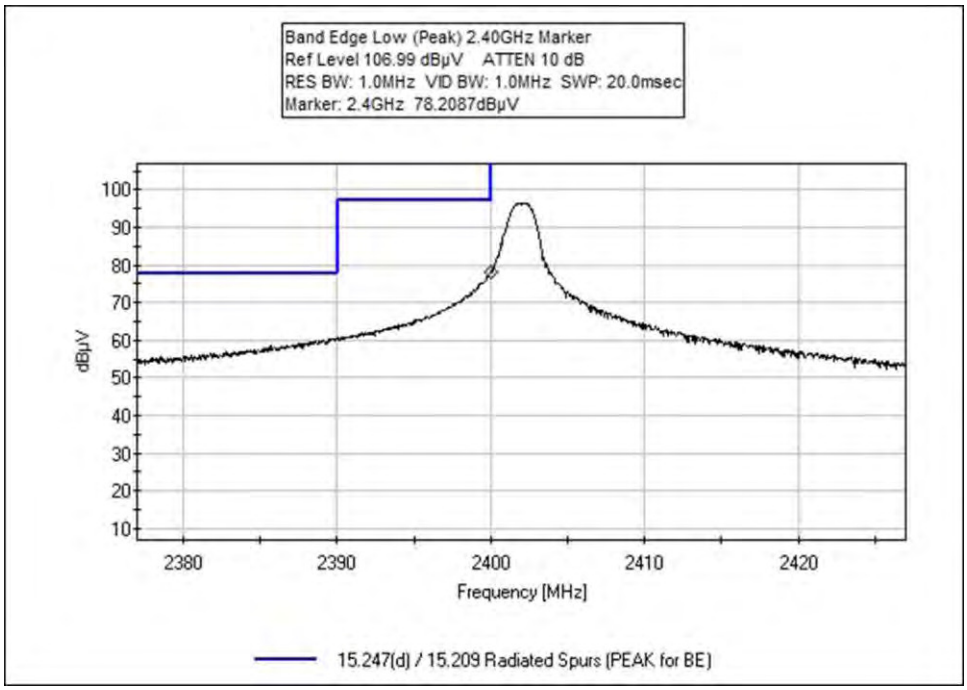
Measurement Data: Reading listed by margin. Test Distance: 3 Meters

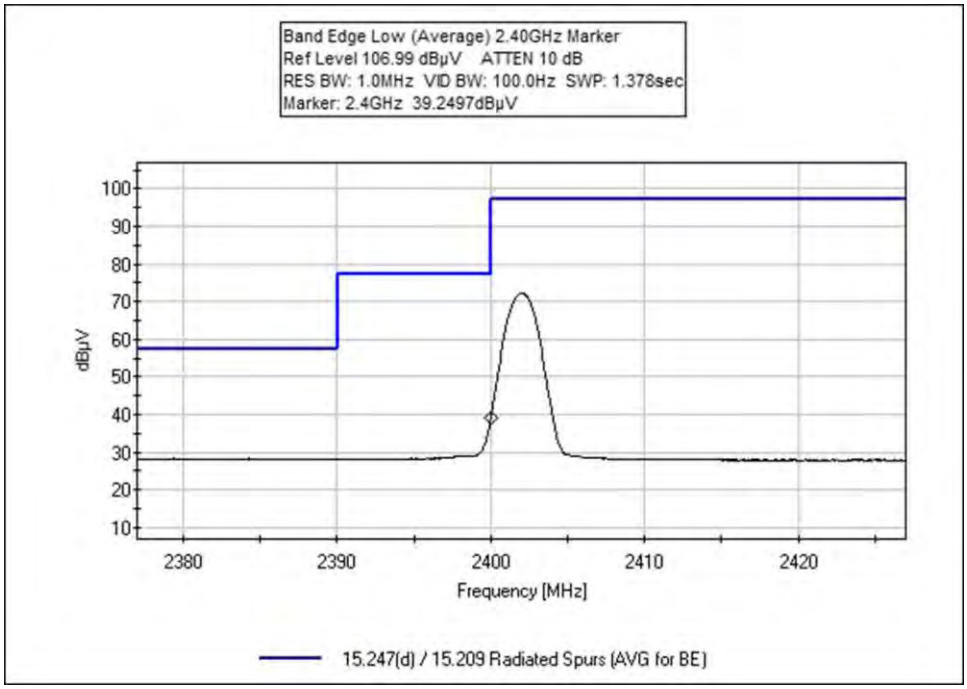
#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	2655.000M Ave	29.1	+0.0 +28.4	+2.8	+0.7	-34.5	+0.0 360	26.5	54.0	-27.5	Horiz 112
2	2655.000M Ave	27.4	+0.0 +28.4	+2.8	+0.7	-34.5	+0.0 360	24.8	54.0	-29.2	Horiz 112
^	2655.000M	42.5	+0.0 +28.4	+2.8	+0.7	-34.5	+0.0 360	39.9	54.0	-14.1	Horiz 104
4	2390.000M Ave	28.3	+0.0 +27.7	+2.7	+0.6	-34.6	+0.0 360	24.7	54.0	-29.3	Horiz 147
^	2390.000M	60.3	+0.0 +27.7	+2.7	+0.6	-34.6	+0.0 360	56.7	54.0	+2.7	Horiz 147
6	2483.500M Ave	28.1	+0.0 +27.7	+2.7	+0.6	-34.5	+0.0 360	24.6	54.0	-29.4	Horiz 147
^	2483.500M	70.1	+0.0 +27.7	+2.7	+0.6	-34.5	+0.0 360	66.6	54.0	+12.6	Horiz 147
8	2400.000M Ave	39.3	+0.0 +27.7	+2.7	+0.6	-34.6	+0.0 360	35.7	73.7	-38.0	Horiz 147
^	2400.000M	78.2	+0.0 +27.7	+2.7	+0.6	-34.6	+0.0 360	74.6	73.7	+0.9	Horiz 147

