

TEST REPORT

Report Number: 105807090MPK-001 Project Number: G105807090 Report Issue Date: June 24, 2024 Report Revision Date: July 26, 2024

Testing performed on the Rechargeable Electric Toothbrush Handle Model: Sydney (HXBTMEB3)

> FCC ID: 2ADZNHX68Y IC: 20109-HX68Y

> > to

FCC Part 15 Subpart C (15.225) ISED RSS-210 Issue 10

for

Philips Oral Healthcare LLC

Test Performed by: Intertek 1365 Adams Court Menlo Park, CA 94025 USA

Kinneth Roque

Reviewed by:

Anderson Soungpanya

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Test Authorized by: Philips Oral Healthcare LLC 22100 Bothell Everett Highway Bothell, WA 98021 USA

Date: June 24, 2024

Date: June 24, 2024

Prepared by: Kenneth Roque



Report No. 105807090MPK-001			
Equipment Under Test:	Rechargeable Electric Toothbrush Handle		
Model Number:	Sydney (HXBTMEB3)		
Applicant:	Philips Oral Healthcare LLC		
Contact:	Dylan Rabena		
Address:	Philips Oral Healthcare LLC 22100 Bothell Everett Highway Bothell, WA 98021		
Country:	USA		
Tel. Number:	1 (425) 487-7000		
Email:	dylan.rabena@philips.com		
Applicable Regulation:	FCC Part 15 Subpart C (15.225) ISED RSS-210 Issue 10		
Date of Test:	May 13, 2024 – May 15, 2024, May 20, 2024 – May 21, 2024		

We attest to the accuracy of this report:

Kinneth Roque

Kenneth Roque EMC Project Engineer

Anderson Soungpanya EMC Team Leader

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1.0 Summary of Tests

TEST	REFERENCE FCC 15.225	REFERENCE RSS-210	RESULTS
Field Strength of Fundamental	15.225(a)	В.6	Complies
Radiated Emissions Outside the band	15.225(b), 15.225(c), 15.225(d), 15.209	B.6	Complies
Frequency Tolerance of the Carrier	15.225(e)	В.6	Complies
Line Conducted Emissions	15.207	RSS-GEN	Not Applicable – RFID is disabled while charging
Occupied Bandwidth	15.215	RSS-GEN	Complies
Antenna requirement	15.203	RSS-GEN	Complies ¹

¹ The EUT utilizes an internal Antenna.



2.0 **General Description**

Product Description 2.1

Philips Oral Healthcare LLC supplied the following description of the EUT:

The Philips Sonicare Toothbrush, Model: Sydney (HXBTMEB3) is a rechargeable toothbrush that is inductively charged. The toothbrush tracks brush head usage through RFID.

Applicant Name & Address	Philips Oral Healthcare LLC 22100 Bothell Everett Highway Bothell, WA 98021 USA	
Contact info / Email	Dylan Rabena / dylan.rabena@philips.com	
Model	Sydney (HXBTMEB3)	
FCC Identifier	2ADZNHX68Y	
IC Identifier	20109-HX68Y	
Operating Frequency	13.56 MHz	
Number of Channels	1	
Type of Modulation	ASK Modulation	
Antenna Type	Internal Antenna	

Overview of the EUT

EUT receive date:	May 13, 2024
EUT receive condition:	The pre-production version of the EUT was received in good condition with no apparent damage. As declared by the Applicant, it is identical to the production units.
Test start date:	May 13, 2024
Test completion date:	May 21, 2024



2.2 Related Submittal(s) Grants

None

2.3 Test Methodology

Radiated tests were performed at an antenna to EUT distance of 10 meters, unless stated otherwise in this test report. All other measurements were made in accordance with the procedures in part 2 of CFR 47 7, ANSI C63.10: 2013, RSS-210 Issue 10 & RSS-GEN Issue 5.

2.4 **Test Facility**

The radiated emission test site and conducted measurement facility used to collect the data is 10m semi-anechoic chamber located in Menlo Park, California. This test facility and site measurement data have been fully placed on file with the FCC and Industry Canada (Site # 2042L-1).

