

# SAR Exclusion Report

Report No. : SFCFQC-WTW-P23080377

Applicant : Sonova Consumer Hearing GmbH

Address : Am Labor 1, 30900 Wedemark, Germany

Product Name : MOMENTUM True Wireless 4 (MTW4)

Brand Name : SENNHEISER

FCC ID : 2A3ULMTW4

Model No. : MTW4 (refer to item 2 note for more details)

FCC Rule Part : CFR §2.1093

Standards : IEEE Std 1528:2013, KDB 865664 D01 v01r04, KDB 865664 D02 v01r02,  
KDB 447498 D04 Interim General RF Exposure Guidance v01

Sample Received Date : Aug. 15, 2023

Date of Evaluation : Sep. 28, 2023

Lab Address : No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

Test Location : No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City, Taiwan

FCC Accredited No. : TW0003

**CERTIFICATION:** The above equipment have been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch – Lin Kou Laboratories**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's SAR characteristics under the conditions specified in this report. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product certification, approval, or endorsement by TAF or any government agencies.

Prepared By :   
Gina Liu / Specialist

Approved By :   
Gordon Lin / Manager



This report is governed by, and incorporates by reference, the Conditions of Testing as posted at the date of issuance of this report at <http://www.bureauveritas.com/home/about-us/our-business/cps/about-us/terms-conditions/> and is intended for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. Measurement uncertainty is only provided upon request for accredited tests. Statements of conformity are based on simple acceptance criteria without taking measurement uncertainty into account, unless otherwise requested in writing. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence or if you require measurement uncertainty; provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents.



## **Table of Contents**

<b>Release Control Record .....</b>	<b>3</b>
<b>1. Summary of Maximum SAR Value .....</b>	<b>4</b>
<b>2. Description of Equipment Under Test .....</b>	<b>5</b>
<b>3. SAR Measurement Evaluation.....</b>	<b>6</b>
3.1 Maximum Output Power.....	6
3.2 Time-Avg. Power calculation.....	7
3.3 SAR Testing Exclusions .....	11
<b>4. Construction Photos of EUT.....</b>	<b>12</b>
<b>5. Information on the Testing Laboratories.....</b>	<b>13</b>



### Release Control Record

Issue No.	Reason for Change	Date Issued
SFCFQC-WTW-P23080377	Initial release	Oct. 24, 2024

## SAR Exclusion Report

---

### 1. Summary of Maximum SAR Value

Equipment Class	Mode	Highest Reported SAR <sub>1g</sub> (W/kg)
DSS & DTS	Bluetooth	Not Required

**Note:**

1. The SAR limit (**Head & Body: SAR<sub>1g</sub> 1.6 W/kg**) for general population / uncontrolled exposure is specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992.

**Test Reference Guidance:** FCC-19-126

# SAR Exclusion Report

## 2. Description of Equipment Under Test

<b>Test item Description</b>	True Wireless Earphones
<b>Product Name</b>	MOMENTUM True WIRELESS 4 (MTW4)
<b>Brand Name</b>	SENNHEISER
<b>FCC ID</b>	2A3ULMTW4
<b>Model No.</b>	MTW4 (refer to item 2 note for more details)
<b>Sample Status</b>	Engineering Sample
<b>Power Ratings</b>	Earbuds: 3.66Vdc, 75mAh or 3.8Vdc, 72mAh (from battery) Charging case: 5Vdc, 1000 mA (from Type-C USB interface) 3.6Vdc, 820mAh (from battery)
<b>Power Supply (Nominal &amp; Testing)</b>	5Vdc, 1000 mA (from Type-C USB interface) 3.6Vdc, 820mAh (from battery)
<b>Nominal Testing Voltage (Vnom)</b>	3.66~3.8Vdc
<b>Operating Temperature range</b>	0~40°C
<b>Modulation Type</b>	GFSK, $\pi/4$ -DQPSK, 8DPSK
<b>Transmission Technology</b>	FHSS, DSSS
<b>Technology</b>	BLUETOOTH
<b>Operating Frequency</b>	BDR/EDR: 2402 - 2480 MHz LE 4.0: 2402 - 2480MHz LE 5.3: 2404 - 2478MHz (excluding 2426MHz) (for Frequency band 2400-2483.5MHz)
<b>No. of channels</b>	BDR & EDR: 79 LE 4.0: 40 LE 5.3: 37
<b>Channel Spacing</b>	BDR & EDR: 1MHz LE 4.0 & LE 5.3: 2MHz
<b>Channel Bandwidth</b>	BDR & EDR: 79MHz LE 4.0: 80MHz LE 5.3: 74MHz
<b>Data Transfer Rate</b>	Bluetooth BDR: 1Mbps Bluetooth EDR: 2Mbps/3Mbps Bluetooth LE 4.0: 1Mbps Bluetooth LE 5.3: 2Mbps
<b>Maximum Tune-Up Conducted Power (Unit: dBm)</b>	Refer to section 3.1 of this report
<b>Antenna Type</b>	Monopole Antenna
<b>Antenna Gain</b>	Left Earbuds: -0.4dBi Right Earbud: -0.2dBi
<b>HW Version</b>	Earbuds: V02 Charging case: V02
<b>SW Version</b>	Earbuds: V4.7.5 Charging case: V010
<b>Cable supplied</b>	0.4m shielded USB cable without core