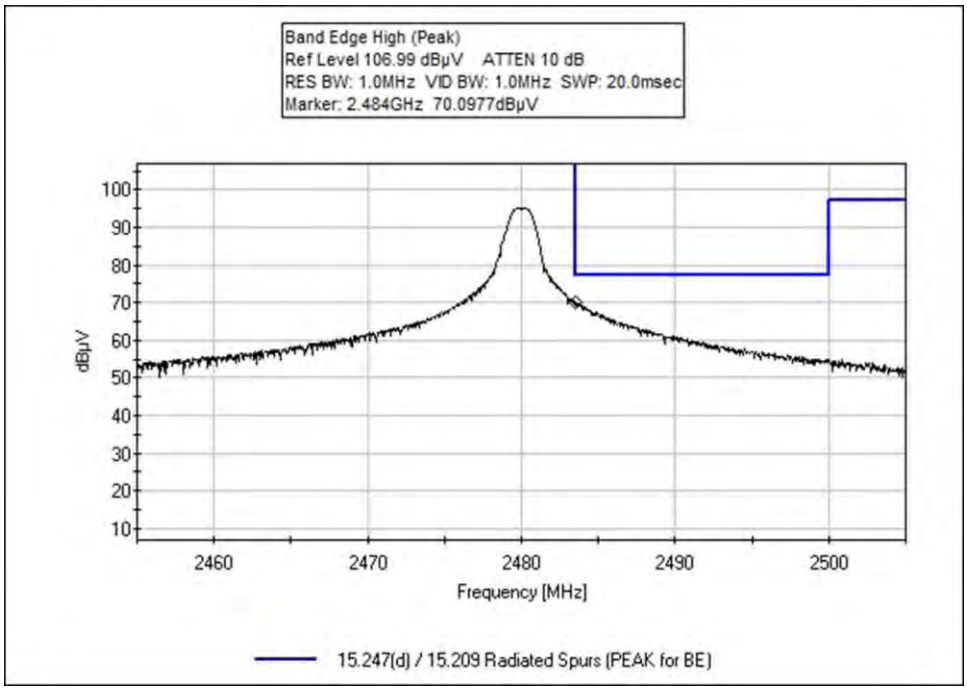
Band Edge Plots

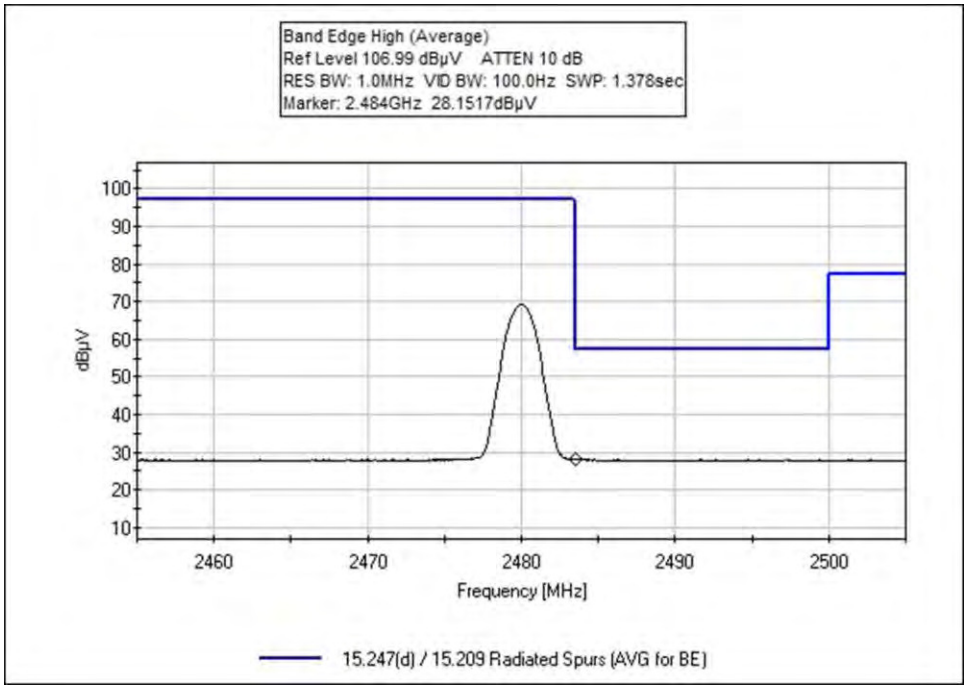





Band Edge Low (Peak) 2.40GHz Marker
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 1.0MHz SWP: 20.0msec
Marker: 2.4GHz 78.2087dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
2380
2390
2400
2410
2420
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurs (PEAK for BE)

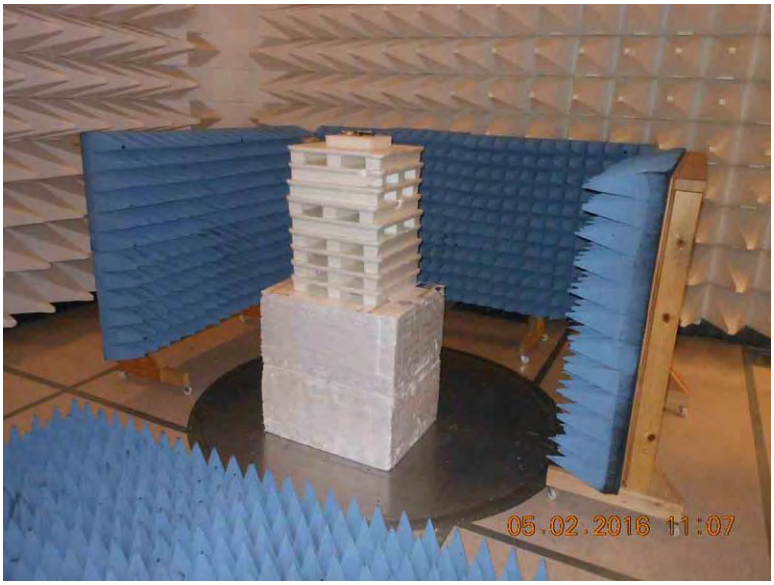

Band Edge Low (Average) 2.40GHz Marker
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 100.0Hz SWP: 1.378sec
Marker: 2.4GHz 39.2497dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
2380
2390
2400
2410
2420
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurs (AVG for BE)


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 70.0977dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurs (PEAK for BE)


Band Edge High (Average)
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 100.0Hz SWP: 1.378sec
Marker: 2.484GHz 28.1517dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurs (AVG for BE)

