Philips Oral Healthcare, Inc.

TEST REPORT FOR

Rechargeable Power Toothbrush with BLE
Model: HX960U*
(*See Appendix A for Manufacturer Declaration)

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.247
(DTS 2400-2483.5 MHz)

Report No.: 102029-7

Date of issue: January 23, 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 # 803.05

Testing the Future
CKC LABORATORIES, INC.

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

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

Representative: Ethan Fabela
Customer Reference Number: US13 - 2100769427

REPORT PREPARED BY:

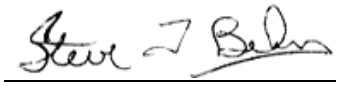
Terri Rayle
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 102029

DATE OF EQUIPMENT RECEIPT: December 15, 2018
DATE(S) OF TESTING: December 15-19, 2018

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.
22116 23rd Drive S.E., Suite A
Canyon Park, Bothell, WA 98021

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.11

Site Registration & Accreditation Information

Location	NIST 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	NA1
15.247(d)	Radiated Emissions & Band Edge	NA	Pass
15.207	AC Conducted Emissions	NA	NA2

NA = Not Applicable
NA1 = Not applicable because the EUT has an integral antenna.
NA2 = Not applicable because the EUT does not transmit while charging.

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
Rechargeable Power Toothbrush with BLE	Philips Oral Healthcare, Inc.	HX960U	NA
Inductive Charger	Philips Oral Healthcare, Inc.	HX6100	NA

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.	HX960U	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:	Integral Inverted F antenna
Beamforming Type:	NA
Antenna Connection Type:	Integral
Nominal Input Voltage:	3.7V Battery
Firmware / Software used for Test:	UPCI V1.3.0

FCC Part 15 Subpart C

15.247(a)(2) 6dB Bandwidth

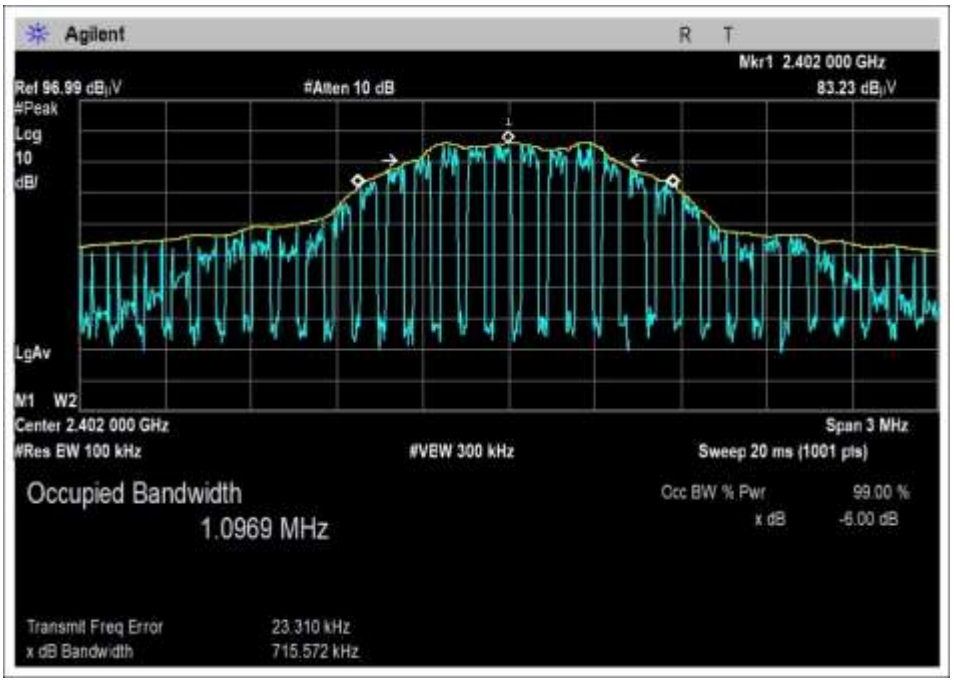
Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	S. Pittsford
Test Method:	ANSI C63.10 (2013), KDB 558074 V05 Aug 24th 2018	Test Date(s):	12/15/2018
Configuration:	2		
Test Setup:	Frequency tested: 2402, 2440, 2480MHz Firmware power setting: Max Power Software: UPCI V1.3.0 Protocol /MCS/Modulation: GFSK Antenna type: Integral Inverted F antenna Antenna Gain: 0.0 dBi. Duty Cycle: Continuously Transmitting (100%) Test Mode: Continuously transmitting on low, mid, and high channels Test Setup: EUT is transmitting through integral antenna. Modifications Added: None		

Environmental Conditions			
Temperature (ºC)	21	Relative Humidity (%):	30

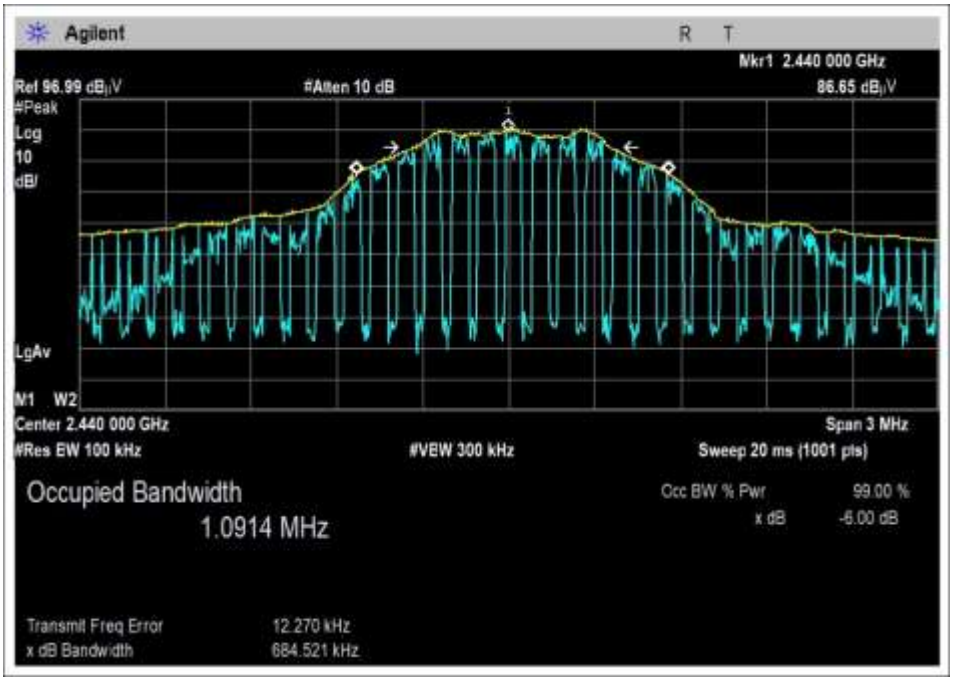
Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
03540	Preamp	HP	83017A	5/2/2017	5/2/2019
01467	Horn Antenna-ANSI C63.5 Calibration	EMCO	3115	7/21/2017	7/21/2019
P06503	Cable	Astrolab	32026-29801-29801-36	3/13/2018	3/13/2020
P06515	Cable	Andrews	Heliax	6/29/2018	6/29/2020
P06540	Cable	Andrews	Heliax	10/30/2017	10/30/2019
02673	Spectrum Analyzer	Agilent	E4446A	2/3/2017	2/3/2019

Test Data Summary					
Frequency (MHz)	**Antenna Port**	**Modulation**	**Measured (kHz)**	**Limit (kHz)**	**Results**
2402	1	GFSK	715.6	≥500	Pass
2440	1	GFSK	684.5	≥500	Pass
2480	1	GFSK	708.9	≥500	Pass

