

# FCC SAR Exclusion Report

**Report No.** : SFBCEE-WTW-P21050412  
**Applicant** : Sennheiser electronic GmbH & Co. KG  
**Address** : Am Labor 1, D-30900 Wedemark, Germany  
**Product Name** : CX Plus True Wireless (CXPLUSTW1)  
**Brand Name** : SENNHEISER  
**FCC ID** : DMOCXPLUSTW1L  
**Model No.** : CXPLUSTW1 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 13, 2021  
**Date of Evaluation** : Jun. 24, 2021  
**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.

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## Release Control Record

Issue No.	Reason for Change	Date Issued
SFBCEE-WTW-P21050412	Initial release	Jul. 01, 2021

## 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.

## FCC SAR Exclusion Report

### 2. Description of Equipment Under Test

<b>Test Item Description</b>	True Wireless Earphones
<b>Product Name</b>	CX Plus True Wireless (CXPLUSTW1)
<b>FCC ID</b>	DMOCXPLUSTW1L
<b>Brand Name</b>	SENNHEISER
<b>Model No.</b>	CXPLUSTW1 L
<b>Status of EUT</b>	Engineering Sample
<b>Power Ratings</b>	Left earbud & Right earbud: 3.7Vdc, 55mAh (from battery) Charging Case: 5Vdc, 600 mA (from Type-C USB interface) 3.7Vdc, 400-420mAh (from battery)
<b>Operating Temperature range</b>	0°C ~ 40°C
<b>Modulation Type</b>	BDR & EDR: GFSK, $\pi/4$ DQPSK, 8DPSK BLE: GFSK
<b>Transmission Technology</b>	BDR & EDR: FHSS BLE: DSSS
<b>Technology</b>	Bluetooth
<b>Operating Frequency</b>	2402 - 2480MHz (for Frequency Band: 2400-2483.5MHz)
<b>No. of channels</b>	BDR & EDR: 79 BLE: 40
<b>Channel Spacing</b>	BDR & EDR: 1MHz BLE: 2MHz
<b>Channel Bandwidth</b>	BDR & EDR: 79MHz BLE: 80MHz
<b>Data Transfer Rate</b>	BDR: 1Mbps and EDR: 2Mbps/3Mbps LE 4.0: 1Mbps and LE 5.2: 2Mbps
<b>Maximum Tune-up Conducted Power (Unit: dBm)</b>	Please refer to section 3.1.1 of this report
<b>Antenna Type</b>	Monopole antenna
<b>Antenna Gain</b>	-2.26 dBi
<b>HW Version</b>	Earbuds: R1 Charging case: R1
<b>SW Version</b>	Earbuds: V1.3.20 Charging case: 1.4.0
<b>Cable supplied</b>	0.2m Shielded USB cable without core

**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.

Refer to Appendix B.

**3.1.2 Measured Conducted Power Result**

Refer to Appendix C.

