



Compliance Certification Services (Kunshan) Inc. Shenzhen Branch

SZCCS-TRF-01 Rev. A/0 Aug01,2022

Report No.: FYCR221100045403

Page: 1 of 11

RF EXPOSURE EVALUATION REPORT

Application No.: FYCR2211000454AT
Applicant: TANGIO LTD
Address of Applicant: 10 Lion Yard, Tremadoc Road, London SW4 7NQ UK
Manufacturer: TANGIO LTD
Address of Manufacturer: 10 Lion Yard, Tremadoc Road, London SW4 7NQ UK
Factory: Nanjing Chukonglingdian Technology Co., LTD
Address of Factory: No. 288 Qinhuai Avenue, Yongyang Sub District, Lishui Dist., Nanjing, Jiangsu, China

Equipment Under Test (EUT):
EUT Name: etee Controller
Model No.: 4001-XX-YY-ZZ (X/Y could be number from 0-9, Z could be number from 0-3) ♣
♣ Please refer to section 3 of this report which indicates which model was actually tested and which were electrically identical.

FCC ID: 2A9E2-ETC4001
Standard(s) : FCC Rules 47 CFR §2.1093
KDB 447498 D04 interim General RF Exposure Guidance v01

Date of Receipt: 2023-04-11
Date of Test: 2023-04-13 to 2023-04-22
Date of Issue: 2023-06-20

| | |
|---------------------------|--------------|
| Evaluation Result: | Pass* |
|---------------------------|--------------|

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

Winkey Wang

Winkey Wang
EMC Technical Manager



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SZCCS-TRF-01 Rev. A/0 Aug01,2022

Report No.: FYCR221100045403

Page: 2 of 11

| Revision Record | | | | |
|-----------------|---------|------------|----------|----------|
| Version | Chapter | Date | Modifier | Remark |
| 01 | | 2023-06-20 | | Original |
| | | | | |
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|--------------------------|--|----------------------------|--|--|
| Authorized for issue by: | | | | |
| | | Tree Zhan | | |
| | | Tree Zhan/Project Engineer | | |
| | | Winkey Wang | | |
| | | Winkey Wang/Reviewer | | |



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SZCCS-TRF-01 Rev. A/0 Aug01,2022

Report No.: FYCR221100045403

Page: 3 of 11

2 Contents

| | Page |
|--|------|
| 1 Cover Page | 1 |
| 2 Contents | 3 |
| 3 General Information..... | 4 |
| 3.1 General Description of E.U.T. | 4 |
| 3.2 Separation Distance | 5 |
| 3.3 Test Location..... | 6 |
| 3.4 Test Facility | 6 |
| 3.5 Deviation from Standards..... | 6 |
| 3.6 Abnormalities from Standard Conditions | 6 |
| 4 FCC Radiofrequency radiation exposure limits | 7 |
| 4.1 Blanket 1 mW Blanket Exemption..... | 7 |
| 4.2 MPE-based Exemption | 7 |
| 4.3 SAR-based Exemption..... | 8 |
| 5 Measurement and Calculation..... | 11 |
| 5.1 Maximum transmit power | 11 |
| 5.2 RF Exposure Calculation | 11 |



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3 General Information

3.1 General Description of E.U.T.

| | |
|----------------------|---|
| Power supply: | Powered by Li-ion Battery Battery information Model: 701658(1ICP7/16/58) Nominal Voltage: 3.7V DC Rating Capacity: 730mAh 2.701Wh |
| Cable(s): | USB-C Cable: 100cm unshielded |
| Operation Frequency: | 2402MHz to 2480MHz |
| Bluetooth Version: | V5.0 LE |
| Modulation Type: | GFSK |
| Number of Channels: | 40 |
| Channel Spacing: | 2MHz |
| Antenna Type: | PIFA Antenna |
| Antenna Gain: | 3.6dBi |

Remark: The information in this section is provided by the applicant or manufacturer, CCS is not liable to the accuracy, suitability, reliability or/and integrity of the information.

