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RF Exposure Evaluation Report

Report No.: CQASZ20231001808E-03
Applicant: Shenzhen TONEMAC Technology Co., Ltd.
Address of Applicant: 502, No.2 Makan South Road, Xili Town, Nanshan District, Shenzhen, Guangdong, China
Equipment Under Test (EUT):
EUT Name: TONEMAC N18 Bluetooth Headphones
Model No.: TONEMAC N18
Test Model No.: TONEMAC N18
Brand Name: TONEMAC
FCC ID: 2BDAC-N18
Standards: 47 CFR Part 1.1307
47 CFR Part 2.1093
KDB447498 D04 Interim General RF Exposure Guidance v01
Date of Receipt: 2023-10-09
Date of Test: 2023-10-09 to 2023-10-17
Date of Issue: 2023-10-31
Test Result: **PASS***

*In the configuration tested, the EUT complied with the standards specified above.

Tested By: Lewis Zhou
(Lewis Zhou)

Reviewed By: Timo Lei
(Timo Lei)

Approved By: Jack Ai
(Jack Ai)



1 Version

Revision History Of Report

| Report No. | Version | Description | Issue Date |
|----------------------|---------|----------------|------------|
| CQASZ20231001808E-03 | Rev.01 | Initial report | 2023-10-31 |

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3 General Information

3.1 Client Information

| | |
|--------------------------|---|
| Applicant: | Shenzhen TONEMAC Technology Co., Ltd. |
| Address of Applicant: | 502, No.2 Makan South Road, Xili Town, Nanshan District, Shenzhen, Guangdong, China |
| Manufacturer: | Shenzhen TONEMAC Technology Co., Ltd. |
| Address of Manufacturer: | 502, No.2 Makan South Road, Xili Town, Nanshan District, Shenzhen, Guangdong, China |
| Factory: | Shenzhen TONEMAC Technology Co., Ltd. |
| Address of Factory: | 502, No.2 Makan South Road, Xili Town, Nanshan District, Shenzhen, Guangdong, China |

3.2 General Description of EUT

| | |
|---------------------------|--|
| Product Name: | TONEMAC N18 Bluetooth Headphones |
| Model No.: | TONEMAC N18 |
| Test Model No.: | TONEMAC N18 |
| Trade Mark: | TONEMAC |
| Software Version: | V1.0 |
| Hardware Version: | V1.0 |
| Power Supply: | Li-ion battery: DC 3.7V 180mAh, Charge by DC 5V for adapter |
| Simultaneous Transmission | <input type="checkbox"/> Simultaneous TX is supported and evaluated in this report. <input checked="" type="checkbox"/> Simultaneous TX is not supported. |

3.3 General Description of BLE

| | |
|----------------------|--|
| Operation Frequency: | 2402MHz~2480MHz |
| Modulation Type: | GFSK |
| Transfer Rate: | 1Mbps/2Mbps |
| Number of Channel: | 40 |
| Product Type: | <input type="checkbox"/> Mobile <input checked="" type="checkbox"/> Portable |
| Antenna Type: | Chip antenna |
| Antenna Gain: | 2.25dBi |

3.4 General Description of BT

| | |
|----------------------|--|
| Operation Frequency: | 2402MHz~2480MHz |
| Modulation Type: | GFSK, $\pi/4$ DQPSK, 8DPSK |
| Transfer Rate: | 1Mbps/2Mbps/3Mbps |
| Number of Channel: | 79 |
| Product Type: | <input type="checkbox"/> Mobile <input checked="" type="checkbox"/> Portable |
| Antenna Type: | Chip antenna |
| Antenna Gain: | 2.25dBi |

4 RF Exposure Evaluation

4.1 SAR Evaluation for Portable condition

4.1.1 Standard Requirement

447498 D04 Interim General RF Exposure Guidance v01

3.2. SAR Test Reduction Guidance

SAR test reduction procedures [Glossary] allow using a particular set of test data as representative of other, similar, test conditions. This may be applied for data within different test positions (e.g. body, head, extremity), wireless modes (e.g. Wi-Fi, cellular), and frequency bands. This test reduction process provides for the use of test data for one specific channel, while referencing to those data for demonstrating compliance in other required channels for each test position of an exposure condition, within the operating mode of a frequency band. This is limited specifically to when the reported 1-g or 10-g SAR for the mid-band or highest output power channel meets any of the following conditions.

