# TEST REPORT

| | |
|---|---|
| **Applicant:** | Queclink Wireless Solutions Co., Ltd. |
| **Address:** | No.30, Lane 500, Xinlong Road, Minhang District, Shanghai, China |
| **Equipment Type:** | GPSTracker |
| **Model Name:** | GL522MG |
| **Brand Name:** | Queclink |
| **FCC ID:** | YQD-GL522MG |
| **Test Standard:** | 47 CFR Part 2.1091<br>KDB 447498 D04 v01 |
| **Sample Arrival Date:** | Sep. 19, 2024 |
| **Test Date:** | Sep. 29, 2024 - Nov. 01, 2024 |
| **Date of Issue:** | Jan. 16, 2025 |

**ISSUED BY:**

Shenzhen BALUN Technology Co., Ltd.

**Tested by:** Xiong Lining **Checked by:** Xu Rui **Approved by:** Tolan Tu

(Testing Director)

**Revision History**

| Version | Issue Date | Revisions Content |
|---|---|---|
| Rev. 01 | Jan. 16, 2025 | Initial Issue |

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# 1 GENERAL INFORMATION

## 1.1 Test Laboratory

| | |
|---|---|
| Name | Shenzhen BALUN Technology Co., Ltd. |
| Address | Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China |
| Phone Number | +86 755 6685 0100 |

## 1.2 Test Location

| | |
|---|---|
| Name | Shenzhen BALUN Technology Co., Ltd. |
| Location | ☐ Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China |
| | ☑ 1/F, Building B, Ganghongji High-tech Intelligent Industrial Park, No. 1008, Songbai Road, Yangguang Community, Xili Sub-district, Nanshan District, Shenzhen, Guangdong Province, P. R. China |
| Accreditation Certificate | The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196. |

# 2 PRODUCT INFORMATION

## 2.1 Applicant Information

| | |
|---|---|
| Applicant | Queclink Wireless Solutions Co., Ltd. |
| Address | No.30, Lane 500, Xinlong Road, Minhang District, Shanghai, China |

## 2.2 Manufacturer Information

| | |
|---|---|
| Manufacturer | Queclink Wireless Solutions Co., Ltd. |
| Address | No.30, Lane 500, Xinlong Road, Minhang District, Shanghai, China |

## 2.3 General Description for Equipment under Test (EUT)

| | |
|---|---|
| EUT Name | GPSTracker |
| Model Name Under Test | GL522MG |
| Series Model Name | N/A |
| Description of Model name differentiation | N/A |
| Hardware Version | N/A |
| Software Version | N/A |
| Dimensions (Approx.) | N/A |
| Weight (Approx.) | N/A |

## 2.4 Technical Information

| | |
|---|---|
| Network and Wireless connectivity | 2G Network GSM/GPRS/EGPRS 850/1900 MHz<br>4G Network FDD LTE-M1 Band 2/4/5/12/13/25/26/66/85<br>FDD NB-IoT Band 2/4/5/12/13/25/66/71/85<br>Bluetooth (BLE)<br>WIFI 802.11b, 802.11g and 802.11n(HT20/40)<br>GPS, GLONASS |

The requirement for the following technical information of the EUT was tested in this report:

| | | | |
|---|---|---|---|
| Operating Mode | WWAN; WLAN; Bluetooth | | |
| Frequency Range | GSM 850 | TX: 824 ~ 849 MHz | RX: 869 ~ 894 MHz |
| | GSM 1900 | TX: 1850 ~ 1910 MHz | RX: 1930 ~ 1990 MHz |
| | LTE-M1 Band 2 | TX: 1850 ~ 1910 MHz | RX: 1930 ~ 1990 MHz |
| | LTE-M1 Band 4 | TX: 1710 ~ 1755 MHz | RX: 2110 ~ 2155 MHz |
| | LTE-M1 Band 5 | TX: 824 ~ 849 MHz | RX: 869 ~ 894 MHz |
| | LTE-M1 Band 12 | TX: 699 ~ 716 MHz | RX: 729 ~ 746 MHz |
| | LTE-M1 Band 13 | TX: 777~ 787 MHz | RX: 746 ~ 756 MHz |
| | LTE-M1 Band 25 | TX: 1850 ~ 1915 MHz | RX: 1930 ~ 1995 MHz |
| | LTE-M1 Band 26 | TX: 824 ~ 849 MHz | RX: 869 ~ 894 MHz |
| | LTE-M1 Band 66 | TX: 1710 ~ 1780 MHz | RX: 2110 ~ 2180 MHz |
| | LTE-M1 Band 85 | TX: 698 ~ 716 MHz | RX:728 ~ 746 MHz |
| | LTE-NB-IoT Band 2 | TX: 1850 ~ 1910 MHz | RX: 1930 ~ 1990 MHz |
| | LTE-NB-IoT Band 4 | TX: 1710 ~ 1755 MHz | RX: 2110 ~ 2155 MHz |
| | LTE-NB-IoT Band 5 | TX: 824 ~ 849 MHz | RX: 869 ~ 894 MHz |
| | LTE-NB-IoT Band 12 | TX: 699 ~ 716 MHz | RX: 729 ~ 746 MHz |
| | LTE-NB-IoT Band 13 | TX: 777~ 787 MHz | RX: 746 ~ 756 MHz |
| | LTE-NB-IoT Band 25 | TX: 1850 ~ 1915 MHz | RX: 1930 ~ 1995 MHz |
| | LTE-NB-IoT Band 66 | TX: 1710 ~ 1780 MHz | RX: 2110 ~ 2180 MHz |
| | LTE-NB-IoT Band 71 | TX: 663 ~ 698 MHz | RX: 617 ~ 652 MHz |
| | LTE-NB-IoT Band 85 | TX: 698 ~ 716 MHz | RX:728 ~ 746 MHz |
| | 802.11b/g/ n(HT20/HT40) | 2412 ~ 2462 MHz | |
| | Bluetooth | 2402 ~ 2480 MHz | |
| Antenna Type | WWAN: FPC Antenna<br>WLAN: PCB Antenna<br>Bluetooth: PCB Antenna | | |
| Exposure Category | General Population/Uncontrolled Exposure | | |
| Product Type | Mobile Device | | |

# 3 SUMMARY OF TEST RESULT

## 3.1 Test Standards

| No. | Identity | Document Title |
|---|---|---|
| 1 | KDB 447498 D04 v01 | 447498 D04 Interim General RF Exposure Guidance v01 |

## 3.2 Limit Standards

| No. | Identity | Document Title |
|---|---|---|
| 1 | 47 CFR Part 2.1091 | Radiofrequency radiation exposure evaluation: mobile devices |

# 4 DEVICE CATEGORY AND LEVELS LIMITS

**Mobile Devices:**

CFR Title 47 §2.1091(b)

For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons.

**FCC KDB 447498 D04 General RF Exposure Guidance v01 Limit**

Evaluation of compliance with the exposure limits in § 1.1310 is necessary if the ERP of the device is greater than ERP20cm in Formula (B.1) [repeated from § 2.1091(c)(1) and § 1.1307(b)(1)(i)(B)].

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

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 λ/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.

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 Pth (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). Pth is given by Formula (B.2).

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

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 |

# 5 ASSESSMENT RESULT

## 5.1 Output Power

| Mode | GSM | |
|---|---|---|
| | GSM850 | GSM1900 |
| Conducted Power (dBm) | 25.97 | 22.97 |
| Antenna Gain (dBi) | 2.29 | 1.59 |
| ERP/EIRP (dBm) | 26.11 | 24.56 |
| Note: This table listed the worst case power value, please refer to R2005A0283-M1 report for more details. | | |

| LTE-M1 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Mode | Band2 | Band4 | Band5 | Band12 | Band13 | Band25 | Band26 | Band66 | Band85 |
| Conducted Power (dBm) | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 |
| Antenna Gain (dBi) | 1.59 | 2.00 | 2.29 | 3.26 | 4.45 | 1.59 | 2.29 | 0.97 | 3.26 |
| ERP/EIRP (dBm) | 26.59 | 27.00 | 25.14 | 26.11 | 27.30 | 26.59 | 25.14 | 25.97 | 26.11 |
| Note: This table listed the worst case power value, please refer to R2005A0283-M1 report for more details. | | | | | | | | | |

