

FCC SAR Exclusion Report

Report No. : SF200508C01

Applicant : Sennheiser electronic GmbH & Co. KG

Address : Am Labor 1, D-30900 Wedemark, Germany

Product : CX True Wireless (CX400TW1)

Brand : SENNHEISER

FCC ID : DMOCX400TW1L

Model No. : CX400TW1 L

Standards : FCC 47 CFR Part 2 (2.1093), IEEE C95.1:1992, IEEE Std 1528:2013
KDB 865664 D01 v01r04, KDB 865664 D02 v01r02, KDB 447498 D01 v06

Sample Received Date : May 08, 2020

Date of Evaluation : Jun. 09, 2020

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

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 :



Shelly Hsueh / Specialist

Approved By :



Gordon Lin / Manager



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Release Control Record

Issue No.	Reason for Change	Date Issued
SF200508C01	Initial release	Jun. 16, 2020

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1. Summary of Maximum SAR Value

Equipment Class	Mode	Highest Reported SAR _{1g} (W/kg)
DSS and 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.

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2. Description of Equipment Under Test

Product	CX True Wireless (CX400TW1)
Brand Name	SENNHEISER
FCC ID	DMOCX400TW1L
Model Name	CX400TW1 L
Tx Frequency Bands (Unit: MHz)	Bluetooth : 2402 ~ 2480
Uplink Modulations	Bluetooth : GFSK, $\pi/4$ -DQPSK, 8-DPSK
Maximum Tune-up Conducted Power (Unit: dBm)	Please refer to section 3.1 of this report
Antenna Type	Monopole antenna
EUT Stage	Engineering Sample

Note:

1. 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.

3. SAR Measurement Evaluation

3.1 Maximum Output Power

3.1.1 Maximum Target Conducted Power

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

<Bluetooth>

Mode	Channel	Frequency (MHz)	Tune-up Power
Bluetooth BDR/EDR	0	2402	9.5
	39	2441	9.5
	78	2480	9.5
Bluetooth LE 4.0/5.1	0	2402	9.5
	19	2440	9.5
	39	2480	9.5

3.1.2 Measured Conducted Power Result

The measuring conducted power (Unit: dBm) are shown as below.

<Bluetooth>

Mode	Channel	Frequency (MHz)	Average Power
Bluetooth BDR/EDR	0	2402	9.20
	39	2441	9.30
	78	2480	9.30
Bluetooth LE 4.0/5.1	0	2402	8.58
	19	2440	8.81
	39	2480	8.86

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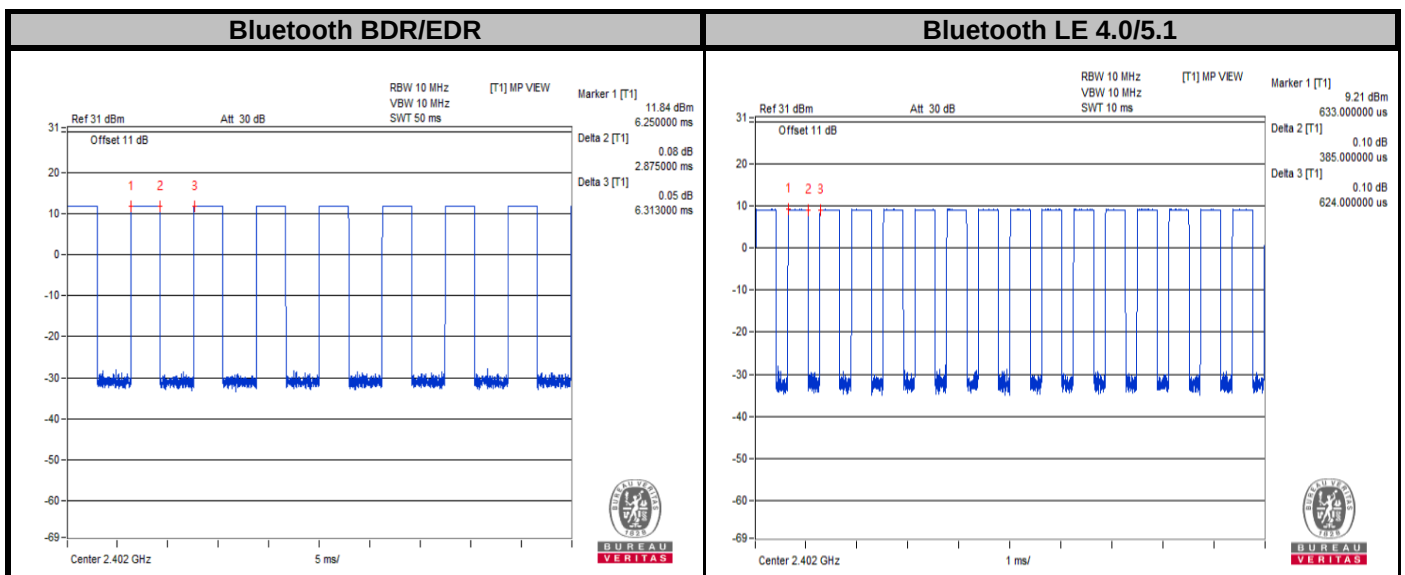
3.1.3 Time-Avg. Power calculation.

The calculation of time-avg. power (Unit: dBm) Including duty cycle.

<The calculated average power with duty cycle>

Mode	Max Tune-up Power	Duty cycle (%)	Calculated Time-Avg. Power
Bluetooth BDR/EDR	9.5	45.54%	6.08
Bluetooth LE 4.0/5.1	9.5	61.70%	7.40

Time-domain plot for Bluetooth transmission signal



The duty factor of Bluetooth signal has been calculated as following.
Duty Factor = Pulse Width / Total Period = 2.875 / 6.313
= 45.54 %

The duty factor of Bluetooth signal has been calculated as following.
Duty Factor = Pulse Width / Total Period = 385 / 624 =
61.70 %

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3.2 SAR Testing Exclusions

According to KDB 447498 D01, 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.

- For the test separation distance ≤ 50 mm

$$\frac{\text{Max. Tune up Power}_{(\text{mW})}}{\text{Min. Test Separation Distance}_{(\text{mm})}} \times \sqrt{f_{(\text{GHz})}} \leq 3.0$$

When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

- For the test separation distance > 50 mm, and the frequency at 100 MHz to 1500 MHz

$$\left[(\text{Threshold at 50 mm in Step 1}) + (\text{Test Separation Distance} - 50 \text{ mm}) \times \left(\frac{f_{(\text{MHz})}}{150} \right) \right]_{(\text{mW})}$$

- For the test separation distance > 50 mm, and the frequency at > 1500 MHz to 6 GHz

$$[(\text{Threshold at 50 mm in Step 1}) + (\text{Test Separation Distance} - 50 \text{ mm}) \times 10]_{(\text{mW})}$$

Mode	Time-Avg. Power (dBm)	Time-Avg. Power (mW)	Left Earbud Ant. to Surface (mm)	Calculated Result	Require SAR Testing?
Bluetooth LE 4.0/5.1	7.40	5.5	8.43	1.03	No

Note:

- When separation distance ≤ 50 mm and the calculated result shown in above table is ≤ 3.0 , the SAR testing exclusion is applied.
- When separation distance > 50 mm and the device output power is less than the calculated result (power threshold, mW) shown in above table, 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. 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@tw.bureauveritas.com

Web Site: <https://ee.bureauveritas.com.tw/BVInternet/Default>

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

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Appendix A. Photographs of EUT and Setup

Please refer to the attached file (reference no.: SF200508C01)