Declaration of EUT Family Grouping:

Model No.: 4001-XX-YY-ZZ

XX (00-99): Product version code

YY (00-99): customer code. 00 = TG0, 01-99: clients/distributor code

ZZ (00-03): Handedness. 00 = a pair of left and right controllers, 01 = Left, 02 = Right, 03 = no handedness

Only the model 4001-00-00-00 were tested, they are identical on PCB layout, RF circuit design, antenna and components are the same except for the tab placement (mirroring) of the Cap sensor. The differences are model names, appearances and colors for trading purpose only, left and right controllers are mirror relationship.



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3.2 Separation Distance

| | |
|---|-----|
| Minimum test separation distance: | 5mm |
| Remark: This minimum test separation distance is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander. | |



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Compliance Certification Services (Kunshan) Inc. Shenzhen Branch

SZCCS-TRF-01 Rev. A/0 Aug01,2022

Report No.: FYCR221100045403

Page: 6 of 11

3.3 Test Location

All tests were performed at:

Compliance Certification Services (Kunshan) Inc. Shenzhen branch.

Fuyong lab. Xinlong TechnoPark, Fengtang Road, Fuyong Subdistrict, Bao'an, Shenzhen, China

Tel: +86 755 8866 3988 Fax: +86 755 2671 0594

All tests were performed at:

3.4 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• A2LA (Certificate No. 6606.01)

Compliance Certification Services (Kunshan) Inc. Shenzhen branch is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 6606.01.

• FCC –Designation Number: CN1322

Compliance Certification Services (Kunshan) Inc. Shenzhen branch has been recognized as an accredited testing laboratory.

Designation Number: CN1322. Test Firm Registration Number: 718073

• Innovation, Science and Economic Development Canada

Compliance Certification Services (Kunshan) Inc. Shenzhen branch has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0129.

IC#: 28189.

3.5 Deviation from Standards

None

3.6 Abnormalities from Standard Conditions

None



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4 FCC Radiofrequency radiation exposure limits

Test exemptions apply for devices used in general population/uncontrolled exposure environments, according to the SAR-based, or MPE-based exemption thresholds.

4.1 Blanket 1 mW Blanket Exemption

The 1 mW Blanket Exemption of §1.1307(b)(3)(i)(A) applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power of no more than 1 mW, regardless of separation distance.

The 1-mW blanket exemption applies at separation distances less than 0.5 cm, including where there is no separation. This exemption shall not be used in conjunction with other exemption criteria other than those for multiple RF sources in paragraph §1.1307(b)(3)(ii)(A).

The 1-mW exemption is independent of service type and covers the full range of 100 kHz to 100 GHz, but it shall not be used in conjunction with other exemption criteria or in devices with higher-power transmitters operating in the same time-averaging period. Exposure from such higher-power transmitters would invalidate the underlying assumption that exposure from the lower-power transmitter is the only contributor to SAR in the relevant volume of tissue.

4.2 MPE-based Exemption

General frequency and separation-distance dependent MPE-based effective radiated power (ERP) thresholds are in Table B.1 [Table 1 of §1.1307(b)(1)(i)(C)] to support an exemption from further evaluation from 300 kHz through 100 GHz.

Table B.1—Thresholds For Single RF Sources Subject to Routine Environmental Evaluation

| RF Source Frequency | | | Minimum Distance | | | Threshold ERP |
|---------------------|---|-----------|--------------------|---|--------------------|--------------------------------------|
| f_L MHz | | f_H MHz | $\lambda_L / 2\pi$ | | $\lambda_H / 2\pi$ | W |
| 0.3 | — | 1.34 | 159 m | — | 35.6 m | 1,920 R ² |
| 1.34 | — | 30 | 35.6 m | — | 1.6 m | 3,450 R ² /f ² |
| 30 | — | 300 | 1.6 m | — | 159 mm | 3.83 R ² |
| 300 | — | 1,500 | 159 mm | — | 31.8 mm | 0.0128 R ² f |
| 1,500 | — | 100,000 | 31.8 mm | — | 0.5 mm | 19.2R ² |

Subscripts L and H are low and high; λ is wavelength.
From §1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns.