### Note:

- The above EUT information is declared by manufacturer and for more detailed features description please refers to the manufacturer's specifications or User's Manual.
- The EUT system model no. MTW4 contains the following devices. The enclosure of EUT includes 3 color.

Device Name	Brand Name	Device Model No.	Color
Right Earbud	SENNHEISER	MTW4 R	Black Graphite White Sliver Black Copper
Left Earbud	SENNHEISER	MTW4 L	
Charging Case	SENNHEISER	MTW4 C	

\* MTW4 R and MTW4 L with BT, BT LE function.

\* Charging case is solely used for charging MTW4 R and MTW4 L only.

### **3. SAR Measurement Evaluation**

#### **3.1 Maximum Output Power**

The maximum conducted power (Unit: dBm) including tune-up tolerance is shown as below.

<b>Left Earbud_Bluetooth</b>			
<b>Mode</b>	<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Max. Tune-up</b>
BR / EDR	0	2402	8.0
	39	2441	8.0
	78	2480	8.0
LE 4.0	0	2402	8.5
	19	2440	8.5
	39	2480	8.5
LE 5.3	1	2404	8.5
	19	2440	8.5
	38	2478	8.5

<b>Right Earbud_Bluetooth</b>			
<b>Mode</b>	<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Max. Tune-up</b>
BR / EDR	0	2402	8.0
	39	2441	8.0
	78	2480	8.0
LE 4.0	0	2402	8.5
	19	2440	8.5
	39	2480	8.5
LE 5.3	1	2404	8.5
	19	2440	8.5
	38	2478	8.5

# SAR Exclusion Report

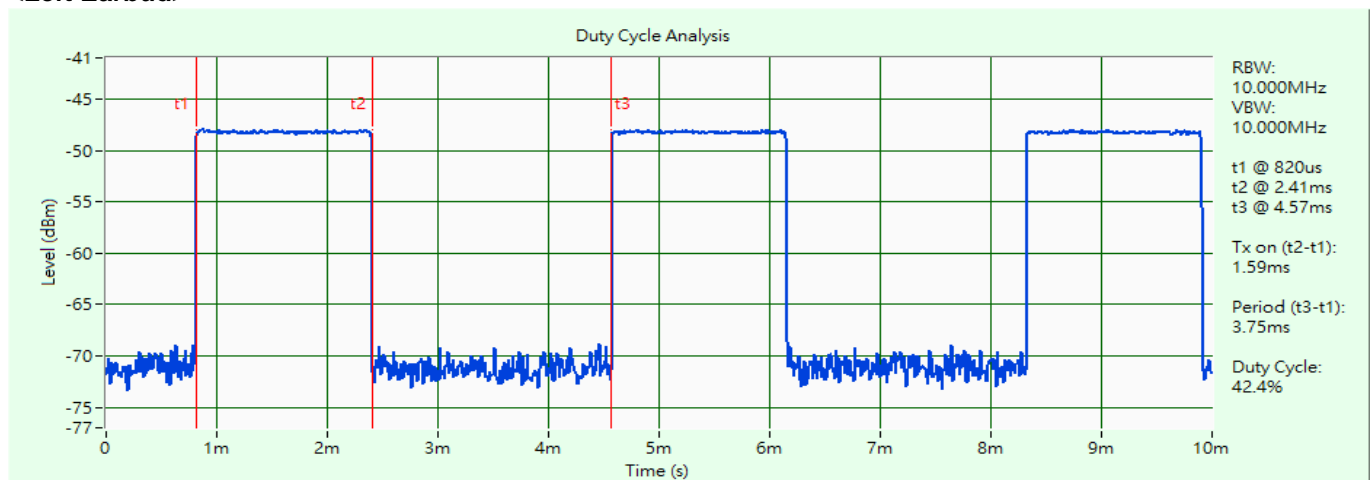
## 3.2 Time-Avg. Power calculation.