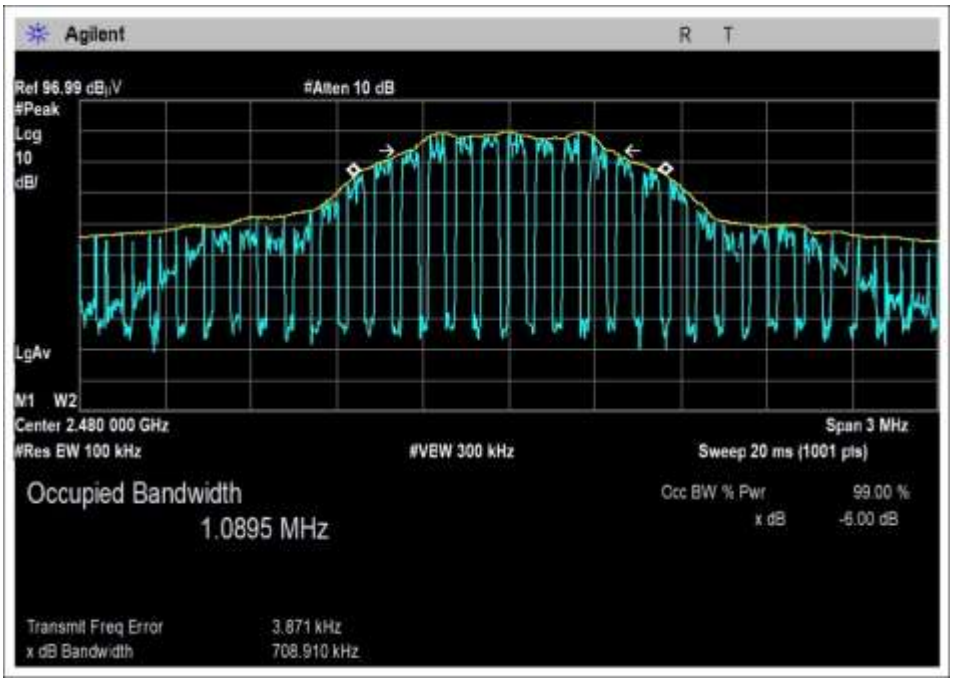
Plots



Low Channel



Middle Channel



High Channel

Test Setup Photo

15.247(b)(3) Output Power

Test Data Summary - Radiated Measurement						
Measurement Option: RBW > DTS Bandwidth						
Frequency (MHz)	**Modulation**	**Ant. Type / Gain (dBi)**	**Field Strength (dBuV/m @3m)**	**Calculated (dBm)**	**Limit (dBm)**	**Results**
2402	GFSK	Integral 0dBi	90.9	-4.3	≤30	Pass
2440	GFSK	Integral 0dBi	89.7	-5.5	≤30	Pass
2480	GFSK	Integral 0dBi	86.9	-8.3	≤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.

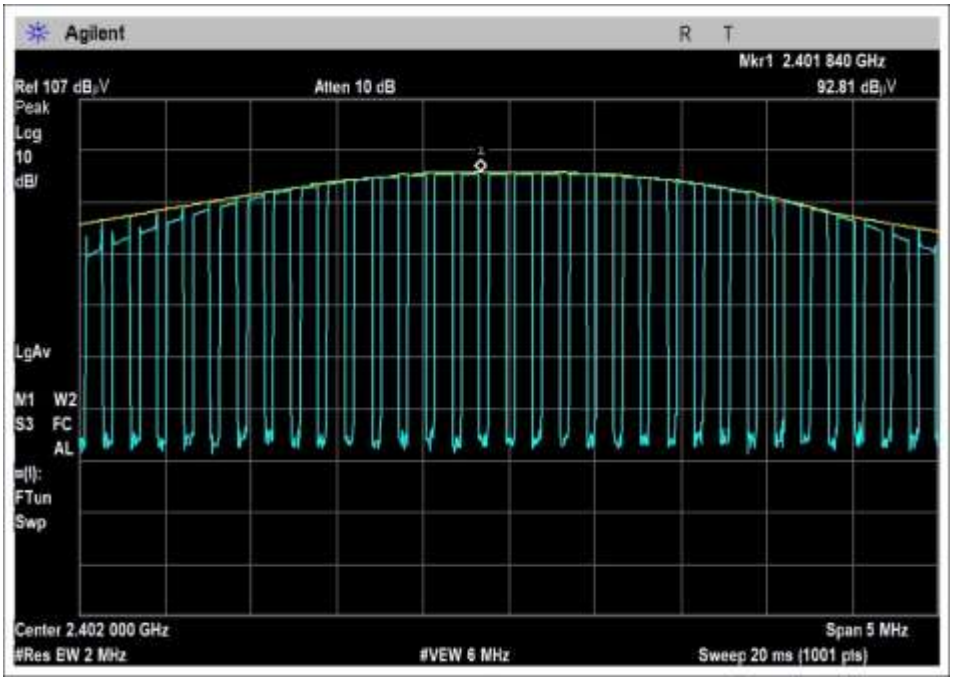
Conducted RF output power calculated in accordance with ANSI C63.10.

$$P(W) = \frac{(E \cdot d)^2}{30\ G}$$

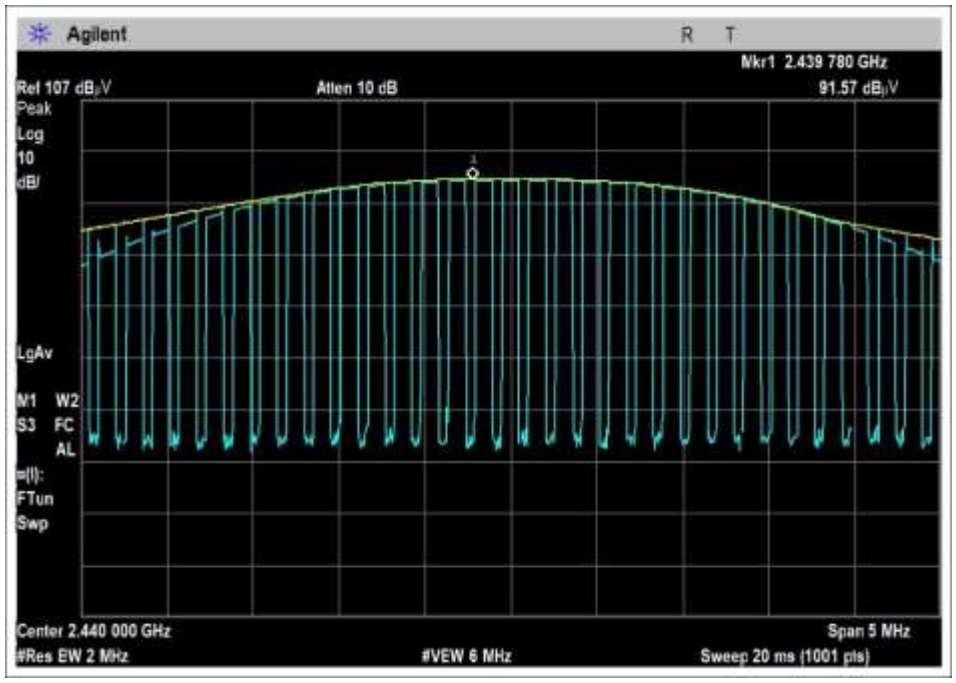
Or equivalently, in logarithmic form:

$$P(dBm) = E(dBuV/m) + 20LOG(d) - G\ - 104.77$$

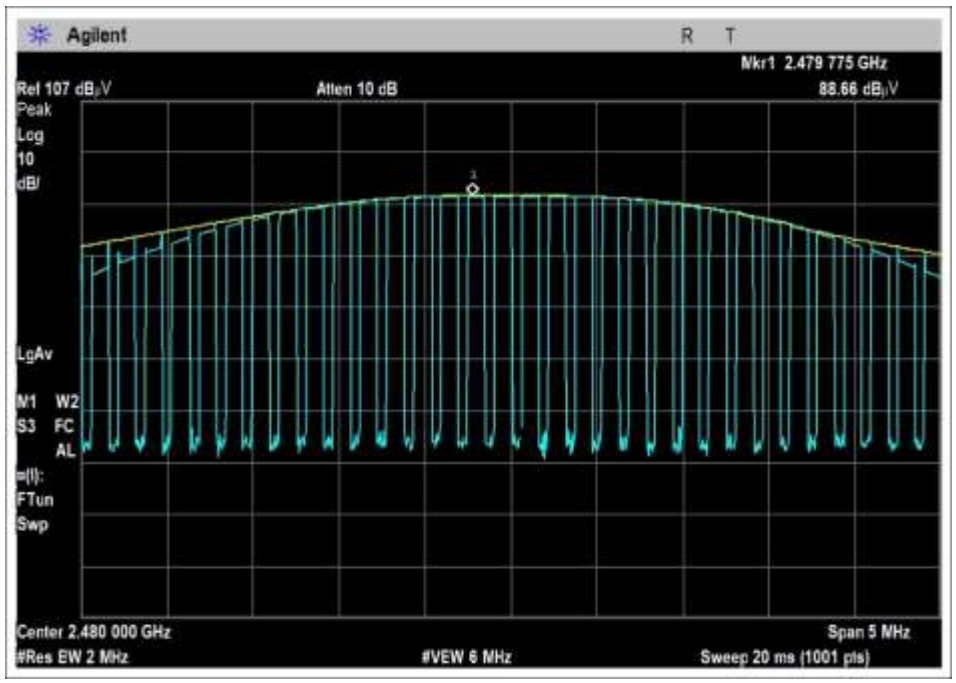
Plots



Low Channel



Middle Channel



High Channel

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC		
Customer:	**Philips Oral Healthcare, Inc.**		
Specification:	**15.247(b) Power Output (2400-2483.5 MHz DTS)**		
Work Order #:	**102029**	Date:	12/18/2018
Test Type:	**Maximized Emissions**	Time:	09:56:30
Tested By:	Matthew Harrison	Sequence#:	12
Software:	EMITest 5.03.11		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

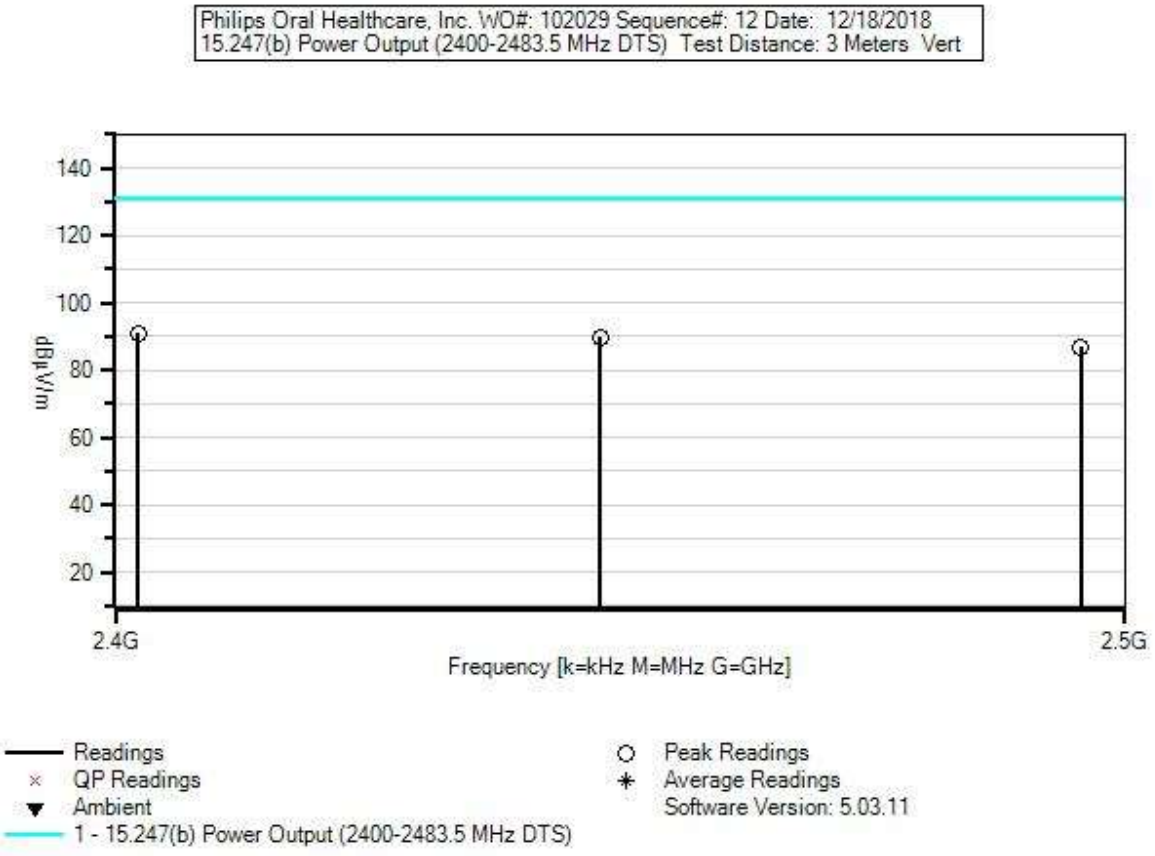
Frequency Range: Fundamental Power
Frequency tested: 2402, 2440, 2480MHz
Firmware power setting: Max Power
Software: UPCI V1.3.0
Protocol /MCS/Modulation: GFSK

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

Duty Cycle: Continuously Transmitting (100%)

Test Mode: Continuously transmitting on low, mid, and high channels
Test Setup: EUT is transmitting through integral antenna. EUT X, Y, Z axis investigated, horizontal and vertical antenna polarities (above 30MHz) + 3 orthogonal polarities (below 30MHz), only worst case reported.
Modifications Added: None
Plots are uncorrected/raw data
15.31(e) EUT has a fresh battery installed

Test Location: Bothell Lab C3
Test Method: ANSI C63.10 (2013)
Temperature (ºC): 21
Relative Humidity (%): 33



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03540	Preamp	83017A	5/2/2017	5/2/2019
T2	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/21/2017	7/21/2019
T3	ANP06503	Cable	32026-29801-29801-36	3/13/2018	3/13/2020
T4	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T5	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T6	AN02673	Spectrum Analyzer	E4446A	2/3/2017	2/3/2019

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

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	2401.840M	92.8	-34.0 +0.4	+28.1 +0.0	+1.0	+2.6	+0.0 360	90.9	131.2 X Axis	-40.3	Vert 169
2	2439.780M	91.6	-34.0 +0.4	+28.1 +0.0	+1.0	+2.6	+0.0 169	89.7	131.2 Y Axis	-41.5	Horiz 196
3	2479.775M	88.7	-34.0 +0.4	+28.1 +0.0	+1.0	+2.7	+0.0 45	86.9	131.2 Z Axis	-44.3	Horiz 179

Test Setup Photos

Above 1GHz, Cone placement

X Axis

Y Axis

Z Axis

15.247(e) Power Spectral Density

PSD Test Data Summary - Radiated Measurement						
Measurement Method: PKPSD						
Frequency (MHz)	**Modulation**	**Ant. Type / Gain (dBi)**	**Field Strength (dBuV/m @3m)**	**Calculated (dBm/3kHz)**	**Limit (dBm/3kHz)**	**Results**
2402	GFSK	Integral 0dBi	75.5	-19.7	≤8	Pass
2440	GFSK	Integral 0dBi	74.1	-21.1	≤8	Pass
2480	GFSK	Integral 0dBi	72.3	-22.9	≤8	Pass

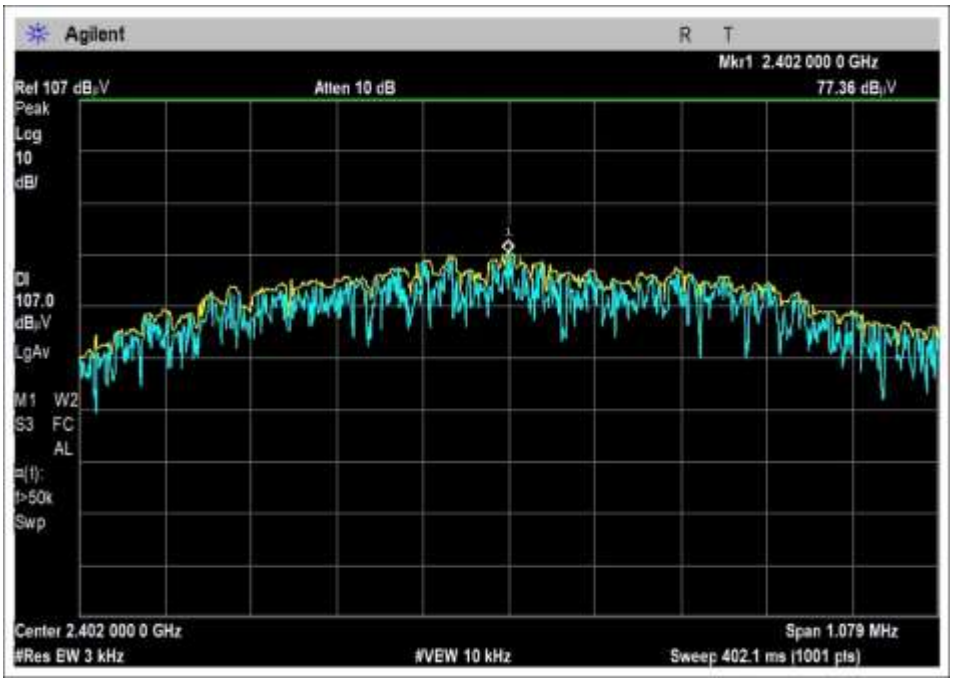
Conducted RF output power calculated in accordance with ANSI C63.10.

