

Philips Oral Healthcare LLC

RF Exposure Exemption Report

SCOPE OF WORK

RF Exposure Exemption Evaluation – Rechargeable Electric Toothbrush Handle, Model: Cairo (HX742A)

REPORT NUMBER

105786504MPK-053

ISSUE DATE

April 29, 2025

REVISED DATE

N/A

PAGES

15

DOCUMENT CONTROL NUMBER

Non-Specific Radio Report Shell Rev. December 2017
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RF Exposure Exemption Evaluation Report

Report Number: 105786504MPK-053

Project Number: G105786504

Report Issue Date: April 29, 2025

Product Designation: Rechargeable Electric Toothbrush Handle
Model: Cairo (HX742A)

Standards: 47CFR 1.1307(b)(3)
RSS-102 Issue 6

for

Philips Oral Healthcare LLC

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Table of Contents

<i>Philips Oral Healthcare LLC</i>	1
1 <i>Introduction and Conclusion</i>	4
2 <i>Evaluation Summary</i>	4
3 <i>Client Information</i>	4
4 <i>Description of Equipment Under Test and Variant Models</i>	5
5 <i>RF Exposure Exemption Evaluation (FCC)</i>	7
6 <i>RF Exposure Exemption Evaluation (ISED)</i>	10
7 <i>Revision History</i>	15

1 Introduction and Conclusion

The evaluation indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining sections are the verbatim text from the actual evaluation during the investigation. These sections include the evaluation name, the specified Method, and Results. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product evaluated **complies** with the requirements of the standard(s) indicated. The results obtained in this report pertain only to the item(s) evaluated. Intertek does not make any claims of compliance for samples or variants which were not evaluated.

2 Evaluation Summary

Section	Test full name	Result
3	Client Information	-
4	Description of Equipment Under Evaluation and Variant Models	-
5	FCC SAR Test Exclusion	Compliant
6	ISED Canada SAR Test Exclusion	Compliant
7	Revision History	-

3 Client Information

This EUT was evaluated at the request of:

Client: Philips Oral Healthcare LLC
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4 Description of Equipment Under Test and Variant Models**4.1 Description of Equipment Under Test (provided by client)**

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

The Philips HX742A is a rechargeable electric toothbrush that is inductively charged. Bluetooth connectivity allows the toothbrush to be connected to an app which provides real-time guidance on pressure, motion, position, duration and frequency of brushing. The toothbrush also tracks the brush head usage through RFID to alert the user when the heads need to be replaced.

4.2 Variant Models

The following variant models have been identified by the manufacturer as being electrically identical models, depopulated models, or with reasonable similarity to the model(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

Description	Model	Remarks																																			
Full Set product type reference	HX710n, HX711n, HX740n, HX741n, HX742n	Full Set is identified by type reference HX710n, HX711n, HX740n, HX741n, HX742n Where the last character n, is an alphanumeric character which differences are only for marketing purposes.																																			
		<u>HX number</u>	Modes and Intensities	Button Qty	Pressure Sensor	NFC/Bluetooth	Configuration	HX710x	1 Mode	1	Audible	NFC	Cairo 1.0	HX711x	2 Modes	1	Audible	NFC	Cairo 1.1	HX740x	2 Modes 3 Intensities	2	Visible	NFC	Cairo 2.0	HX741x	3 Modes 3 Intensities	2	Visible	NFC/Bluetooth	Cairo 2.1	HX742x	4 Modes 3 Intensities	2	Visible	NFC/Bluetooth	Cairo 2.2
		<u>HX number</u>	Modes and Intensities	Button Qty	Pressure Sensor	NFC/Bluetooth	Configuration																														
		HX710x	1 Mode	1	Audible	NFC	Cairo 1.0																														
		HX711x	2 Modes	1	Audible	NFC	Cairo 1.1																														
		HX740x	2 Modes 3 Intensities	2	Visible	NFC	Cairo 2.0																														
		HX741x	3 Modes 3 Intensities	2	Visible	NFC/Bluetooth	Cairo 2.1																														
HX742x	4 Modes 3 Intensities	2	Visible	NFC/Bluetooth	Cairo 2.2																																
Power Toothbrush Handles Codes	HX710x, HX711x, HX740x, HX741x, HX742x	Handle HX742A is the representative model for testing. Toothbrush handles HX710x, HX711x, HX740x, HX741x, HX742x, Where x, is an alphanumeric character which differences are only for the handle color.																																			