2.5 Measurement Uncertainty

Compliance with the limits was based on the results of the measurements and doesn't take into account the measurement uncertainty.

Estimated Measurement Uncertainty				
Measurement	Expanded Uncertainty (k=2)			
	0.15 MHz – 1 GHz	1 GHz – 2.5 GHz	> 2.5 GHz	
RF Power and Power Density – antenna conducted	-	0.7 dB	-	
Unwanted emissions - antenna conducted	1.1 dB	1.3 dB	1.9 dB	
Bandwidth – antenna conducted	-	30 Hz	-	

Measurement	Expanded Uncertainty (k=2)		
	0.15 MHz – 30MHz 30 MHz – 1 GHz 1		1 GHz – 18 GHz
Radiated emissions	-	4.7	5.1 dB
AC mains conducted emissions	2.1 dB	-	-



3.0 System Test Configuration

3.1 Support Equipment

Support Equipment				
Description Manufacturer Model				
Brush Head	Philips Oral Healthcare LLC	C3		

Equipment Under Test				
Description	Serial Number			
Rechargeable Electric	Philips Oral	Sydney	Sudnov 4.0 ST. NEC ENAC 001	
Toothbrush Handle	Healthcare LLC	(HXBTMEB3)	Sydney 4.0 ST_NFC EMIC-001	

The EUT is powered by 3.8 VDC (internal battery).

3.2 Block Diagram of Test Setup

The diagram shown below details the interconnection of the EUT and support equipment. For specific layout, refer to the test configuration photograph in the relevant section of this report.



S = Shielded	F = With Ferrite
U = Unshielded	m = Length in Meters



3.3 Justification

For radiated emission measurements the EUT is placed on a non-conductive table. The EUT was configured to continuously transmit.

3.4 Software Exercise Program

None

3.5 Mode of Operation during test

The Rechargeable Electric Toothbrush Handle was set up to continuously transmitting at 13.56MHz.

3.6 Modifications required for Compliance

No modifications were made by the manufacturer to bring the EUT into compliance.

3.7 Additions, deviations and exclusions from standards

No additions, deviations or exclusion have been made from standard.



4.0 **Measurement Results**

- 4.1 Field Strength of Fundamental and Radiated Emissions Outside the band
- 4.1.1 Requirements

FCC Rules 15.225

- a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter (84 dBuV) at 30 meters.
- b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
- d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

§15.209 Radiated emission limits; general requirements.



4.1.2 Procedure

Radiated Measurements Below 30 MHz

During the test the EUT is rotated and the measuring antenna angles are varied during the search for maximum signal level.

Radiated emissions are taken at ten meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Measurements for below 30 MHz were made at 10 meters. Data results below are corrected for distance back to 30 meters.

Radiated Measurements Above 30 MHz

During the test the EUT is rotated and the measuring antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at ten meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Measurements for above 30 MHz were made at 10 meters.

Radiated emission measurements were performed from 9kHz to 1 GHz. Analyzer resolution is:

200Hz or greater for 9kHz to 150kHz 9 kHz or greater for 150kHz to 30 MHz 120 kHz or greater for 30MHz to 1000 MHz For those frequencies quasi-peak detector applies

Data includes of the worst-case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation is as follows:

FS = RA + AF + CF - AG - DCF

Where FS = Field Strength in dB (μ V/m)

RA = Receiver Amplitude (including preamplifier) in dB (μ V) CF = Cable Attenuation Factor in dB AF = Antenna Factor in dB (1/m)AG = Amplifier Gain in dB DCF = Distance Correction Factor

Note: FS was measured with loop antenna below 30MHz



4.1.3 Test Result 15.225 (a) (b) (c) (d) and 15.209



Radiated Spurious Emissions from 9 kHz to 30MHz, EUT Upright (X-Axis)

Receiving Antenna Coaxial Orientation FCC Part 15C/FCC 15.209, 9kHz - 30MHz at 10m - QPeak/10.0m/



Model: ; Client: ; Comments: ; Test Date: 05/13/2024 16:28





Receiving Antenna Horizontal Orientation





Frequency	Peak FS@10m	Limit@10m	Margin	Delerity	Correction
(MHz)	dB(uV/m)	dB(uV/m)	dB	Polarity	dB
13.56	24.24	103.1	-78.86	Coaxial	2.15