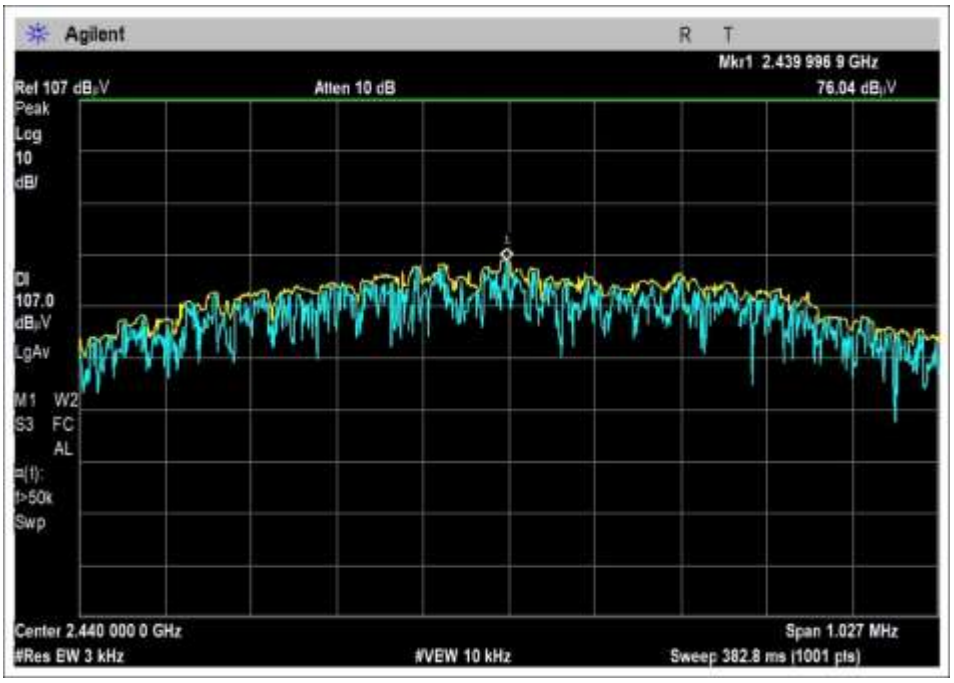
$$P(W) = \frac{(E \cdot d)^2}{30\ G}$$

Or equivalently, in logarithmic form:

$$P(dBm) = E(dBuV/m) + 20LOG(d) - G\ - 104.77$$

Plots





Middle Channel

High Channel

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC		
Customer:	**Philips Oral Healthcare, Inc.**		
Specification:	**15.247(e) Peak Power Spectral Density (2400-2483.5 MHz DTS)**		
Work Order #:	**102029**	Date:	12/18/2018
Test Type:	**Maximized Emissions**	Time:	10:35:35
Tested By:	Steven Pittsford	Sequence#:	12
Software:	EMITest 5.03.11		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

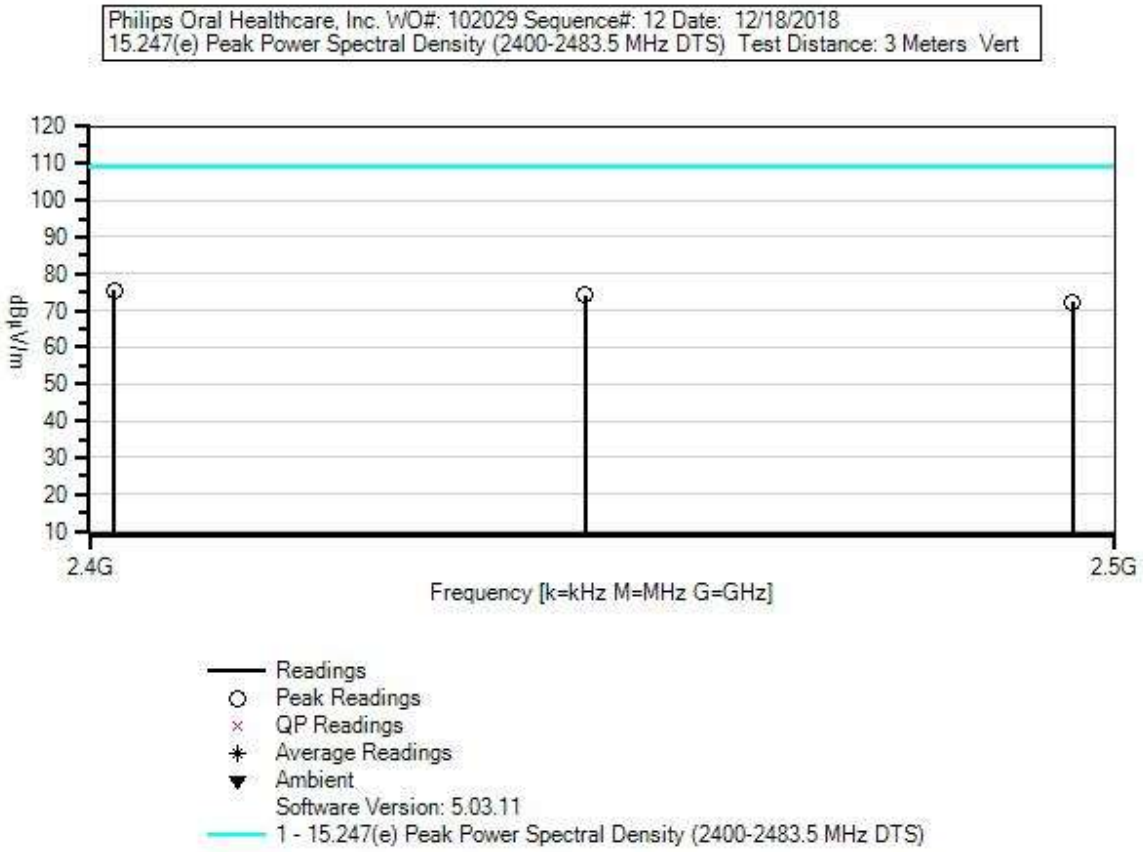
Frequency Range: Power Spectral Density (Radiated)
Frequency tested: 2402, 2440, 2480MHz
Firmware power setting: Max Power
Software: UPCI V1.3.0
Protocol /MCS/Modulation: GFSK

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

Duty Cycle: Continuously Transmitting (100%)

Test Mode: Continuously transmitting on low, mid, and high channels
Test Setup: EUT is transmitting through integral antenna. EUT X, Y, Z axis investigated, horizontal and vertical antenna polarities (above 30MHz) + 3 orthogonal polarities (below 30MHz), only worst case reported.
Modifications Added: None
Plots are uncorrected/raw data

Test Location: Bothell Lab C3
Test Method: ANSI C63.10 (2013)
Temperature (ºC): 21
Relative Humidity (%): 33



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03540	Preamp	83017A	5/2/2017	5/2/2019
T2	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/21/2017	7/21/2019
T3	ANP06503	Cable	32026-29801-29801-36	3/13/2018	3/13/2020
T4	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T5	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T6	AN02673	Spectrum Analyzer	E4446A	2/3/2017	2/3/2019

