

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.

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Release Control Record

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

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1. Summary of Maximum SAR Value

Equipment Class	Mode	Highest Reported SAR _{1g} (W/kg)
DSS & DTS	Bluetooth	Not Required

Note:

1. The SAR limit (**Head & Body: SAR_{1g} 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

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2. Description of Equipment Under Test

Test item Description	True Wireless Earphones
Product Name	MOMENTUM True WIRELESS 4 (MTW4)
Brand Name	SENNHEISER
FCC ID	2A3ULMTW4
Model No.	MTW4 (refer to item 2 note for more details)
Sample Status	Engineering Sample
Power Ratings	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)
Power Supply (Nominal & Testing)	5Vdc, 1000 mA (from Type-C USB interface) 3.6Vdc, 820mAh (from battery)
Nominal Testing Voltage (Vnom)	3.66~3.8Vdc
Operating Temperature range	0~40°C
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8DPSK
Transmission Technology	FHSS, DSSS
Technology	BLUETOOTH
Operating Frequency	BDR/EDR: 2402 - 2480 MHz LE 4.0: 2402 - 2480MHz LE 5.3: 2404 - 2478MHz (excluding 2426MHz) (for Frequency band 2400-2483.5MHz)
No. of channels	BDR & EDR: 79 LE 4.0: 40 LE 5.3: 37
Channel Spacing	BDR & EDR: 1MHz LE 4.0 & LE 5.3: 2MHz
Channel Bandwidth	BDR & EDR: 79MHz LE 4.0: 80MHz LE 5.3: 74MHz
Data Transfer Rate	Bluetooth BDR: 1Mbps Bluetooth EDR: 2Mbps/3Mbps Bluetooth LE 4.0: 1Mbps Bluetooth LE 5.3: 2Mbps
Maximum Tune-Up Conducted Power (Unit: dBm)	Refer to section 3.1 of this report
Antenna Type	Monopole Antenna
Antenna Gain	Left Earbuds: -0.4dBi Right Earbud: -0.2dBi
HW Version	Earbuds: V02 Charging case: V02
SW Version	Earbuds: V4.7.5 Charging case: V010
Cable supplied	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.

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3. SAR Measurement Evaluation

3.1 Maximum Output Power

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

Left Earbud_Bluetooth			
Mode	Channel	Frequency (MHz)	Max. Tune-up
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

Right Earbud_Bluetooth			
Mode	Channel	Frequency (MHz)	Max. Tune-up
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

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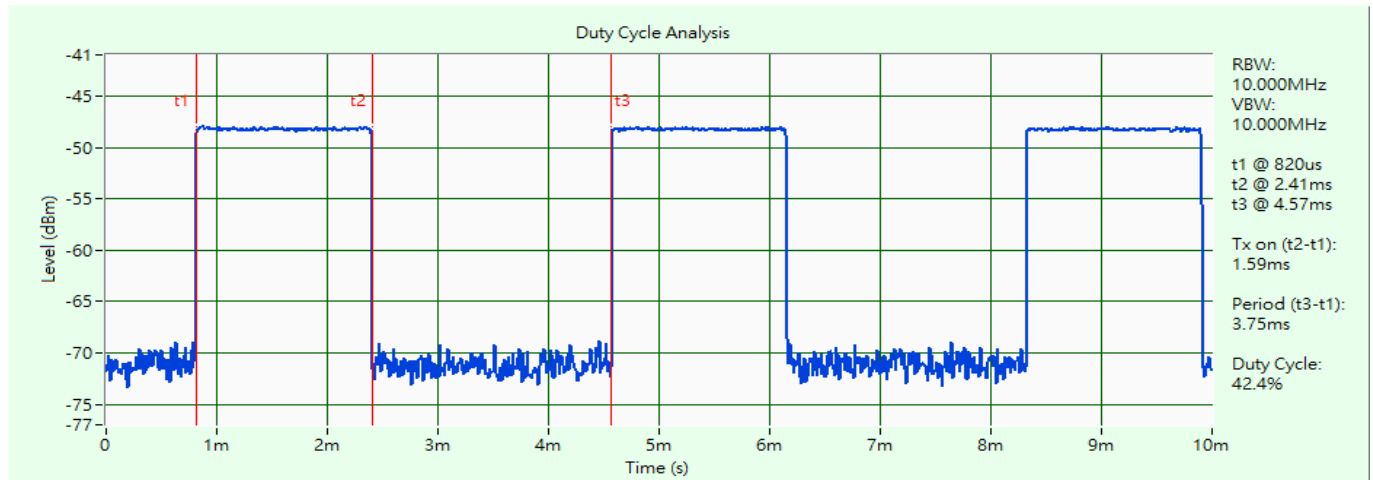
3.2 Time-Avg. Power calculation.