### <Considerations Related to Bluetooth for Setup and Testing>

This device has installed Bluetooth engineering testing software which can provide continuous transmitting RF signal. During Bluetooth SAR testing, this device was operated to transmit continuously at the maximum transmission duty with specified transmission mode, operating frequency, lowest data rate, and maximum output power.

The EUT was set to LE mode at the maximum output power. Its duty factor was calculated as below, it specified and designed from manufacturer when devices operate at normal usage condition.

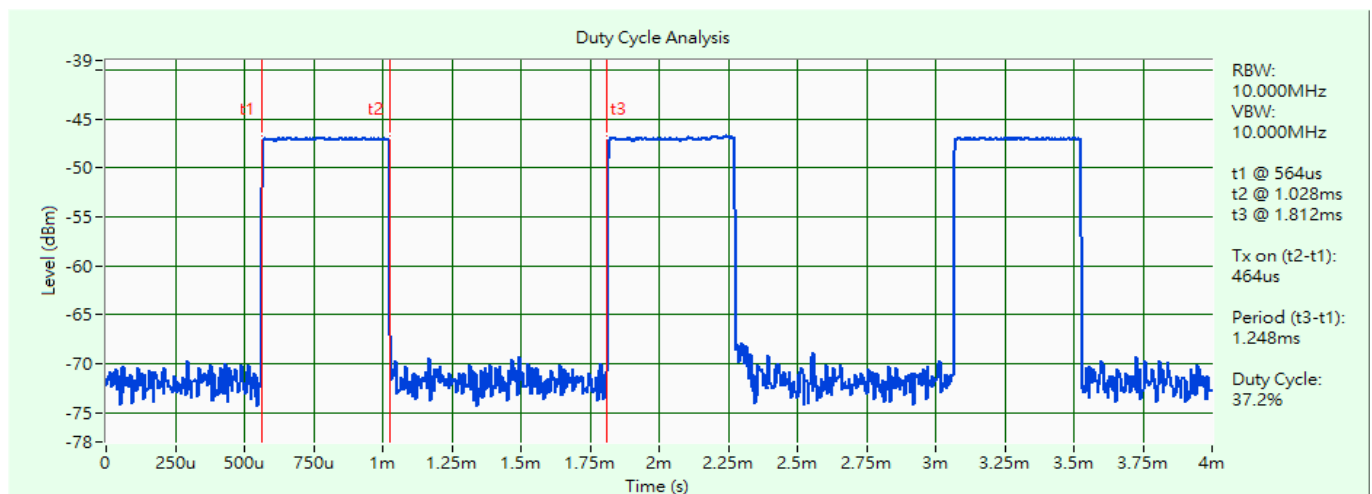
### <Left Earbud>



Time-domain plot for Bluetooth transmission signal\_BR / EDR

The duty factor of Bluetooth signal has been calculated as following.

$$\text{Duty Factor} = \text{Pulse Width} / \text{Total Period} = 1.59 / 3.75 = 42.4\%$$