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

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	2402.000M	77.4	-34.0 +0.4	+28.1 +0.0	+1.0	+2.6	+0.0	75.5	109.2 X Axis	-33.7	Vert 195
2	2439.997M	76.0	-34.0 +0.4	+28.1 +0.0	+1.0	+2.6	+0.0 321	74.1	109.2 Y Axis	-35.1	Horiz 167
3	2479.983M	74.1	-34.0 +0.4	+28.1 +0.0	+1.0	+2.7	+0.0 44	72.3	109.2 Z Axis	-36.9	Horiz 180

Test Setup Photos

Above 1GHz, Cone placement

X Axis

Y Axis

Z Axis

15.247(d) Radiated Emissions & Band Edge

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC		
Customer:	**Philips Oral Healthcare, Inc.**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**102029**	Date:	12/19/2018
Test Type:	**Maximized Emissions**	Time:	09:11:34
Tested By:	Steven Pittsford / Matt Harrison	Sequence#:	10
Software:	EMITest 5.03.11		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 9kHz-25GHz
Frequency tested: 2402, 2440, 2480MHz
Firmware power setting: Max Power
Software: UPCI V1.3.0
Protocol /MCS/Modulation: GFSK

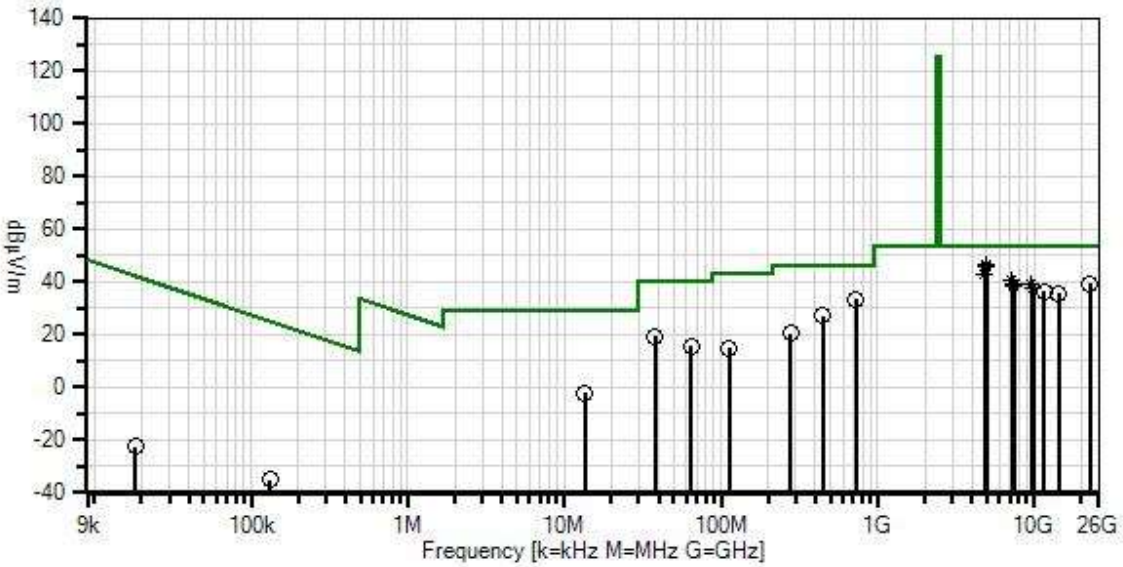
Antenna type: Integral Inverted F antenna
Antenna Gain: 0.0 dBi.

Duty Cycle: Continuously Transmitting (100%)

Test Mode: Continuously transmitting on low, mid, and high channels
Test Setup: EUT is transmitting through integral antenna. EUT X, Y, Z axis investigated, horizontal and vertical antenna polarities (above 30MHz) + 3 orthogonal polarities (below 30MHz), only worst case reported.
Modifications Added: None

Test Location: Bothell Lab C3
Test Method: ANSI C63.10 (2013), KDB 558074 V05 Aug 24th 2018
Temperature (ºC): 22
Relative Humidity (%): 30

Philips Oral Healthcare, Inc. WO#: 102029 Sequence#: 10 Date: 12/19/2018
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert



Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurious Emissions
Peak Readings
Average Readings
Software Version: 5.03.11

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03540	Preamp	83017A	5/2/2017	5/2/2019
T2	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/21/2017	7/21/2019
T3	ANP06503	Cable	32026-29801-29801-36	3/13/2018	3/13/2020
T4	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T5	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T6	AN02673	Spectrum Analyzer	E4446A	2/3/2017	2/3/2019
T7	AN03116	High Pass Filter	11SH10-00313	1/16/2017	1/16/2019
T8	AN02741	Active Horn Antenna	AMFW-5F-12001800-20-10P	3/30/2017	3/30/2019
T9	AN02742	Active Horn Antenna	AMFW-5F-18002650-20-10P	10/16/2018	10/16/2020
T10	AN02763-69	Waveguide	Multiple	4/23/2018	4/23/2020
T11	AN03122	Cable	32026-2-29801-36	3/13/2018	3/13/2020
T12	ANP06678	Cable	32026-29801-29801-144	3/13/2018	3/13/2020
T13	AN02307	Preamp	8447D	1/15/2018	1/15/2020
T14	AN03628	Biconilog Antenna	3142E	6/7/2017	6/7/2019
T15	ANP06123	Attenuator	18N-6	5/5/2017	5/5/2019
T16	ANP05305	Cable	ETSI-50T	10/24/2017	10/24/2019
T17	ANP05360	Cable	RG214	1/31/2018	1/31/2020
T18	AN00052	Loop Antenna	6502	5/7/2018	5/7/2020

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

#	Freq	Rdng	T1 T5 T9 T13 T17	T2 T6 T10 T14 T18	T3 T7 T11 T15	T4 T8 T12 T16	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	4960.350M	40.4	-33.2	+32.5	+1.6	+4.2	+0.0	47.0	54.0	-7.0	Vert
	Ave		+0.5	+0.0	+1.0	+0.0	360		X		204
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							
^	4960.350M	49.1	-33.2	+32.5	+1.6	+4.2	+0.0	55.7	54.0	+1.7	Vert
			+0.5	+0.0	+1.0	+0.0	-16		X		181
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							

3	4880.465M	39.4	-33.2	+32.4	+1.6	+4.2	+0.0	45.9		54.0	-8.1	Vert
	Ave		+0.5	+0.0	+1.0	+0.0	286		X			194
			+0.0	+0.0	+0.0	+0.0						
			+0.0	+0.0	+0.0	+0.0						
			+0.0	+0.0								
^	4880.465M	50.5	-33.2	+32.4	+1.6	+4.2	+0.0	57.0		54.0	+3.0	Vert
			+0.5	+0.0	+1.0	+0.0	299		X			194
			+0.0	+0.0	+0.0	+0.0						
			+0.0	+0.0	+0.0	+0.0						
			+0.0	+0.0								
5	4804.549M	37.0	-33.2	+32.3	+1.5	+4.1	+0.0	43.2		54.0	-10.8	Horiz
	Ave		+0.5	+0.0	+1.0	+0.0			Z			166
			+0.0	+0.0	+0.0	+0.0						
			+0.0	+0.0	+0.0	+0.0						
			+0.0	+0.0								
^	4804.541M	47.5	-33.2	+32.3	+1.5	+4.1	+0.0	53.7		54.0	-0.3	Horiz
			+0.5	+0.0	+1.0	+0.0			Z			168
			+0.0	+0.0	+0.0	+0.0						
			+0.0	+0.0	+0.0	+0.0						
			+0.0	+0.0								
7	724.500M	29.9	+0.0	+0.0	+0.0	+0.0	+0.0	33.5		46.0	-12.5	Vert
			+0.3	+0.0	+0.0	+0.0						200
			+0.0	+0.0	+0.0	+0.0						
			-28.0	+22.3	+5.9	+1.4						
			+1.7	+0.0								
8	7206.559M	29.4	-33.9	+36.2	+2.1	+5.3	+0.0	40.8		54.0	-13.2	Horiz
	Ave		+0.7	+0.0	+1.0	+0.0			X			117
			+0.0	+0.0	+0.0	+0.0						
			+0.0	+0.0	+0.0	+0.0						
			+0.0	+0.0								
^	7206.559M	42.8	-33.9	+36.2	+2.1	+5.3	+0.0	54.2		54.0	+0.2	Horiz
			+0.7	+0.0	+1.0	+0.0			X			123
			+0.0	+0.0	+0.0	+0.0						
			+0.0	+0.0	+0.0	+0.0						
			+0.0	+0.0								
10	7440.410M	27.5	-34.4	+36.8	+2.2	+5.5	+0.0	39.6		54.0	-14.4	Horiz
	Ave		+1.1	+0.0	+0.9	+0.0	109		Z			185
			+0.0	+0.0	+0.0	+0.0						
			+0.0	+0.0	+0.0	+0.0						
			+0.0	+0.0								
^	7440.410M	38.6	-34.4	+36.8	+2.2	+5.5	+0.0	50.7		54.0	-3.3	Horiz
			+1.1	+0.0	+0.9	+0.0			Z			204
			+0.0	+0.0	+0.0	+0.0						
			+0.0	+0.0	+0.0	+0.0						
			+0.0	+0.0								
12	22788.000 M	42.3	+0.0	+0.0	+0.0	+0.0	+0.0	39.5		54.0	-14.5	Vert
			+0.0	+0.0	+0.0	+0.0						
			-16.0	+1.7	+2.5	+9.0						154
			+0.0	+0.0	+0.0	+0.0						
			+0.0	+0.0								