5 RF Exposure Exemption Evaluation (FCC)

5.1 Determination of exemption [FCC 1.1307(b)(3)]

- (i) For single RF sources (i.e., any single fixed RF source, mobile device, or portable device, as defined in paragraph (b)(2) of this section): A single RF source is exempt if:
- (A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(ii)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);
 - (B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by;

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

- (C) Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

Table 1 to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source frequency (MHz)	Threshold ERP (watts)
0.3 – 1.34	1,920 R ²
1.34 – 30	3,450 R ² /f ²
30 – 300	3.83 R ²
300 – 1,500	0.0128 R ² f
1,500 – 100,000	19.2 R ²

(ii) For multiple RF sources: Multiple RF sources are exempt if:

- (A) The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required). This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(i)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(i)(A).
- (B) In the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

Where:

a = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(B) of this section for P_{th} , including existing exempt transmitters and those being added.

b = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(C) of this section for Threshold ERP, including existing exempt transmitters and those being added.

c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.

P_i = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source i at a distance between 0.5 cm and 40 cm (inclusive).

$P_{th,i}$ = the exemption threshold power (P_{th}) according to paragraph (b)(3)(i)(B) of this section for fixed, mobile, or portable RF source i .

ERP_j = the ERP of fixed, mobile, or portable RF source j .

$ERP_{th,j}$ = exemption threshold ERP for fixed, mobile, or portable RF source j , at a distance of at least $\lambda/2\pi$ according to the applicable formula of paragraph (b)(3)(i)(C) of this section.

$Evaluated_k$ = the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation at the location of exposure.

$Exposure Limit_k$ = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source k , as applicable from § 1.1310 of this chapter.

5.2 Exemption Evaluation

Frequency (MHz)	Peak FS @ 10m (dBμV/m)	EIRP (dBm)	EIRP (mW)	Note
13.56	23.79	-60.98	0.000000798	FS measurement was taken from Report #105786504MPK-051.

Frequency (MHz)	Peak RF Power (dBm)	Antenna Gain ¹ (dBi)	EIRP (dBm)	EIRP (mW)	Note
2402 – 2480	-0.61	0	-0.61	0.869	Conducted power measurements were taken from report #105786504MPK-050

¹As declared by the manufacturer.

²Antenna gains below 0 are considered as 0dBi.

The maximum combined EIRP of -60.98 dBm (0.000000798 mW) for RFID and -0.61 dBm (0.869 mW) for BLE is less than 1 mW.

According to FCC §1.1307(b)(3)(i), the device is exempt in fixed, mobile, or portable device exposure conditions.

5.3 Evaluation Results

The sample evaluated was found to Comply. The maximum conducted power is less than 1 mW.

6 RF Exposure Exemption Evaluation (ISED)

6.1 Determination of SAR exemption [RSS-102 Section 6.3, Table 11]

Table 11: Power limits for exemption from routine SAR evaluation based on the separation distance

Frequency (MHz)	≤ 5 mm (mW)	10 mm (mW)	15 mm (mW)	20 mm (mW)	25 mm (mW)	30 mm (mW)	35 mm (mW)	40 mm (mW)	45 mm (mW)	> 50 mm (mW)
≤ 300	45	116	139	163	189	216	246	280	319	362
450	32	71	87	104	124	147	175	208	248	296
835	21	32	41	54	72	96	129	172	228	298
1900	6	10	18	33	57	92	138	194	257	323
2450	3	7	16	32	56	89	128	170	209	245
3500	2	6	15	29	50	72	94	114	134	158
5800	1	5	13	23	32	41	54	74	102	128

6.2 Exemption Evaluation

RFID

Frequency (MHz)	Peak FS @ 10m (dBμV/m)	EIRP (dBm)	EIRP (mW)	Separation Distance (mm)	Power limits for exemption (mW)	Note
13.56	23.79	-60.98	0.000000798	≤5	45	FS measurement was taken from report 105786504MPK-051.

BLE

Frequency (MHz)	Peak RF Power (dBm)	Antenna Gain ¹ (dBi)	EIRP (dBm)	EIRP (mW)	Separation Distance (mm)	Power limits for exemption (mW)	Note
2402 – 2480	-0.61	0	-0.61	0.869	≤5	2	Conducted power measurements were taken from report 105786504MPK-050

¹Antenna gain declared by manufacturer is -3.89 dBi. Antenna gains below 0 are considered as 0 dBi for worst case scenario.