<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.

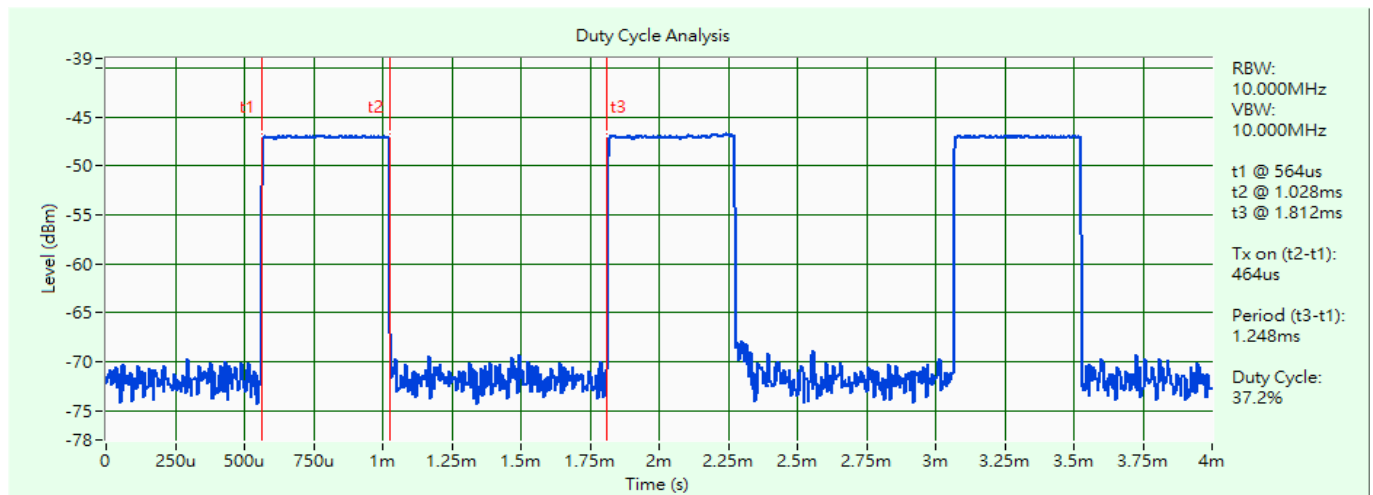
<Left Earbud>



Time-domain plot for Bluetooth transmission signal_BR / EDR

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

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