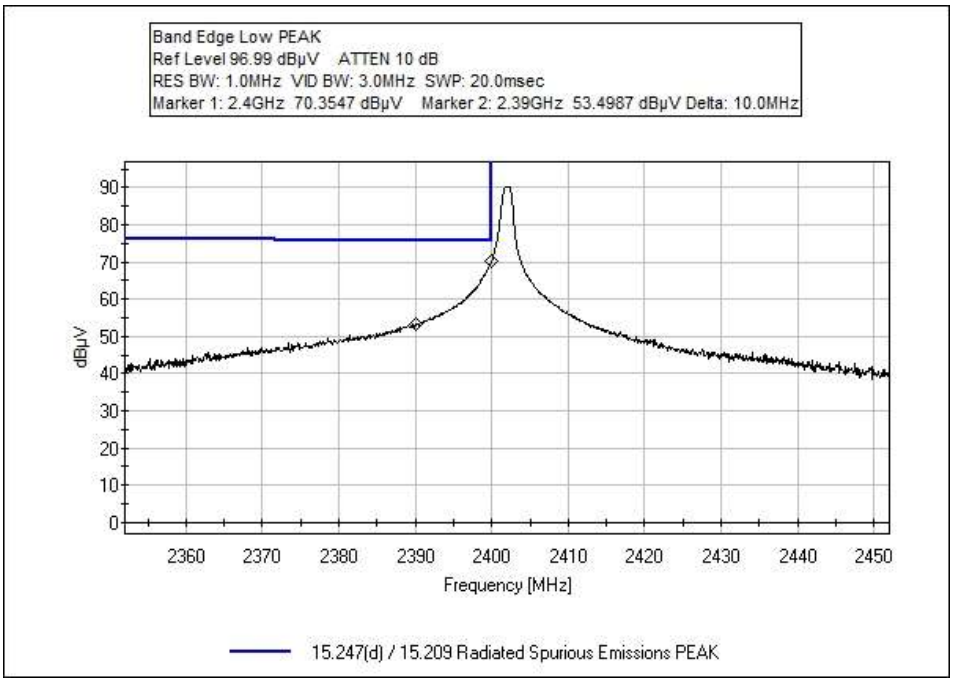
13	9608.895M Ave	24.5	-33.5 +0.7 +0.0 +0.0 +0.0	+37.5 +0.0 +0.0 +0.0 +0.0	+2.6 +0.9 +0.0 +0.0	+6.2 +0.0 +0.0 +0.0	+0.0 127	38.9	54.0	-15.1	Vert 123
^	9608.895M	39.1	-33.5 +0.7 +0.0 +0.0 +0.0	+37.5 +0.0 +0.0 +0.0 +0.0	+2.6 +0.9 +0.0 +0.0	+6.2 +0.0 +0.0 +0.0	+0.0 255	53.5	54.0	-0.5	Vert 123
15	7320.780M Ave	26.7	-34.1 +0.9 +0.0 +0.0 +0.0	+36.5 +0.0 +0.0 +0.0 +0.0	+2.1 +1.0 +0.0 +0.0	+5.4 +0.0 +0.0 +0.0	+0.0 360	38.5 X	54.0	-15.5	Horiz 168
^	7320.780M	41.9	-34.1 +0.9 +0.0 +0.0 +0.0	+36.5 +0.0 +0.0 +0.0 +0.0	+2.1 +1.0 +0.0 +0.0	+5.4 +0.0 +0.0 +0.0	+0.0 -15	53.7 X	54.0	-0.3	Horiz 153
17	9762.780M Ave	23.9	-33.6 +0.5 +0.0 +0.0 +0.0	+37.6 +0.0 +0.0 +0.0 +0.0	+2.6 +0.6 +0.0 +0.0	+6.3 +0.0 +0.0 +0.0	+0.0 -16	37.9	54.0	-16.1	Vert 168
^	9762.780M	35.1	-33.6 +0.5 +0.0 +0.0 +0.0	+37.6 +0.0 +0.0 +0.0 +0.0	+2.6 +0.6 +0.0 +0.0	+6.3 +0.0 +0.0 +0.0	+0.0 -16	49.1	54.0	-4.9	Vert 168
19	9919.120M Ave	23.5	-33.7 +0.4 +0.0 +0.0 +0.0	+37.7 +0.0 +0.0 +0.0 +0.0	+2.6 +0.8 +0.0 +0.0	+6.3 +0.0 +0.0 +0.0	+0.0	37.6	54.0	-16.4	Vert 180
^	9919.120M	37.3	-33.7 +0.4 +0.0 +0.0 +0.0	+37.7 +0.0 +0.0 +0.0 +0.0	+2.6 +0.8 +0.0 +0.0	+6.3 +0.0 +0.0 +0.0	+0.0 267	51.4	54.0	-2.6	Vert 180
21	11624.000 M	41.6	+0.0 +1.1 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0	+6.7 -13.0 +0.0 +0.0	+0.0	36.4	54.0	-17.6	Vert 154
22	14280.000 M	41.8	+0.0 +0.8 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0	+7.9 -14.6 +0.0 +0.0	+0.0	35.9	54.0	-18.1	Vert 154