Note: Correction = AF+CF-AG- distance correction factor

Distance correction factor=40*log10(limit distance/measured distance)





Radiated Spurious Emissions from 30 to 1000 MHz

Freq	Peak FS @10m	Limit @10m	Margin	Height	Azimuth	Polarity	Correction
(MHz)	dB(uV/m)	dB(uV/m)	(dB)	(m)	(Deg)		(dB)
778.743	30.31	35.50	-5.19	2.00	207.50	Vertical	-3.00
583.062	29.27	35.50	-6.23	3.00	32.50	Vertical	-6.50
610.189	28.73	35.50	-6.77	2.00	329.00	Vertical	-6.16
664.445	28.71	35.50	-6.79	2.00	240.00	Vertical	-5.01
637.317	28.64	35.50	-6.86	3.00	212.75	Vertical	-5.28
691.572	27.27	35.50	-8.23	2.00	256.00	Vertical	-4.57

Note: Correction = AF + CF – AG



Radiated Spurious Emissions from 1 to 18 GHz, Peak Scan vs Avg and Peak Limits



Model: ; Client: ; Comments: ; Test Date: 05/15/2024 14:36



Radiated Spurious Emissions from 9 kHz to 30MHz, EUT Flat on Back (Y-Axis)



Receiving Antenna Coplanar Orientation

Receiving Antenna Coaxial Orientation



Model: ; Client: ; Comments: ; Test Date: 05/14/2024 15:17





Receiving Antenna Horizontal Orientation



FCC Part 15C/FCC Part 15.225, 9kHz - 30MHz at 10m - QPeak/10.0m/ Peak (Horizontal)



Model: ; Client: ; Comments: ; Test Date: 05/14/2024 15:17

Frequency	Peak FS@10m	Limit@10m	Margin	Polority	Correction
(MHz)	dB(uV/m)	dB(uV/m)	dB	Polarity	dB
13.56	23.21	103.1	-79.89	Coplanar	2.15

Note: Correction = AF+CF-AG- distance correction factor

Distance correction factor=40*log10(limit distance/measured distance)





Radiated Spurious Emissions from 30 to 1000 MHz

Freq	Peak FS @10m	Limit @10m	Margin	Height	Azimuth	Polarity	Correction
(MHz)	dB(uV/m)	dB(uV/m)	(dB)	(m)	(Deg)	, orally	(dB)
610.189	29.19	35.50	-6.31	1.00	295.00	Horizontal	-6.16
583.062	28.50	35.50	-7.00	1.00	279.75	Horizontal	-6.50
637.317	28.41	35.50	-7.09	1.00	295.00	Horizontal	-5.28
745.795	27.87	35.50	-7.63	1.00	92.75	Horizontal	-4.09
827.146	27.82	35.50	-7.68	1.00	118.75	Horizontal	-2.20
800.051	27.56	35.50	-7.94	1.00	109.75	Horizontal	-2.69

Note: Correction = AF + CF – AG



Radiated Spurious Emissions from 1 to 18 GHz, Peak Scan vs Avg and Peak Limits



Model: ; Client: ; Comments: ; Test Date: 05/15/2024 14:48



Radiated Spurious Emissions from 9 kHz to 30MHz, EUT Flat on Side (Z-Axis)



Receiving Antenna Coplanar Orientation











Receiving Antenna Horizontal Orientation



FCC Part 15C/FCC Part 15.225, 9kHz - 30MHz at 10m - QPeak/10.0m/ Peak (Horizontal)



Frequency	Peak FS@10m	Limit@10m	Margin	Delerity	Correction
(MHz)	dB(uV/m)	dB(uV/m)	dB	Polarity	dB
13.56	23.07	103.1	-80.03	Coplanar	2.15

Note: Correction = AF+CF–AG- distance correction factor

Distance correction factor=40*log10(limit distance/measured distance)