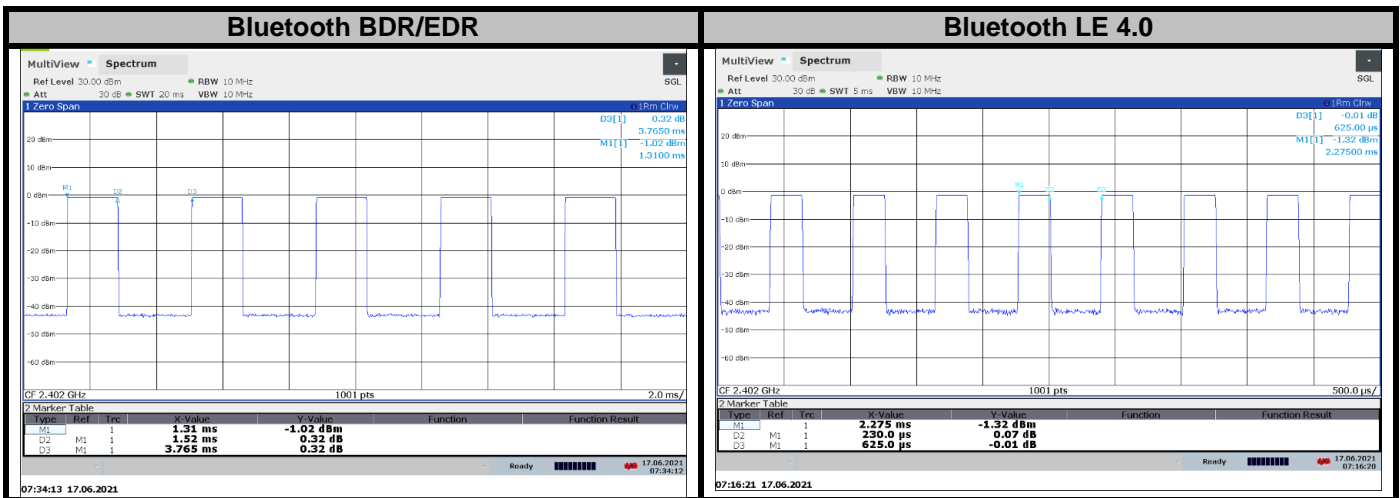
**3.1.3 Time-Avg. Power calculation.**

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

<The calculated average power with duty cycle>

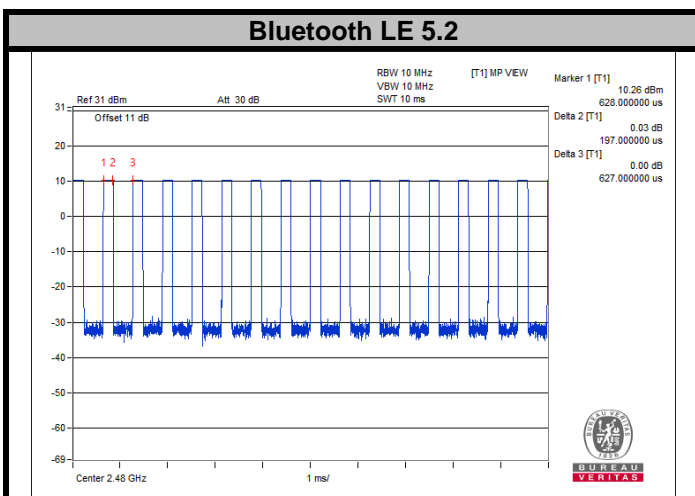
Mode	Max Tune-up Power (Not include Duty Cycle)	Duty cycle (%)	Calculated Time-Avg. Power (Include Duty Cycle)
BDR / EDR	10.5	40.37	6.56
LE 4.0	10.5	36.80	6.16
LE 5.2	10.5	31.42	5.47

## Time-domain plot for Bluetooth transmission signal



The duty factor of Bluetooth signal has been calculated as following.  
 Duty Factor = Pulse Width / Total Period = 1.52 / 3.765 = 40.37 %

The duty factor of Bluetooth signal has been calculated as following.  
 Duty Factor = Pulse Width / Total Period = 230 / 625 = 36.8 %



The duty factor of Bluetooth signal has been calculated as following.  
 Duty Factor = Pulse Width / Total Period = 197.0 / 627.0 = 31.42 %

**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  $\leq 50$  mm

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

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

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

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

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

Mode	Time-Avg. Power (Include Duty Cycle) (dBm)	Time-Avg. Power (Include Duty Cycle) (mW)	Left Earbud Ant. to Surface (mm)	Calculated Result	Require SAR Testing?
BDR / EDR	6.56	4.529	6.7	1.06	No
LE 4.0	6.16	4.130	6.7	0.97	No
LE 5.2	5.47	3.524	6.7	0.83	No

**Note:**

- When separation distance  $\leq 50$  mm and the calculated result shown in above table is  $\leq 3.0$ , 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:

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

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