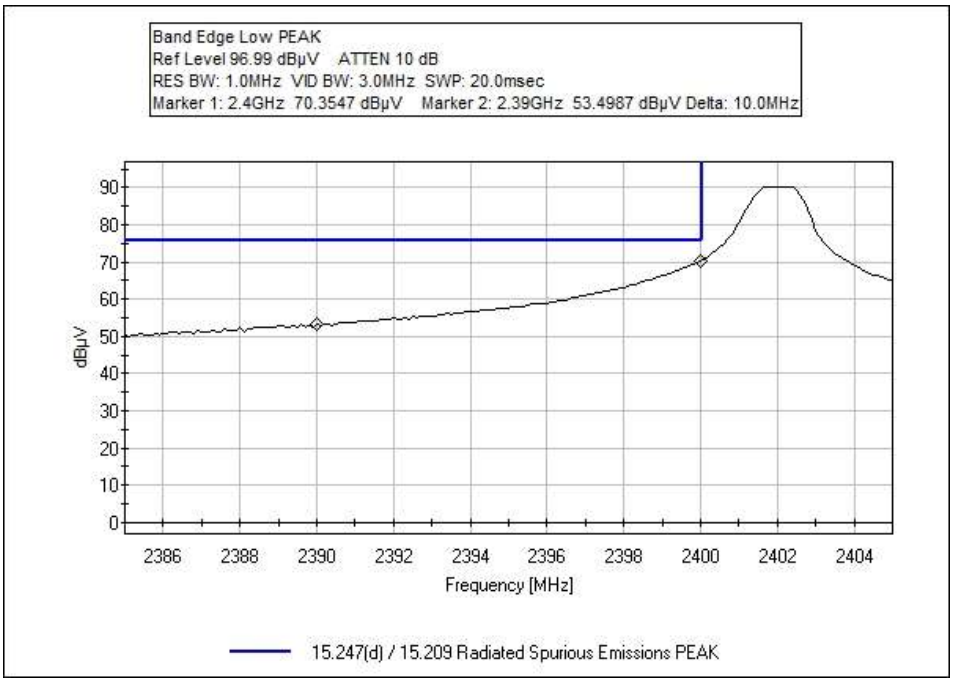
23	446.100M	29.3	+0.0 +0.2 +0.0 -27.9 +1.3	+0.0 +0.0 +0.0 +17.2 +0.0	+0.0 +0.0 +0.0 +5.9	+0.0 +0.0 +0.0 +1.1	+0.0	27.1	46.0	-18.9	Vert 200
24	37.900M	29.0	+0.0 +0.1 +0.0 -27.9 +0.3	+0.0 +0.0 +0.0 +11.6 +0.0	+0.0 +0.0 +0.0 +5.9	+0.0 +0.0 +0.0 +0.3	+0.0	19.3	40.0	-20.7	Vert 200
25	64.900M	30.1	+0.0 +0.1 +0.0 -27.9 +0.4	+0.0 +0.0 +0.0 +6.9 +0.0	+0.0 +0.0 +0.0 +5.9	+0.0 +0.0 +0.0 +0.4	+0.0	15.9	40.0	-24.1	Vert 200
26	279.300M	26.9	+0.0 +0.2 +0.0 -27.0 +1.0	+0.0 +0.0 +0.0 +12.6 +0.0	+0.0 +0.0 +0.0 +5.9	+0.0 +0.0 +0.0 +0.8	+0.0	20.4	46.0	-25.6	Vert 200
27	112.600M	27.6	+0.0 +0.1 +0.0 -27.7 +0.6	+0.0 +0.0 +0.0 +7.9 +0.0	+0.0 +0.0 +0.0 +5.9	+0.0 +0.0 +0.0 +0.5	+0.0	14.9	43.5	-28.6	Vert 200
28	13.553M	28.8	+0.0 +0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0 +9.1	+0.0 +0.0 +0.0 +0.0	+0.2 +0.0 +0.0 +0.0	-40.0	-1.9	29.5	-31.4	Perp 100
29	131.952k	35.3	+0.0 +0.0 +0.0 +0.0 +0.0	+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	-80.0 360	-35.1	25.2	-60.3	Perp 99
30	18.165k	45.3	+0.0 +0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0 +12.2	+0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0	-80.0 360	-22.5	42.4	-64.9	Perp 99

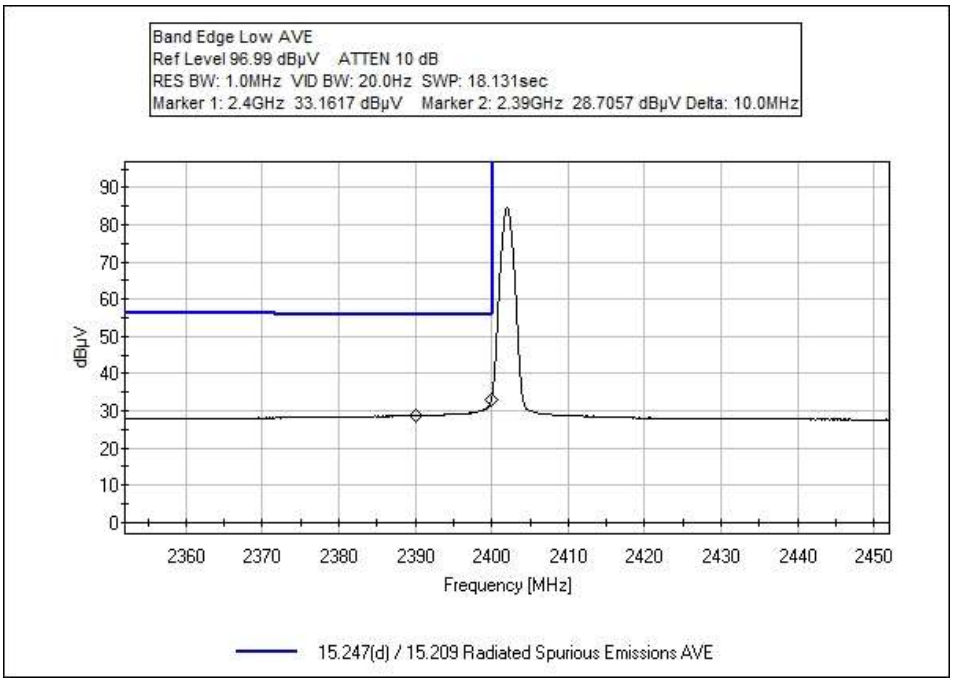
Band Edge

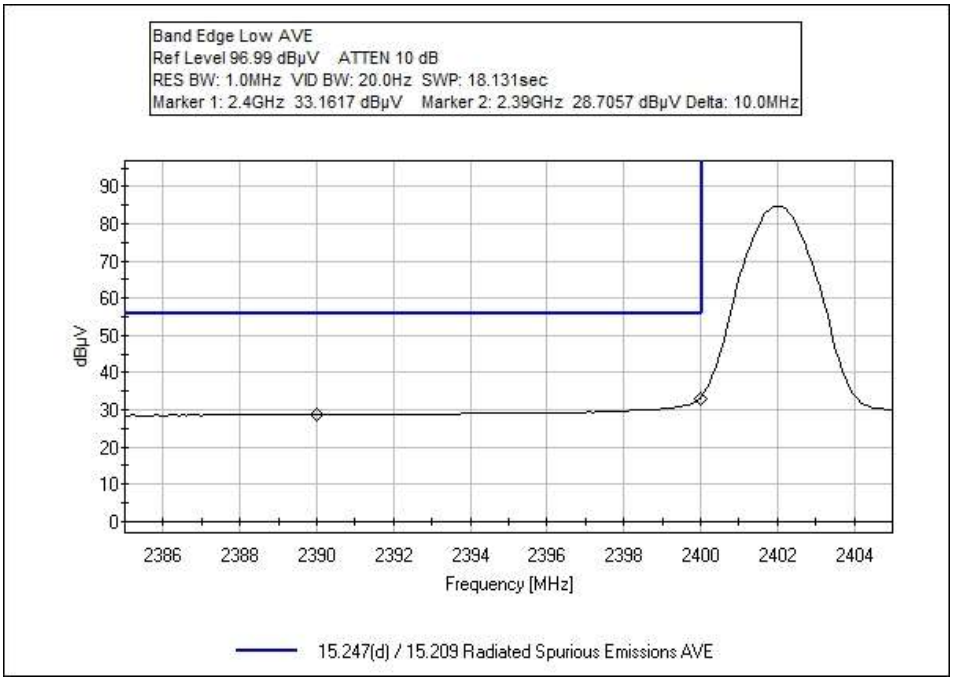
Band Edge Summary					
Frequency (MHz)	**Modulation**	**Ant. Type**	**Field Strength (dBuV/m @3m)**	**Limit (dBuV/m @3m)**	**Results**
2390.0	GFSK	Integral	26.8 (AVE)	<54 (AVE)	Pass
2390.0	GFSK	Integral	51.6 (PEAK)	<74 (PEAK)	Pass
2400.0	GFSK	Integral	31.3 (AVE)	<54 (AVE)	Pass
2400.0	GFSK	Integral	68.5 (PEAK)	<74 (PEAK)	Pass
2483.5	GFSK	Integral	27.6 (AVE)	<54 (AVE)	Pass
2483.5	GFSK	Integral	60.2 (PEAK)	<74 (PEAK)	Pass