The EIRP of the RFID radio (0.000000798 mW) is less than the limit of 45 mW.
The EIRP of the BLE radio (0.869 mW) is less than the limit of 2 mW.

According to RSS-102 Section 6.3, the device is exempt from SAR evaluation.

6.3 SAR calculation for RSS-102 Issue 6

RSS-102 Issue 6 Section 7.1.8 SAR estimation for exempted transmitters:

$$SAR_{estimated} = \frac{P_{max}}{P_{max,exemption}} \times 0.25 \times SAR_{limit} W/kg$$

- P_{max} is the maximum power level including tune-up tolerance for the exempted transmitter
- $P_{max,exemption}$ is the maximum power level of exemption at the same frequency and distance for the exempted transmitter
- SAR_{limit} is the applicable SAR limit (e.g. 1.6 W/kg for 1 g or 4 W/kg for 10 g)

Radio	Frequency Range (MHz)	EIRP ¹ (dBm)	P _{max} (mW)	Distance (mm)	SAR _{limit} (W/kg)	SAR estimated (W/kg)	P _{max, exemption} (mW)
RFID	13.56	-60.98	0.000000798	5	1.6	0.00000000709	45
BLE	2420 – 2480	-0.61	0.869	5	1.6	0.174	2

No duty cycle was considered.

6.4 Total Exposure Ratio

The exposure ratio (ER) resulting from SAR-based exempted transmitters can be calculated using equation

$$ER_{therm>10\text{ MHz},u} = \frac{SAR_{estimated,u}}{SAR_{limit,u}}, 10\text{ MHz} < f_u \leq 6\text{ GHz}$$

where:

- $SAR_{estimated,u}$ is the SAR value of the exempted u-th transmitter/test frequency (refer to section 7.1.8)
- $SAR_{limit,u}$ is the basic restriction limit that is applicable for the u-th transmitter and
- f_u is the operating frequency / test frequency of the u-th transmitter

The thermal total exposure ratio (TER)

$$\begin{aligned} TER_{therm} = & ER_{therm \leq 10\text{ MHz}} \\ & + \sum_{t=1}^T ER_{therm>10\text{ MHz},t} + \sum_{u=1}^U ER_{therm>10\text{ MHz},u} \\ & + \sum_{v=1}^V ER_{therm>10\text{ MHz},v} + \sum_{w=1}^W ER_{therm>10\text{ MHz},w} \\ & + \sum_{x=1}^X ER_{therm>10\text{ MHz},x} + \sum_{y=1}^Y ER_{therm>10\text{ MHz},y} \\ & + \sum_{z=1}^Z ER_{exempted_{1mW},z} \end{aligned}$$

Where:

- T is the number of simultaneously operating transmitters for which an assessment against the basic restriction for SAR may have been performed (refer to section 8.2.2.1)
- U is the number of simultaneously operating exempted transmitters for which an estimate against the basic restriction for SAR may have been performed (refer to section 8.2.2.1)
- V is the number of simultaneously operating transmitters for which an assessment against the basic restriction for APD may have been performed (refer to section 8.2.2.2)
- W is the number of simultaneously operating exempted transmitters for which an estimate against the basic restriction for APD may have been performed (refer to section 8.2.2.2)
- X is the number of simultaneously operating transmitters (operating between 6 GHz and 30 GHz) for which an assessment against the IPD level may have been performed (refer to section 8.2.2.3)
- Y is the number of simultaneously operating transmitters (operating between 30 GHz and 300 GHz) for which an assessment against the IPD level may have been performed (refer to section 8.2.2.3) and
- Z is the number of simultaneously operating transmitters for which the 1 mW exemption as outlined in section 6.5 applies (refer to section 8.2.2.4)

Radio	Frequency Range (MHz)	SAR _{estimated} (W/kg)	SAR _{limit, u} (W/kg)	ER _{therm}	TER _{therm}
RFID	13.56	0.00000000709	1.6	0.00000000443	0.109
BLE	2402 – 2480	0.174	1.6	0.109	

TER_{therm} is less than 1 so the EUT is compliant to SAR-PD-Exposure limits.

6.5 Evaluation Results

The sample evaluated was found to Comply. The EUT is exempt from routine SAR evaluation and TER_{therm} is ≤1.

7 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
1.0	April 29, 2025	105786504MPK-053	EC	AS	Original Issue