The table applies to any RF source (i.e. single fixed, mobile, and portable transmitters) and specifies power and distance criteria for each of the five frequency ranges used for the MPE limits. These criteria apply at separation distances from any part of the radiating structure of at least $\lambda/2\pi$. The thresholds are



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SZCCS-TRF-01 Rev. A/0 Aug01,2022

Report No.: FYCR221100045403

Page: 8 of 11

based on the general population MPE limits with a single perfect reflection, outside of the reactive near-field, and in the main beam of the radiator.

For mobile devices that are not exempt per Table B.1 [Table 1 of §1.1307(b)(1)(i)(C)] at distances from 20 cm to 40 cm and in 0.3 GHz to 6 GHz, evaluation of compliance with the exposure limits in §1.1310 is necessary if the ERP of the device is greater than ERP_{20cm} in Formula (B.1) [repeated from §2.1091(c)(1); also in §1.1307(b)(1)(i)(B)].

$$P_{th} \text{ (mW)} = ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases} \quad (B.1)$$

If the ERP is not easily obtained, then the available maximum time-averaged power may be used (i.e., without consideration of ERP only if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole.

SAR-based exemptions are constant at separation distances between 20 cm and 40 cm to avoid discontinuities in the threshold when transitioning between SAR-based and MPE-based exemption criteria at 40 cm, considering the importance of reflections.

| Limit calculation | | | |
|-------------------|----------------|----------------------|------------------|
| Frequency range | Frequency(MHz) | $R(\lambda/2\pi)(m)$ | Threshold ERP(W) |
| 300~1500MHz | 915 | 0.0522 | 0.032 |
| 1500~100000MHz | 2480 | 0.0193 | 0.007 |

4.3 SAR-based Exemption

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.



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Report No.: FYCR221100045403

Page: 9 of 11

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).



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Compliance Certification Services (Kunshan) Inc. Shenzhen Branch

SZCCS-TRF-01 Rev. A/0 Aug01,2022

Report No.: FYCR221100045403

Page: 10 of 11

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 |

| Limit calculation | | | | |
|----------------------|----------------|-------|--------------|--------------|
| Frequency range(GHz) | Frequency(GHz) | X | Distance(cm) | Pth (mW) |
| 0.3~1.5 | 0.915 | 1.474 | 0.5 | 8.133 |
| 1.5~6 | 2.48 | 1.905 | 0.5 | 2.717 |



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5 Measurement and Calculation

5.1 Maximum transmit power

For BLE:

The Power Data is based on the RF Test Report FYCR221100045402

Antenna Gain: 3.6dBi

Output Power Into Antenna & RF Exposure Evaluation Distance:

| Frequency | Maximum EIRP [dBm] | Maximum EIRP (mW) |
|-----------|--------------------|-------------------|
| 2480 | 2.62 | 1.83 |

5.2 RF Exposure Calculation

Remark: we used the maximum power between the conducted power and ERP/EIRP to perform RF exposure exemption evaluation.

For BLE transmitter:

The Max Power is 1.83mW. The best case gain of the antenna is 3.6dBi.

| | Evaluation method | Exempt Limit(mW) | Verdict |
|-------------------------------------|---------------------------------|------------------|---------|
| <input type="checkbox"/> | Blanket 1 mW Blanket Exemption | 1mW | N/A |
| <input type="checkbox"/> | MPE-based Exemption(ERP) | 3060mW | N/A |
| <input checked="" type="checkbox"/> | SAR-based Exemption(P_{th}) | 2.7mW | Yes |

So, the device is to qualify for SAR test exemption, the exemption report is in lieu of the SAR report.

--End of the Report--



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