Radiated Spurious Emissions from 30 to 1000 MHz

Freq (MHz)	Peak FS @10m dB(uV/m)	Limit @10m dB(uV/m)	Margin (dB)	Height (m)	Azimuth (Deg)	Polarity	Correction (dB)
637 317	28.19	35.50	-7 31	1.00	37.25	Horizontal	-5.28
037.317	20.19	33.30	-7.51	1.00	51.25	TIONZONIA	-5.20
610.189	27.90	35.50	-7.60	1.00	2.75	Horizontal	-6.16
583.094	27.87	35.50	-7.63	1.00	19.75	Horizontal	-6.50
31.390	21.18	29.50	-8.32	1.00	317.25	Vertical	-7.27
31.164	21.14	29.50	-8.36	2.00	227.75	Horizontal	-7.10
800.051	27.07	35.50	-8.43	1.00	34.75	Horizontal	-2.69

Note: Correction = AF + CF – AG



Radiated Spurious Emissions from 1 to 18 GHz, Peak Scan vs Avg and Peak Limits



Result Complies by 5.19 dB



4.2 Frequency Tolerance

4.2.1 Requirement FCC 15.225 (e)

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

4.2.2 Procedure

The EUT was placed in the temperature chamber. The frequency counter was connected to the transmitter output. For each temperature, the carrier frequency was recorded with the battery fully charged.



4.2.3 Test Results 15.225 (e)

Nominal Frequency: 13560000 Hz

Voltage (DC)	Temperature (C)	Measured Frequency (Hz)	Deviation from Reference (Hz)	Deviation (%)
Fully charged Battery	-20	13559775.64	-224.359	-0.002
Fully charged Battery	-10	13559807.69	-192.308	-0.001
Fully charged Battery	0	13559839.74	-160.256	-0.001
Fully charged Battery	10	13559839.74	-160.256	-0.001
Fully charged Battery	20	13559839.74	-160.256	-0.001
Fully charged Battery	30	13559839.74	-160.256	-0.001
Fully charged Battery	40	13559839.74	-160.256	-0.001
Fully charged Battery	50	13559839.74	-160.256	-0.001



4.3 Occupied Bandwidth

FCC 15.215

4.3.1 Requirements

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage.

4.3.2 Procedure

The EUT was setup to transmit in normal operating condition.

Measurements were made with the loop antenna in close proximity of the EUT. Following the procedures of ANSI 63.10: 2013, the 20dB bandwidth measurements were taken. The following plots show Occupied Bandwidth.



4.3.3 Test Results

Frequency	-20 dB Channel Bandwidth	99% Channel Bandwidth
(MHz)	(kHz)	(kHz)
13.56	435.897	581.731



-20dB & 99% Channel Bandwidth Plot

Date: 6.JUN.2024 14:26:51

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5.0 List of test equipment

Measurement equipment used for emission compliance testing utilized the equipment on the following list:

Equipment	Manufacturer	Model/Type	Asset #	Cal Int	Cal Due
EMI Receiver	Rohde and Schwarz	ESU40	ITS 00961	12	04/26/25
Loop Antenna	EMCO	6512	ITS 01573	12	11/30/24
Active Horn Antenna	ETS-Lindgren	3117-PA	ITS 1325	12	11/26/24
Notch Filter	Micro-Tronics	BRC50702	ITS 01166	12	06/13/24
BI-Log Antenna	SunAR RF Motion	JB1	ITS 01577	12	02/28/25
Pre-Amplifier	Sonoma Instrument	310N	ITS 00942	12	04/20/25
Spectrum Analyzer	Rohde and Schwarz	FSU	ITS 00913	12	06/16/24
Loop Sensor	Solar Electronics	7334-1	ITS 01608	12	11/21/24
Temperature Test Chamber	ESPEC	BTX-475	ITS 01436	12	10/23/24

Software used for emission compliance testing utilized the following:

Name	Manufacturer	Version	Template/Profile
BAT-EMC	Nexio	3.20.0.23	Philips – 05-13-24.bpp



6.0 **Document History**

Revision/ Job Number	Writer Initials	Reviewer Initials	Date	Change
1.0 / G105807090	KRQ	AS	June 24, 2024	Original document
2.0 / G105807090	KRQ	AS	July 26, 2024	Fixed FCC and IC ID typo.