4.1.2 Limits

SAR-based thresholds are derived based on frequency, power, and separation distance of the RF source. The formula defines the thresholds in general for either available maximum time-averaged power or maximum time-averaged ERP, whichever is greater.

If the ERP of a device is not easily determined, such as for a portable device with a small form factor, the applicant may use the available maximum time-averaged power exclusively if the device antenna or radiating structure does not exceed an electrical length of $\lambda/4$.

As for devices with antennas of length greater than $\lambda/4$ where the gain is not well defined, but always less than that of a half-wave dipole (length $\lambda/2$), the available maximum time-averaged power generated by the device may be used in place of the maximum time-averaged ERP, where that value is not known.

The separation distance is the smallest distance from any part of the antenna or radiating structure for all persons, during operation at the applicable ERP. In the case of mobile or portable devices, the separation distance is from the outer housing of the device where it is closest to the antenna.

The SAR-based exemption formula of § 1.1307(b)(3)(i)(B), repeated here as Formula (B.2), applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power or effective radiated power (ERP), whichever is greater, of less than or equal to the threshold P_{th} (mW).

This method shall only be used at separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by Formula (B.2).

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases} \quad (\text{B. 2})$$

where

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

and f is in GHz, d is the separation distance (cm), and $ERP_{20 \text{ cm}}$ is per Formula (B.1).
The example values shown in Table B.2 are for illustration only.

Table B.2—Example Power Thresholds (mW)

| Frequency (MHz) | Distance (mm) | | | | | | | | | |
|-----------------|---------------|----|----|-----|-----|-----|-----|-----|-----|-----|
| | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 300 | 39 | 65 | 88 | 110 | 129 | 148 | 166 | 184 | 201 | 217 |
| 450 | 22 | 44 | 67 | 89 | 112 | 135 | 158 | 180 | 203 | 226 |
| 835 | 9 | 25 | 44 | 66 | 90 | 116 | 145 | 175 | 207 | 240 |
| 1900 | 3 | 12 | 26 | 44 | 66 | 92 | 122 | 157 | 195 | 236 |
| 2450 | 3 | 10 | 22 | 38 | 59 | 83 | 111 | 143 | 179 | 219 |
| 3600 | 2 | 8 | 18 | 32 | 49 | 71 | 96 | 125 | 158 | 195 |
| 5800 | 1 | 6 | 14 | 25 | 40 | 58 | 80 | 106 | 136 | 169 |

4.1.3 SAR Exclusion Evaluation Result

1) For BLE

Measurement Data

| Channel | Conducted Peak Output Power (dBm) | EIRP (dBm) | ERP (dBm) | Maximum tune-up Power (mW) | Exclusion threshold (mW) |
|----------------------|---|---------------|--------------|-------------------------------------|-----------------------------|
| Lowest (2402MHz) | 0.67 | 2.92 | 0.77 | 1.19 | 3.0 |
| Middle (2440MHz) | 1.61 | 3.86 | 1.71 | 1.48 | |
| Highest (2480MHz) | 1.48 | 3.73 | 1.58 | 1.44 | |

Remark: The Max Conducted Peak Output Power data refer to report Report No.: CQASZ20231001808E-01

2) For BT

Measurement Data

| Channel | Conducted Peak Output Power (dBm) | EIRP (dBm) | ERP (dBm) | Maximum tune-up Power (mW) | Exclusion threshold (mW) |
|----------------------|---|---------------|--------------|-------------------------------------|-----------------------------|
| Lowest (2402MHz) | 0.51 | 2.76 | 0.61 | 1.15 | 3.0 |
| Middle (2441MHz) | 2.47 | 4.72 | 2.57 | 1.81 | |
| Highest (2480MHz) | 3.06 | 5.31 | 3.16 | 2.07 | |

Remark: The Max Conducted Peak Output Power data refer to report Report No.: CQASZ20231001808E-02

*** END OF REPORT ***