Test Setup Photos

< 1GHz

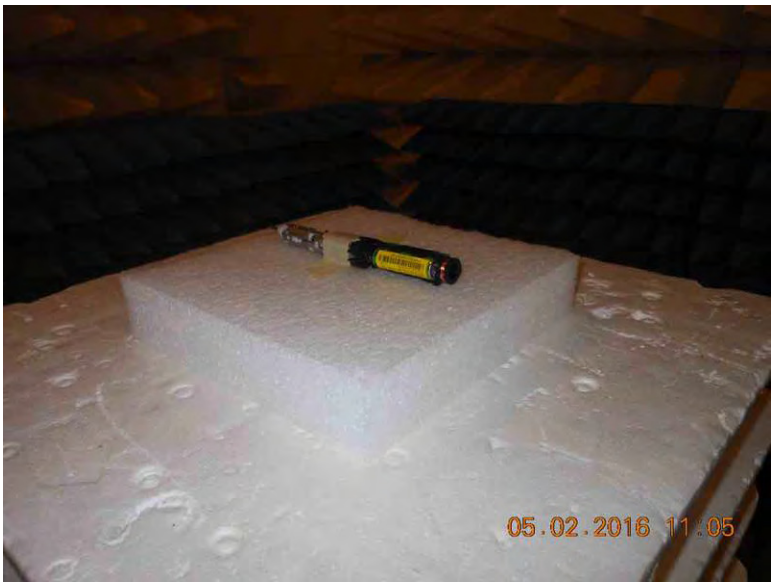


> 1GHz

X Axis, < 1GHz

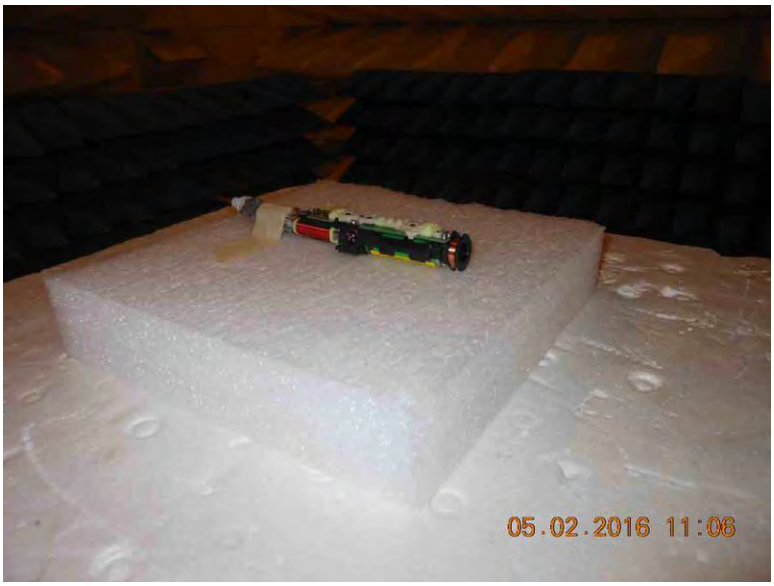
X Axis, >1GHz

Y Axis, < 1GHz



Y Axis, > 1GHz

Z Axis, < 1GHz



Z Axis, >1GHz

15.207 AC Conducted Emissions

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 22116 23rd Dr. SE, Suite A • Bothell, WA 98021 • (425) 402-1717		
Customer:	**Philips Oral Healthcare, Inc.**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**98106**	Date:	2/8/2016
Test Type:	**Conducted Emissions**	Time:	3:08:06 PM
Tested By:	Steven Pittsford	Sequence#:	13
Software:	EMITest 5.03.00		120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