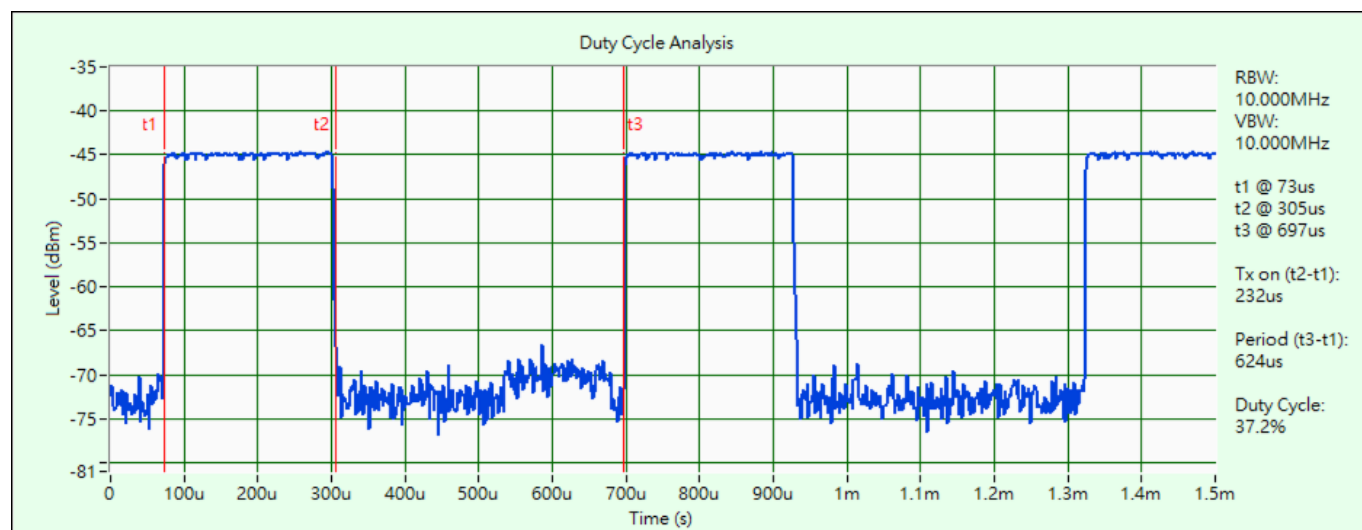


Time-domain plot for Bluetooth transmission signal_LE 4.0

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

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

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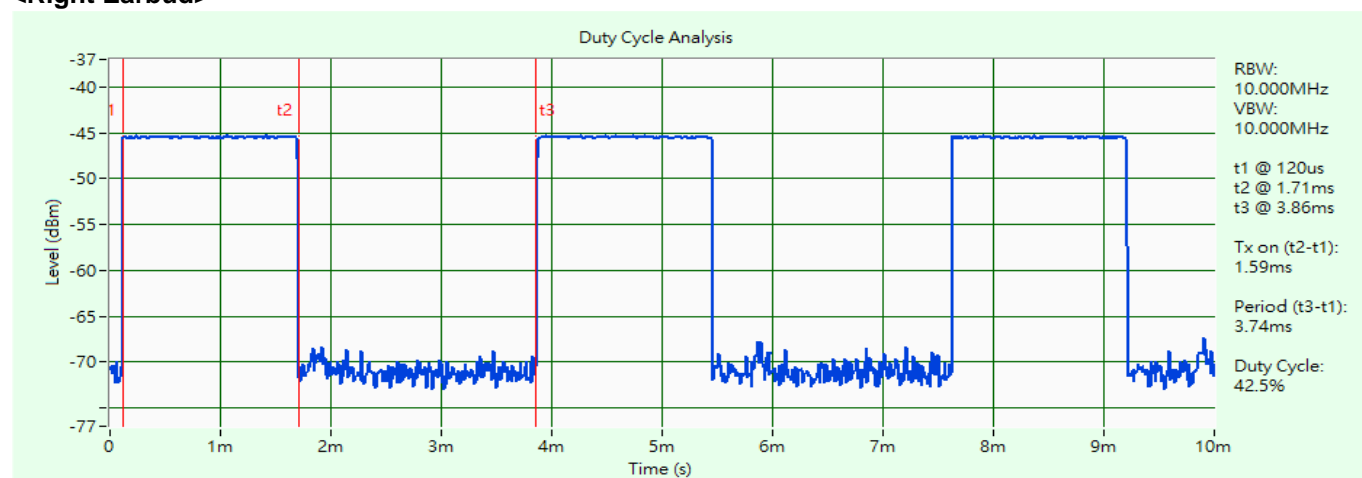