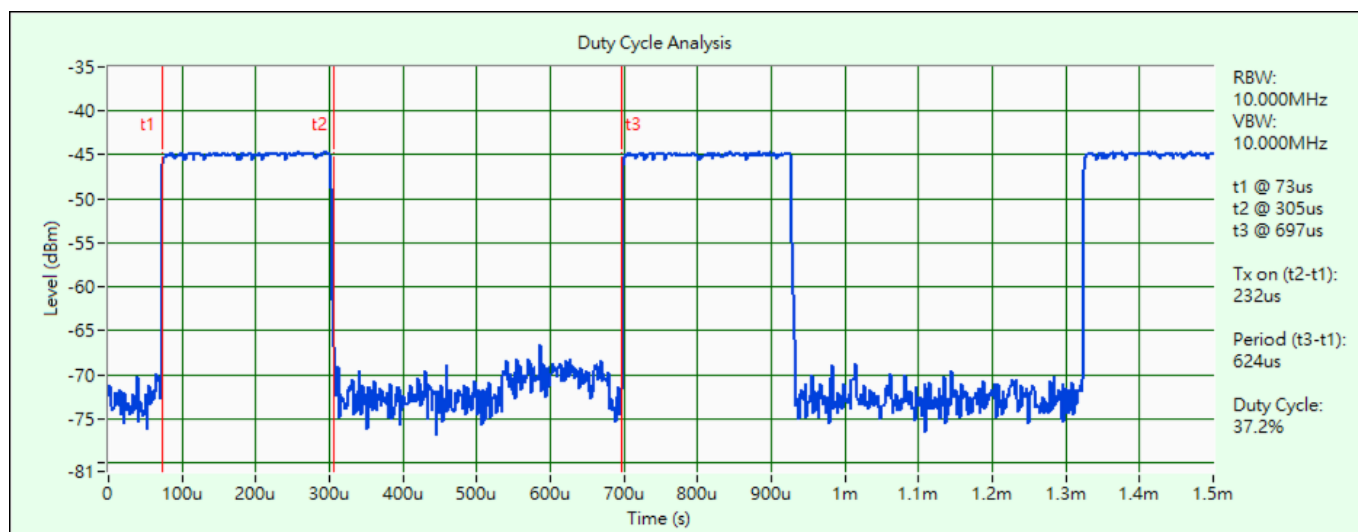


Time-domain plot for Bluetooth transmission signal\_LE 4.0

The duty factor of Bluetooth signal has been calculated as following.

$$\text{Duty Factor} = \text{Pulse Width} / \text{Total Period} = 464 / 1248 = 37.2\%$$

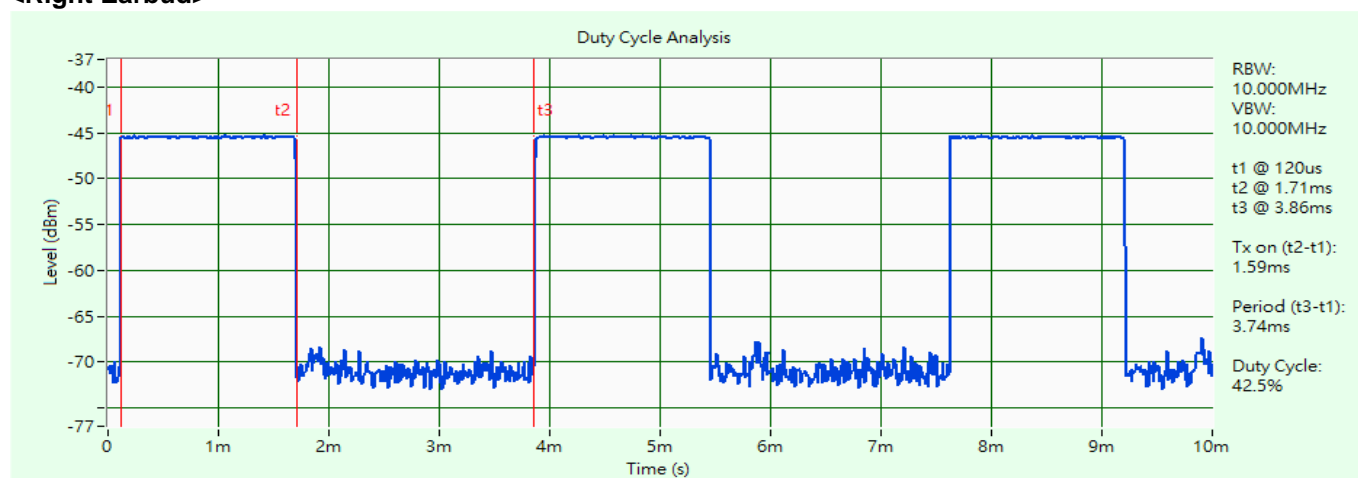
# SAR Exclusion Report



**Time-domain plot for Bluetooth transmission signal\_LE 5.3**

The duty factor of Bluetooth signal has been calculated as following.  
 Duty Factor = Pulse Width / Total Period = 232 / 624 = 37.2%