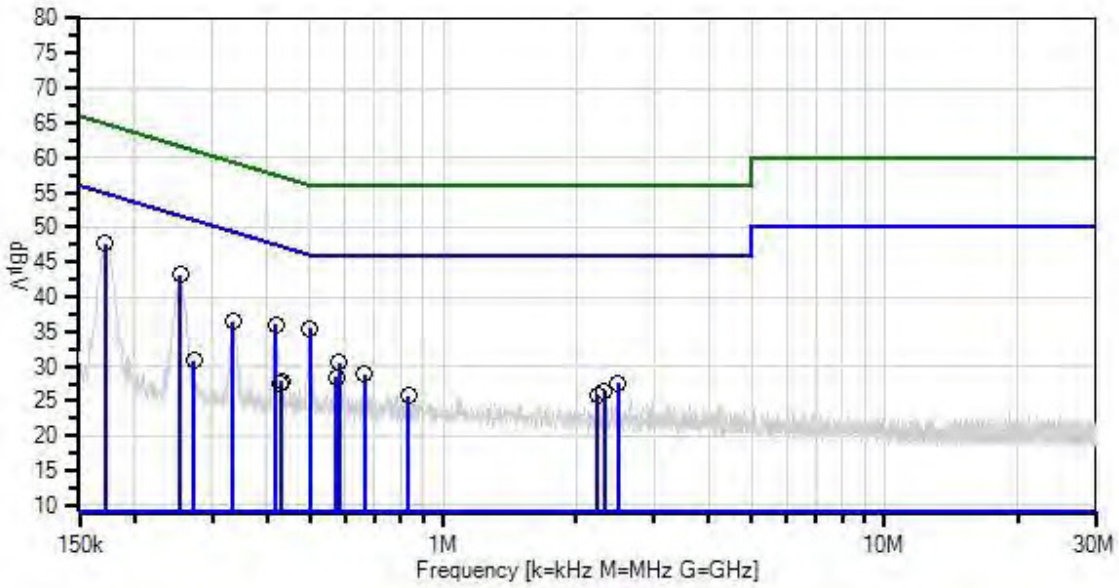
Frequency Range: 150k-30MHz
Firmware power setting: Max
Software: RealTerm 2.0.0.70
Protocol /MCS/Modulation: BLE

Temperature: 22°C
Relative Humidity: 32%

Antenna type: Integral Inverted F antenna
Antenna Gain: 0.0 dBi.
Duty Cycle: 63%

Test Method: ANSI C63.10 (2013)
Test Mode: Transmitting in normal operation
Test Setup: The EUT is sitting on the inductive charger and is charging. The inductive charger is sitting on a wooden test bench.

Philips Oral Healthcare, Inc. WO#: 98106 Sequence#: 13 Date: 2/8/2016
15.207 AC Mains - Average Test Lead: 120V 60Hz Line



Sweep Data
× QP Readings
Software Version: 5.03.00
Readings
Average Readings
1 - 15.207 AC Mains - Average
Peak Readings
Ambient
2 - 15.207 AC Mains - Quasi-peak

Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06219	Attenuator	768-10	4/23/2014	4/23/2016
T2	ANP05305	Cable	ETSI-50T	2/20/2014	2/20/2016
T3	ANP06540	Cable	Heliax	10/29/2015	10/29/2017
T4	AN01492	50uH LISN-Line	3816/2NM	8/5/2015	8/5/2017
	AN01492	50uH LISN-Neutral	3816/2NM	8/5/2015	8/5/2017
T5	AN02611	High Pass Filter	HE9615-150K-50-720B	3/26/2014	3/26/2016
	AN02872	Spectrum Analyzer	E4440A	11/18/2015	11/18/2017

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	171.816k	35.4	+10.3 +0.4	+0.0	+0.0	+1.6	+0.0	47.7	54.9	-7.2	Line
2	253.263k	31.6	+10.3 +0.2	+0.0	+0.0	+1.0	+0.0	43.1	51.6	-8.5	Line
3	500.513k	24.5	+10.3 +0.2	+0.0	+0.0	+0.5	+0.0	35.5	46.0	-10.5	Line
4	416.884k	24.9	+10.3 +0.2	+0.0	+0.0	+0.6	+0.0	36.0	47.5	-11.5	Line
5	333.983k	25.4	+10.3 +0.1	+0.0	+0.0	+0.7	+0.0	36.5	49.4	-12.9	Line
6	580.505k	19.5	+10.3 +0.2	+0.0	+0.0	+0.5	+0.0	30.5	46.0	-15.5	Line
7	663.407k	18.1	+10.2 +0.2	+0.0	+0.0	+0.4	+0.0	28.9	46.0	-17.1	Line
8	573.961k	17.4	+10.3 +0.2	+0.0	+0.0	+0.5	+0.0	28.4	46.0	-17.6	Line
9	2.493M	16.7	+10.3 +0.1	+0.1	+0.0	+0.4	+0.0	27.6	46.0	-18.4	Line
10	430.701k	16.8	+10.3 +0.2	+0.0	+0.0	+0.6	+0.0	27.9	47.2	-19.3	Line
11	2.323M	15.6	+10.3 +0.1	+0.1	+0.0	+0.4	+0.0	26.5	46.0	-19.5	Line
12	429.247k	16.4	+10.3 +0.2	+0.0	+0.0	+0.6	+0.0	27.5	47.3	-19.8	Line
13	2.242M	15.1	+10.2 +0.1	+0.1	+0.0	+0.4	+0.0	25.9	46.0	-20.1	Line
14	832.846k	15.0	+10.1 +0.2	+0.1	+0.0	+0.4	+0.0	25.8	46.0	-20.2	Line
15	272.170k	19.4	+10.3 +0.2	+0.0	+0.0	+0.9	+0.0	30.8	51.1	-20.3	Line