Time-domain plot for Bluetooth transmission signal_LE 5.3

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

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

<Right Earbud>

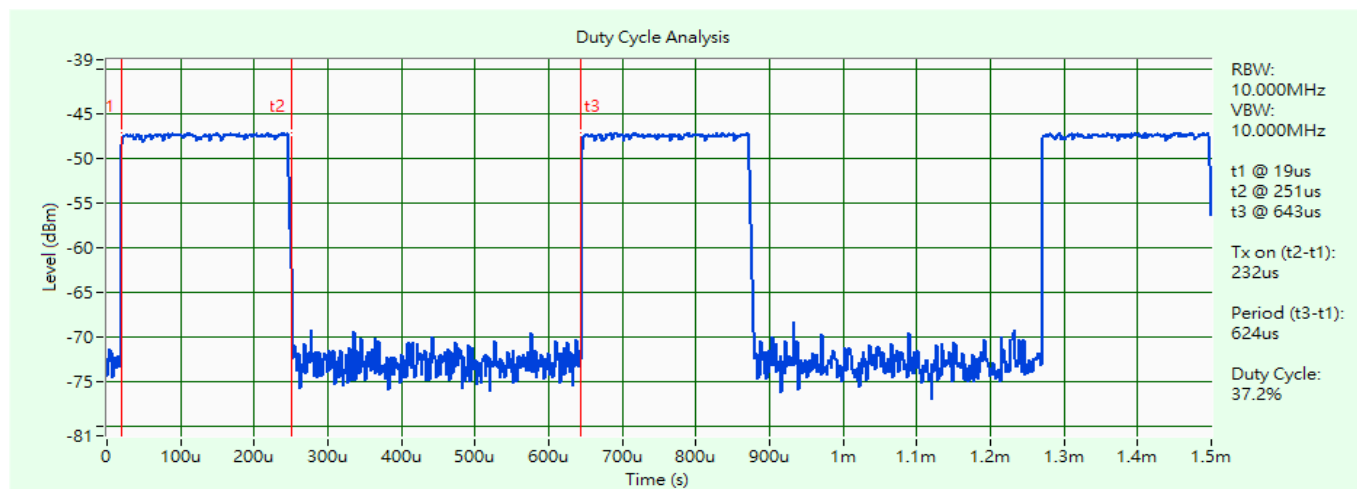


Time-domain plot for Bluetooth transmission signal_BR / EDR

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

$$\text{Duty Factor} = \text{Pulse Width} / \text{Total Period} = 1.59 / 3.74 = 42.5\%$$

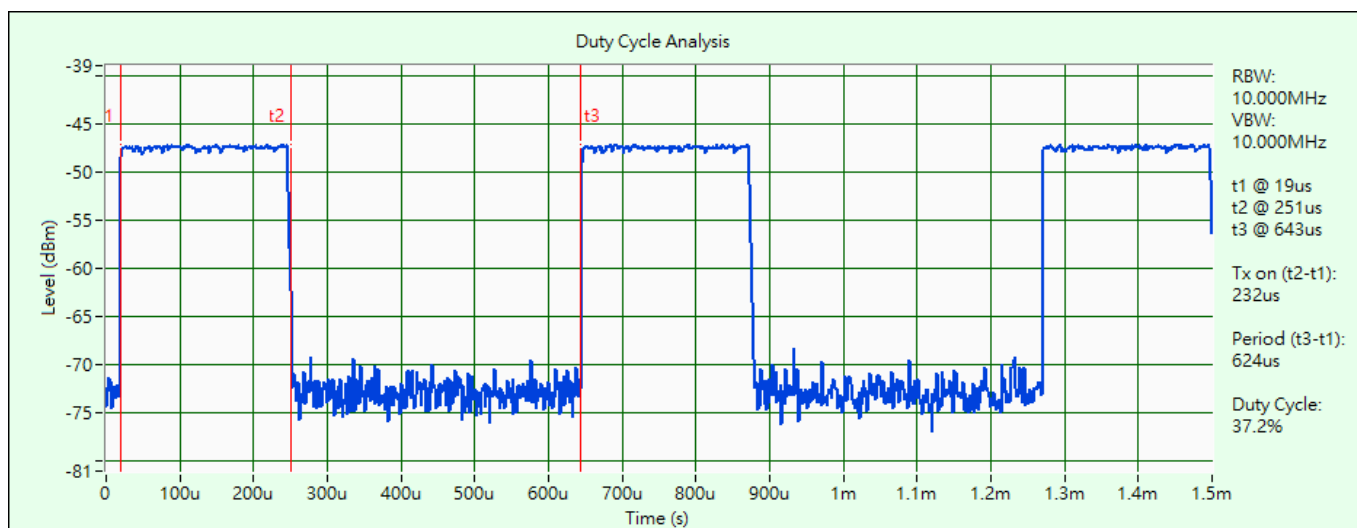
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Time-domain plot for Bluetooth transmission signal_LE 4.0

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.

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

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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

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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.

- 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:

- When separation distance ≤ 50 mm and the calculated result shown in above table is ≤ 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:

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

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