## <Right Earbud>

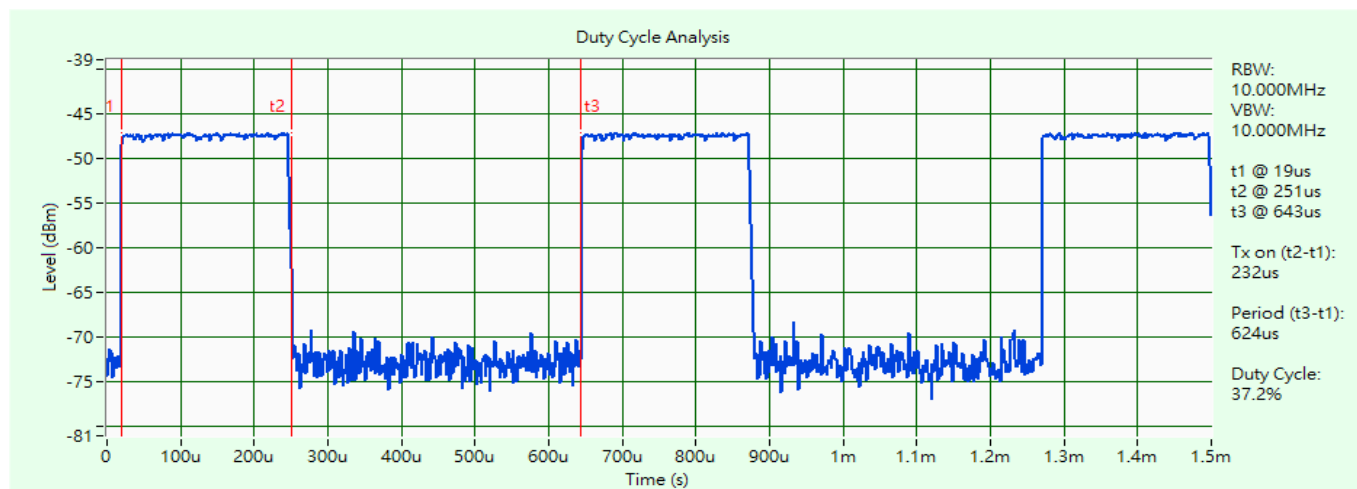


**Time-domain plot for Bluetooth transmission signal\_BR / EDR**

The duty factor of Bluetooth signal has been calculated as following.  
 Duty Factor = Pulse Width / Total Period = 1.59 / 3.74 = 42.5%



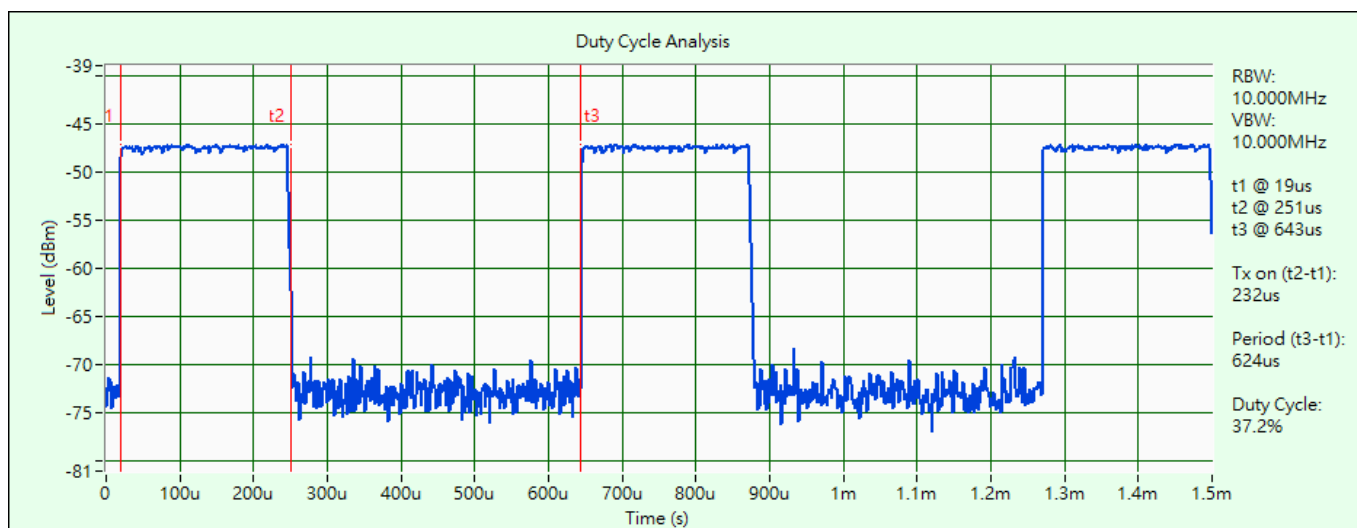
# SAR Exclusion Report



**Time-domain plot for Bluetooth transmission signal\_LE 4.0**

The duty factor of Bluetooth signal has been calculated as following.