Test Location:	CKC Laboratories, Inc. • 22116 23rd Dr. SE, Suite A • Bothell, WA 98021 • (425) 402-1717		
Customer:	**Philips Oral Healthcare, Inc.**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**98106**	Date:	2/8/2016
Test Type:	**Conducted Emissions**	Time:	3:27:51 PM
Tested By:	Steven Pittsford	Sequence#:	14
Software:	EMITest 5.03.00		120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

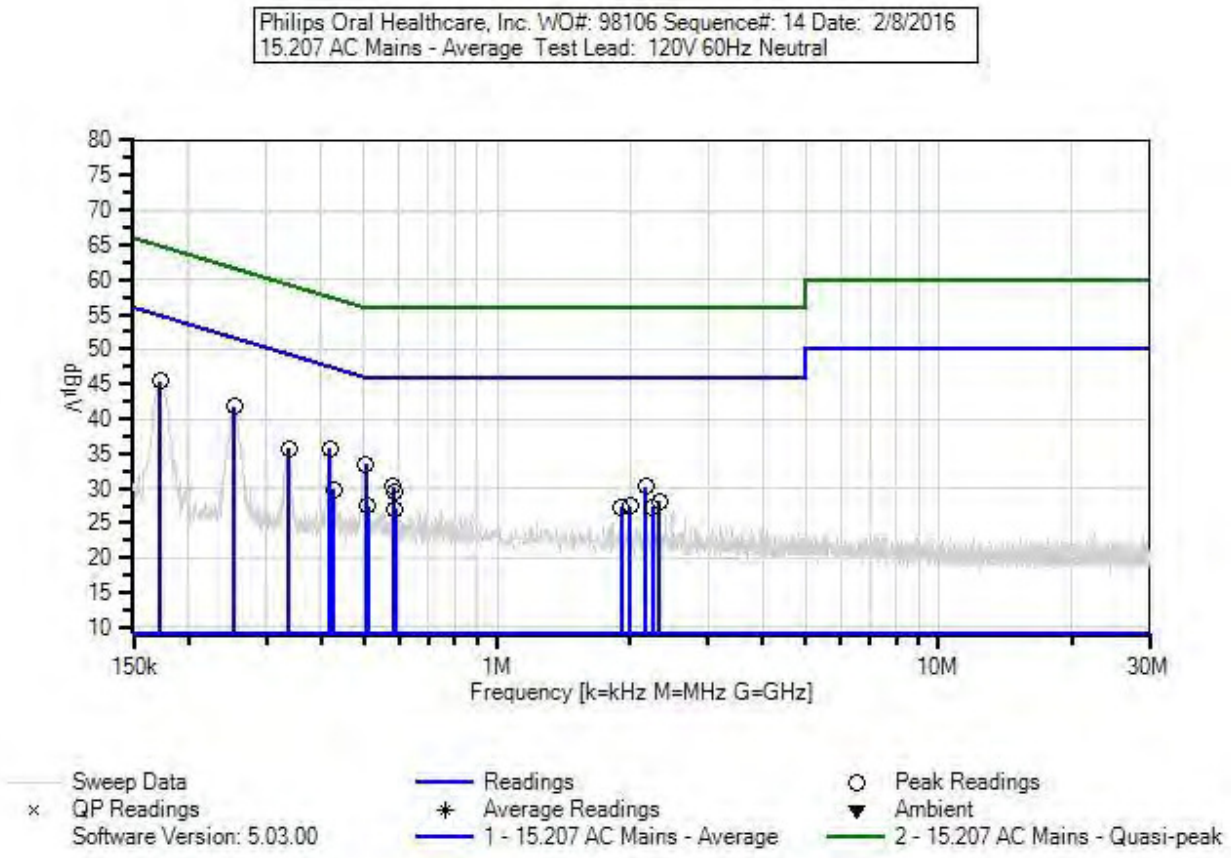
Frequency Range: 150k-30MHz

Firmware power setting: Max
Software: RealTerm 2.0.0.70
Protocol /MCS/Modulation: BLE