| LTE-NB-IoT | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Mode | Band2 | Band4 | Band5 | Band12 | Band13 | Band25 | Band66 | Band71 | Band85 |
| Conducted Power (dBm) | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 |
| Antenna Gain (dBi) | 1.59 | 2.00 | 2.29 | 3.26 | 4.45 | 1.59 | 0.97 | 1.66 | 3.26 |
| ERP/EIRP (dBm) | 26.59 | 27.00 | 25.14 | 26.11 | 27.30 | 26.59 | 25.97 | 24.51 | 26.11 |
| Note: This table listed the worst case power value, please refer to R2005A0283-M1 report for more details. | | | | | | | | | |

| Mode | 2.4G WIFI |
|---|---|
| Conducted Power (dBm) | 17.46 |
| Antenna Gain (dBi) | 0.00 |
| EIRP (dBm) | 17.46 |
| Note: This table listed the worst case power value, please refer to STR18098017I report for more details. | |

| Mode | Bluetooth |
|---|---|
| Conducted Power (dBm) | -1.61 |
| Antenna Gain (dBi) | 3.00 |
| EIRP (dBm) | 1.39 |
| Note: This table listed the worst case power value, please refer to BL-SZ2490432-601 report for more details. | |

## 5.2 Tune-up power

| Mode | Conducted Power Range (dBm) | EIRP Range (dBm) | ERP Range (dBm) |
|---|---|---|---|
| GSM850 | [24.00, 26.00] | / | [25.00, 27.00] |
| GSM1900 | [21.00, 23.00] | [23.00, 25.00] | [20.85, 22.85] |
| LTE-M1 Band2 | [24.00, 26.00] | [25.00, 27.00] | [22.85, 24.85] |
| LTE-M1 Band4 | [24.00, 26.00] | [26.00, 28.00] | [23.85, 25.85] |
| LTE-M1 Band5 | [24.00, 26.00] | / | [24.00, 26.00] |
| LTE-M1 Band12 | [24.00, 26.00] | / | [25.00, 27.00] |
| LTE-M1 Band13 | [24.00, 26.00] | / | [26.00, 28.00] |
| LTE-M1 Band25 | [24.00, 26.00] | [25.00, 27.00] | [22.85, 24.85] |
| LTE-M1 Band26 | [24.00, 26.00] | / | [24.00, 26.00] |
| LTE-M1 Band66 | [24.00, 26.00] | [24.00, 26.00] | [21.85, 23.85] |
| LTE-M1 Band85 | [24.00, 26.00] | / | [25.00, 27.00] |
| LTE-NB-IoT Band Band2 | [24.00, 26.00] | [25.00, 27.00] | [22.85, 24.85] |
| LTE-NB-IoT Band Band4 | [24.00, 26.00] | [26.00, 28.00] | [23.85, 25.85] |
| LTE-NB-IoT Band Band5 | [24.00, 26.00] | / | [24.00, 26.00] |
| LTE-NB-IoT Band Band12 | [24.00, 26.00] | / | [25.00, 27.00] |
| LTE-NB-IoT Band Band13 | [24.00, 26.00] | / | [26.00, 28.00] |
| LTE-NB-IoT Band Band25 | [24.00, 26.00] | [25.00, 27.00] | [22.85, 24.85] |
| LTE-NB-IoT Band Band66 | [24.00, 26.00] | [24.00, 26.00] | [21.85, 23.85] |
| LTE-NB-IoT Band Band71 | [24.00, 26.00] | / | [23.00, 25.00] |
| LTE-NB-IoT Band Band85 | [24.00, 26.00] | / | [25.00, 27.00] |
| 2.4G WIFI | [16.00, 18.00] | [16.00, 18.00] | [13.85, 15.85] |
| Bluetooth | [-3.00, -1.00] | [0.00, 2.00] | [-2.15, -0.15] |
| Note1: ERP= EIRP -2.15dB.<br>Note2: According KDB 447498 D04, used the greater of maximum conducted power and ERP to compare with the threshold value Pth. | | | |