$$\text{Duty Factor} = \text{Pulse Width} / \text{Total Period} = 232 / 624 = 37.2\%$$



**Time-domain plot for Bluetooth transmission signal\_LE 5.3**

The duty factor of Bluetooth signal has been calculated as following.

$$\text{Duty Factor} = \text{Pulse Width} / \text{Total Period} = 232 / 624 = 37.2\%$$

## SAR Exclusion Report

The calculation of time-averaged power with duty cycle are performed as below.

### <The calculation of time-averaged power with duty cycle for Left Earbud>

Mode	Max. Tune-up or ERP (dBm)	Duty Cycle (%)	Calculated Max. Time-Avg. power (Include Duty Cycle) (dBm)
BR / EDR	8.0	42.4	4.274
LE 4.0	8.5	37.2	4.205
LE 5.3	8.5	37.2	4.205

### <The calculation of time-averaged power with duty cycle for Right Earbud>

Mode	Max. Tune-up or ERP (dBm)	Duty Cycle (%)	Calculated Max. Time-Avg. power (Include Duty Cycle) (dBm)
BR / EDR	8.0	42.5	4.284
LE 4.0	8.5	37.2	4.205
LE 5.3	8.5	37.2	4.205

# SAR Exclusion Report

## 3.3 SAR Testing Exclusions

According to FCC-19-126, the SAR test exclusion condition is based on source-based time-averaged maximum conducted output power, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions. The SAR exclusion threshold is determined by the following formula.

1. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequency from 0.3 GHz to 6 GHz (inclusive).

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

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);

### <Left Earbud>

Mode	Frequency (GHz)	Calculated Max. Time-Avg. power (Include Duty Cycle) (dBm)	Calculated Max. Time-Avg. power (Include Duty Cycle) (mW)	Exclusion (mW)	Require SAR Testing?
BR / EDR	2.48	4.274	2.6755	2.72	No
LE 4.0	2.48	4.205	2.6333		No
LE 5.3	2.48	4.205	2.6333		No

### <Right Earbud>

Mode	Frequency (GHz)	Calculated Max. Time-Avg. power (Include Duty Cycle) (dBm)	Calculated Max. Time-Avg. power (Include Duty Cycle) (mW)	Exclusion (dBm)	Require SAR Testing?
BR / EDR	2.48	4.284	2.6816	2.72	No
LE 4.0	2.48	4.205	2.6333		No
LE 5.3	2.48	4.205	2.6333		No

#### Note:

1. When separation distance  $\leq 50$  mm and the calculated result shown in above table is  $\leq 3.0$ , the SAR testing exclusion is applied.

#### Summary:

Since the SAR testing for all device orientations apply SAR test exclusion per KDB 447498, SAR testing for this device is not required.

#### **4. Construction Photos of EUT**

Please refer to the attached file (CFQC-WTW-P23080377 (EUT photo)).

### 5. Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

**Taiwan Huaya Lab:**

Add: No. 19, Huaya 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan  
Tel: +886-(0)3-318-3232  
Fax: +886-(0)3-211-5834

**Taiwan Linkou Lab:**

Add: No. 47-2, Baodoucuokeng, Linkou Dist., New Taipei City 244, Taiwan  
Tel: +886-(0)2-2605-2180  
Fax: +886-(0)2-2605-2943

**Taiwan Hsinchu Lab1:**

Add: E-2, No. 1, Lixing 1st Rd., East Dist., Hsinchu City 300, Taiwan  
Tel: +886-(0)3-666-8565  
Fax: +886-(0)3-666-8323

**Taiwan Hsinchu Lab2:**

Add: No. 49, Ln. 206, Wende Rd., Qionglin Township, Hsinchu County 307, Taiwan  
Tel: +886-(0)3-512-0595  
Fax: +886-(0)3-512-0568

**Taiwan Xindian Lab:**

Add: B2F., No. 215, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan  
Tel: +886-(0)2-8914-5882  
Fax: +886-(0)2-8914-5840

**Email:** [service.adt@bureauveritas.com](mailto:service.adt@bureauveritas.com)

**Web Site:** <http://ee.bureauveritas.com.tw>

The road map of all our labs can be found in our web site also.

---END---