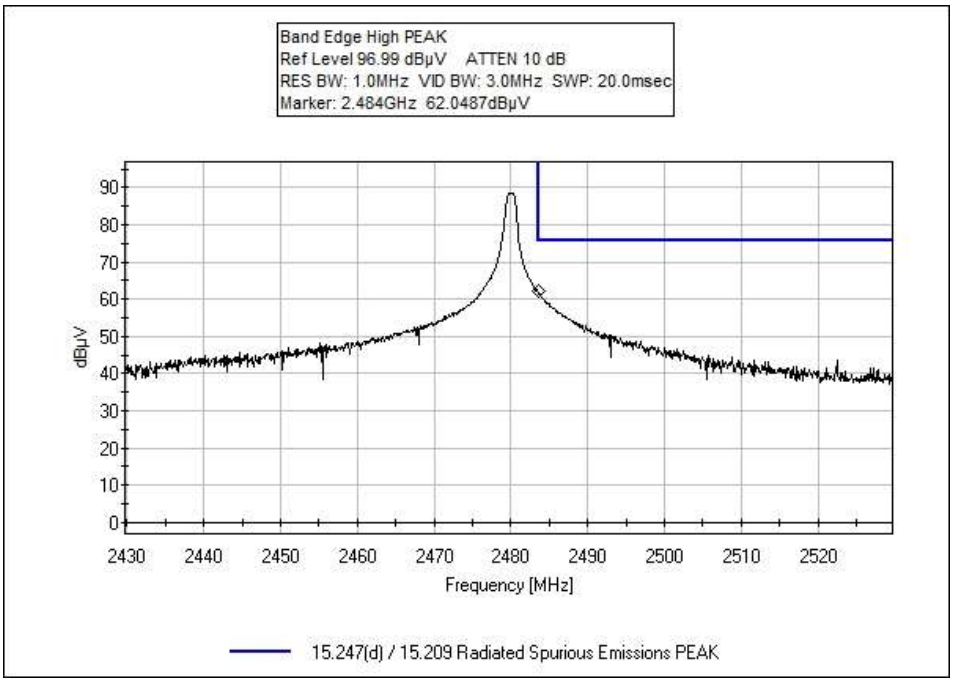
Band Edge Plots

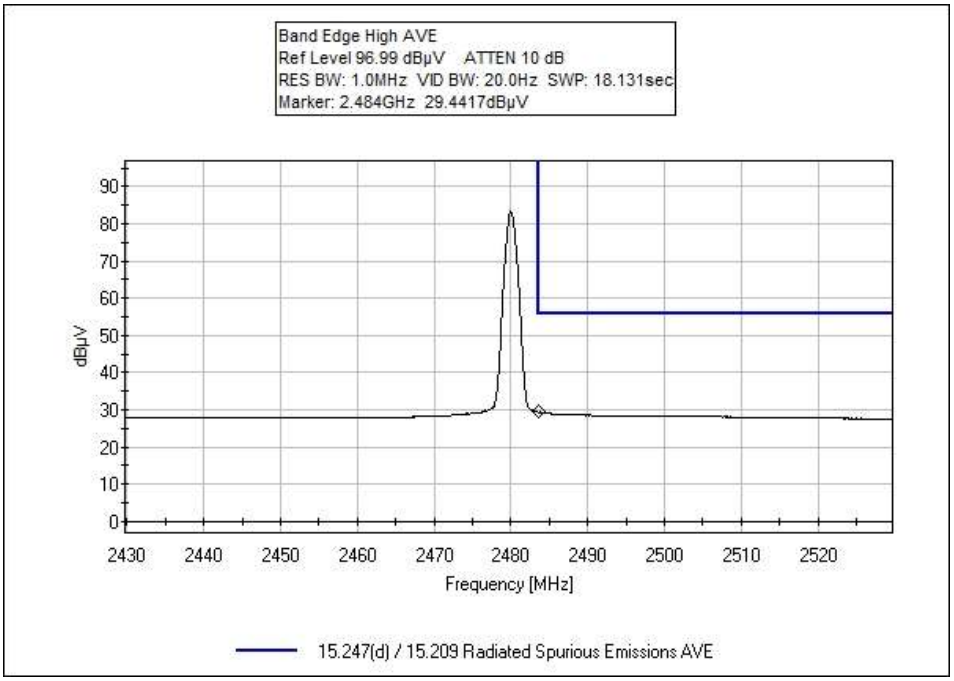





Band Edge Low AVE
Ref Level 96.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 20.0Hz SWP: 18.131sec
Marker 1: 2.4GHz 33.1617 dBµV Marker 2: 2.39GHz 28.7057 dBµV Delta: 10.0MHz
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions AVE


Band Edge Low AVE
Ref Level 96.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 20.0Hz SWP: 18.131sec
Marker 1: 2.4GHz 33.1617 dBµV Marker 2: 2.39GHz 28.7057 dBµV Delta: 10.0MHz
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions AVE


Band Edge High PEAK
Ref Level 96.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker: 2.484GHz 62.0487dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
2430
2440
2450
2460
2470
2480
2490
2500
2510
2520
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions PEAK


Band Edge High AVE
Ref Level 96.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 20.0Hz SWP: 18.131sec
Marker: 2.484GHz 29.4417dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
2430
2440
2450
2460
2470
2480
2490
2500
2510
2520
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions AVE

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC		
Customer:	**Philips Oral Healthcare, Inc.**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions PEAK**		
Work Order #:	**102029**	Date:	12/15/2018
Test Type:	**Maximized Emissions**	Time:	10:43:01
Tested By:	Steven Pittsford	Sequence#:	11
Software:	EMITest 5.03.11		

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: 2402, 2480MHz
Firmware power setting: Max Power
Software: UPCI V1.3.0
Protocol /MCS/Modulation: GFSK

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

Duty Cycle: Continuously Transmitting (100%)

Test Mode: Continuously transmitting on low, mid, and high channels
Test Setup: EUT is transmitting through integral antenna. EUT X, Y, Z axis investigated, horizontal and vertical antenna polarities (above 30MHz) + 3 orthogonal polarities (below 30MHz), only worst case reported.
Modifications Added: None
Limit line corrected for transducers in plots

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03540	Preamp	83017A	5/2/2017	5/2/2019
T2	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/21/2017	7/21/2019
T3	ANP06503	Cable	32026-29801-29801-36	3/13/2018	3/13/2020
T4	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T5	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T6	AN02673	Spectrum Analyzer	E4446A	2/3/2017	2/3/2019

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

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	2400.000M	33.2	-34.0	+28.1	+1.0	+2.6	+0.0	31.3	54.0	-22.7	Vert
	Ave		+0.4	+0.0			11				185
^	2400.000M	70.4	-34.0	+28.1	+1.0	+2.6	+0.0	68.5	74.0	-5.5	Vert
			+0.4	+0.0			11				185
3	2483.500M	29.4	-34.0	+28.1	+1.0	+2.7	+0.0	27.6	54.0	-26.4	Vert
	Ave		+0.4	+0.0			11				193
^	2483.500M	62.0	-34.0	+28.1	+1.0	+2.7	+0.0	60.2	74.0	-13.8	Vert
			+0.4	+0.0			11				193
5	2390.000M	28.7	-34.0	+28.1	+1.0	+2.6	+0.0	26.8	54.0	-27.2	Vert
	Ave		+0.4	+0.0			11				185
^	2390.000M	53.5	-34.0	+28.1	+1.0	+2.6	+0.0	51.6	74.0	-22.4	Vert
			+0.4	+0.0			11				185

Test Setup Photos

Below 1GHz

Above 1GHz, Cone placement

X Axis

Y Axis

Z Axis

Appendix A: Manufacturer Declaration

The following device and model has been tested by CKC Laboratories:
Rechargeable Power Toothbrush with BLE, HX960U

Since the time of testing, the manufacturer has chosen to use the following device and model name in its place:
Rechargeable Power Toothbrush with BLE and NFC 13.56, HX96

The manufacturer declares that the following additional models are identical electrically or any differences between them do not affect their EMC characteristics, and therefore meets the level of testing equivalent to the tested model.
HX960Y, HX961Y, HX962Y, with "Y" representing the color of the handle.

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

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

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

Emissions Test Details

TESTING PARAMETERS

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

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

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

CORRECTION FACTORS

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

SAMPLE CALCULATIONS		
	Meter reading	(dBµV)
+	Antenna Factor	(dB/m)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

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

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

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

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

Peak

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

Quasi-Peak

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

Average

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