## 5.3 RF Exposure Evaluation Result

| Evolution mode | Maximum Power (dBm) | Maximum Power (mw) | Distance (mm) | Threshold Power (mW) | Power / Limit | Verdict |
|---|---|---|---|---|---|---|
| GSM850 | 27.00 | 501.19 | 200 | 1731.96 | 0.2894 | Pass |
| GSM1900 | 23.00 | 199.53 | 200 | 3060.00 | 0.0652 | Pass |
| LTE-M1 Band2 | 26.00 | 398.11 | 200 | 3060.00 | 0.1301 | Pass |
| LTE-M1 Band4 | 26.00 | 398.11 | 200 | 3060.00 | 0.1301 | Pass |
| LTE-M1 Band5 | 26.00 | 398.11 | 200 | 1731.96 | 0.2299 | Pass |
| LTE-M1 Band12 | 27.00 | 501.19 | 200 | 1460.64 | 0.3431 | Pass |
| LTE-M1 Band13 | 28.00 | 630.96 | 200 | 1605.48 | 0.3930 | Pass |
| LTE-M1 Band25 | 26.00 | 398.11 | 200 | 3060.00 | 0.1301 | Pass |
| LTE-M1 Band26 | 26.00 | 398.11 | 200 | 1731.96 | 0.2299 | Pass |
| LTE-M1 Band66 | 26.00 | 398.11 | 200 | 3060.00 | 0.1301 | Pass |
| LTE-M1 Band85 | 27.00 | 501.19 | 200 | 1460.64 | 0.3431 | Pass |
| LTE-NB-IoT Band Band2 | 26.00 | 398.11 | 200 | 3060.00 | 0.1301 | Pass |
| LTE-NB-IoT Band Band4 | 26.00 | 398.11 | 200 | 3060.00 | 0.1301 | Pass |
| LTE-NB-IoT Band Band5 | 26.00 | 398.11 | 200 | 1731.96 | 0.2299 | Pass |
| LTE-NB-IoT Band Band12 | 27.00 | 501.19 | 200 | 1460.64 | 0.3431 | Pass |
| LTE-NB-IoT Band Band13 | 28.00 | 630.96 | 200 | 1605.48 | 0.3930 | Pass |
| LTE-NB-IoT Band Band25 | 26.00 | 398.11 | 200 | 3060.00 | 0.1301 | Pass |
| LTE-NB-IoT Band Band66 | 26.00 | 398.11 | 200 | 3060.00 | 0.1301 | Pass |
| LTE-NB-IoT Band Band71 | 26.00 | 398.11 | 200 | 1423.92 | 0.2796 | Pass |
| LTE-NB-IoT Band Band85 | 27.00 | 501.19 | 200 | 1460.64 | 0.3431 | Pass |
| 2.4G WIFI | 18.00 | 63.10 | 200 | 3060.00 | 0.0206 | Pass |
| Bluetooth | -0.15 | 0.97 | 200 | 3060.00 | 0.0003 | Pass |

## 5.4 Collocated Power Calculation

| Evolution mode | Frequency (GHz) | Power / Limit | Σ(Power / Limit) of WWAN + WLAN + BT | Verdict |
|---|---|---|---|---|
| LTE-M1 Band13 | 0.787 | 0.3930 | **0.4139** | Pass |
| 2.4G WIFI | 2.620 | 0.0206 | | |
| Bluetooth | 2.480 | 0.0003 | | |

Note:

1. Σ(Power / Limit): This is a summation of [(power for each transmitter/ antenna included in the simultaneous transmission)/ (corresponding Power limit)], for WWAN + WLAN + BT.
2. Both of the WWAN/WLAN/BT can transmit simultaneously, the formula of calculated the Power is CP1 / LP1 + CP2 / LP2 + ……etc. < 1
   CP = Calculation power
   LP = Limit of power
3. The worst-case situation is 0.4139, which is less than “1”. This confirmed that the device comply with FCC KDB 447498 D04 Power limit.
4. The DUT work frequency range used is 777 MHz ~ 787 MHz, 2412 MHz ~ 2462 MHz and 2402 MHz ~ 2480 MHz the result close to the limit by the above formula, so we select worst case power to calculate the exclusion power threshold.

## 5.5 Conclusion

This EUT is deemed to comply with the reference level limits, therefore the basic restrictions are compliant with human exposure limits.

# Statement

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--END OF REPORT--