Temperature: 22°C
Relative Humidity: 32%

Antenna type: Integral Inverted F antenna
Antenna Gain: 0.0 dBi.
Duty Cycle: 63%

Test Method: ANSI C63.10 (2013)
Test Mode: Transmitting in normal operation
Test Setup: The EUT is sitting on the inductive charger and is charging. The inductive charger is sitting on a wooden test bench.


Philips Oral Healthcare, Inc. WO#: 98106 Sequence#: 14 Date: 2/8/2016
15.207 AC Mains - Average Test Lead: 120V 60Hz Neutral
dBµV
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
150k
1M
10M
30M
Frequency [k=kHz M=MHz G=GHz]
Sweep Data
QP Readings
Software Version: 5.03.00
Readings
Average Readings
1 - 15.207 AC Mains - Average
Peak Readings
Ambient
2 - 15.207 AC Mains - Quasi-peak

Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06219	Attenuator	768-10	4/23/2014	4/23/2016
T2	ANP05305	Cable	ETSI-50T	2/20/2014	2/20/2016
T3	ANP06540	Cable	Heliax	10/29/2015	10/29/2017
	AN01492	50uH LISN-Line	3816/2NM	8/5/2015	8/5/2017
T4	AN01492	50uH LISN-Neutral	3816/2NM	8/5/2015	8/5/2017
T5	AN02611	High Pass Filter	HE9615-150K-50-720B	3/26/2014	3/26/2016
	AN02872	Spectrum Analyzer	E4440A	11/18/2015	11/18/2017

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	172.543k	33.1	+10.3 +0.4	+0.0	+0.0	+1.6	+0.0	45.4	54.8	-9.4	Neutr
2	253.263k	30.4	+10.3 +0.2	+0.0	+0.0	+0.9	+0.0	41.8	51.6	-9.8	Neutr
3	416.884k	24.6	+10.3 +0.2	+0.0	+0.0	+0.6	+0.0	35.7	47.5	-11.8	Neutr
4	503.422k	22.5	+10.3 +0.2	+0.0	+0.0	+0.5	+0.0	33.5	46.0	-12.5	Neutr
5	336.891k	24.6	+10.3 +0.1	+0.0	+0.0	+0.7	+0.0	35.7	49.3	-13.6	Neutr
6	581.233k	19.4	+10.3 +0.2	+0.0	+0.0	+0.4	+0.0	30.3	46.0	-15.7	Neutr
7	2.170M	19.5	+10.2 +0.1	+0.1	+0.0	+0.3	+0.0	30.2	46.0	-15.8	Neutr
8	584.141k	18.7	+10.3 +0.2	+0.0	+0.0	+0.4	+0.0	29.6	46.0	-16.4	Neutr
9	425.611k	18.8	+10.3 +0.2	+0.0	+0.0	+0.5	+0.0	29.8	47.3	-17.5	Neutr
10	2.332M	17.3	+10.3 +0.1	+0.1	+0.0	+0.4	+0.0	28.2	46.0	-17.8	Neutr
11	2.004M	16.7	+10.2 +0.1	+0.1	+0.0	+0.4	+0.0	27.5	46.0	-18.5	Neutr
12	510.694k	16.4	+10.3 +0.2	+0.0	+0.0	+0.5	+0.0	27.4	46.0	-18.6	Neutr
13	1.911M	16.6	+10.2 +0.1	+0.1	+0.0	+0.3	+0.0	27.3	46.0	-18.7	Neutr
14	2.251M	16.5	+10.2 +0.1	+0.1	+0.0	+0.4	+0.0	27.3	46.0	-18.7	Neutr
15	588.505k	16.1	+10.3 +0.2	+0.0	+0.0	+0.4	+0.0	27.0	46.0	-19.0	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 the limit value subtracting the corrected measured value; a negative margin represents a measurement less than the limit while a positive margin represents a measurement exceeding 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.