

## MPE Report

Applicant : PISMO LABS TECHNOLOGY LIMITED  
Product Type : PEPWAVE / peplink Wireless Product  
Trade Name : PEPWAVE / peplink  
Model Number : Balance 20X, B20X, Surf SOHO, Surf SOHO LTE,  
Surf SOHO LTEA, Balance 20X LTE,  
Balance 20X LTEA, PismoAC8E, BPL-021X-LTE-US-T,  
BPL-021X-LTEA-W-T, EXM-MINI-1LTEA-W, EXM-MINI-1LTEA-P,  
PismoAC8P, PismoAC8  
FCC ID : U8G-P1AC8E  
Test Specification : ANSI / IEEE Std.C95.1-1992 / IEEE Std. 1528-2013  
47 CFR § 2.1091  
47 CFR § 1.1310  
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### Issue by

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Taiwan Accreditation Foundation accreditation number: 1330  
Test Firm MRA designation number: TW0010

#### Note:

- 1.The test results are valid only for samples provided by customers and under the test conditions described in this report.
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- 3.The relevant information is provided by customers in this test report. According to the correctness, appropriateness or completeness of the information provided by the customer, if there is any doubt or error in the information which affects the validity of the test results, the laboratory does not take the responsibility.



### **Revision History**

| Rev. | Issue Date    | Revisions     | Revised By   |
|------|---------------|---------------|--------------|
| 00   | Aug. 27, 2019 | Initial Issue | Jennifer Liu |
|      |               |               |              |
|      |               |               |              |
|      |               |               |              |



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## 1. Reference Testing Standards

| Standard        | Description  | Version |
|-----------------|--|---------|
| ANSI/IEEE C95.1 | American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 300 KHz to 100 GHz, New York. | 2005    |

## 2. Description of Equipment under Test (EUT)

|   |  |                       |
|---|--|-----------------------|
| Applicant   | PISMO LABS TECHNOLOGY LIMITED<br>A8, 5/F, HK Spinners Industrial Building, Phase 6, 481 Castle Peak Road, Cheung Sha Wan, Hong Kong  |                       |
| Manufacturer  | PISMO LABS TECHNOLOGY LIMITED<br>A8, 5/F, HK Spinners Industrial Building, Phase 6, 481 Castle Peak Road, Cheung Sha Wan, Hong Kong  |                       |
| Product Type  | PEPWAVE / peplink Wireless Product   |                       |
| Trade Name  | PEPWAVE / peplink  |                       |
| Model Number  | Balance 20X, B20X, Surf SOHO, Surf SOHO LTE, Surf SOHO LTEA, Balance 20X LTE, Balance 20X LTEA, PismoAC8E, BPL-021X-LTE-US-T, BPL-021X-LTEA-W-T, EXM-MINI-1LTEA-W, EXM-MINI-1LTEA-P, PismoAC8P, PismoAC8 |                       |
| Product Type /Trade Name / Model Number Different Description | These product Type & trade names & model numbers differ from each other in selling region.   |                       |
| FCC ID  | U8G-P1AC8E   |                       |
| IMEI No.  | LE910C4-NF: 354328092001740<br>MC7455: 359072064700480   |                       |
| Frequency Range   | Operate Band   | Frequency Range (MHz) |
|   | Module: Telit, LE910C4-NF  |                       |
|   | WCDMA(RMC12.2K)/HSDPA/HSUPA Band II  | 1852.4-1907.6         |
|   | WCDMA(RMC12.2K)/HSDPA/HSUPA Band IV  | 1712.4-1752.6         |
|   | WCDMA(RMC12.2K)/HSDPA/HSUPA Band V   | 826.4-846.6           |
|   | LTE Band 2 (BW 1.4, 3, 5, 10, 15, 20 MHz)  | 1850-1910             |
|   | LTE Band 4 (BW 1.4, 3, 5, 10, 15, 20 MHz)  | 1710-1755             |
|   | LTE Band 5 (BW 1.4, 3, 5, 10 MHz)  | 824-849               |
|   | LTE Band 12 (BW 1.4, 3, 5, 10 MHz)   | 699-716               |
|   | LTE Band 13 (BW 5, 10 MHz)   | 777-787               |
|   | LTE Band 14 (BW 5, 10 MHz)   | 788-798               |
|   | LTE Band 66 (BW 1.4, 3, 5, 10, 15, 20 MHz)   | 1710-1780             |
|   | LTE Band 71 (BW 5, 10, 15, 20 MHz)   | 663-698               |



| Frequency Range | Module: Sierra, MC7455                                   |               |
|-----------------|--|---------------|
|                 | WCDMA(RMC12.2K)/HSDPA/HSUPA Band II                      | 1852.4-1907.6 |
|                 | WCDMA(RMC12.2K)/HSDPA/HSUPA Band IV                      | 1712.4-1752.6 |
|                 | WCDMA(RMC12.2K)/HSDPA/HSUPA Band V                       | 826.4-846.6   |
|                 | LTE Band 2 (BW 1.4, 3, 5, 10, 15, 20 MHz)                | 1850-1910     |
|                 | LTE Band 4 (BW 1.4, 3, 5, 10, 15, 20 MHz)                | 1710-1755     |
|                 | LTE Band 5 (BW 1.4, 3, 5, 10 MHz)                        | 824-849       |
|                 | LTE Band 7 (BW 5, 10, 15, 20 MHz)                        | 2500-2570     |
|                 | LTE Band 12 (BW 1.4, 3, 5, 10 MHz)                       | 699-716       |
|                 | LTE Band 13 (BW 5, 10 MHz)                               | 777-787       |
|                 | LTE Band 25 (BW 1.4, 3, 5, 10, 15, 20 MHz)               | 1850-1915     |
|                 | LTE Band 26 (BW 1.4, 3, 5, 10, 15 MHz)                   | 814-849       |
|                 | LTE Band 30 (BW 5, 10 MHz)                               | 2305-2315     |
|                 | LTE Band 41 (BW 5, 10, 15, 20 MHz)                       | 2496-2690     |
|                 | WLAN   |               |
|                 | IEEE 802.11b / 802.11g / 802.11n 2.4 GHz 20 MHz (256QAM) | 2412-2462     |
|                 | IEEE 802.11n 2.4 GHz 40 MHz (256QAM)                     | 2422-2452     |
|                 | IEEE 802.11a U-NII Band I                                | 5180-5240     |
|                 | IEEE 802.11a U-NII Band III                              | 5745-5825     |
|                 | IEEE 802.11n 5 GHz / 802.11ac 20 MHz U-NII Band I        | 5180-5240     |
|                 | IEEE 802.11n 5 GHz / 802.11ac 20 MHz U-NII Band III      | 5745-5825     |
|                 | IEEE 802.11n 5 GHz / 802.11ac 40 MHz U-NII Band I        | 5190-5230     |
|                 | IEEE 802.11n 5 GHz / 802.11ac 40 MHz U-NII Band III      | 5755-5795     |
|                 | IEEE 802.11ac 80 MHz U-NII Band I                        | 5210          |
|                 | IEEE 802.11ac 80 MHz U-NII Band III                      | 5775          |



|                     |                           |              |                              |                 |                 |
|---------------------|---------------------------|--------------|------------------------------|-----------------|-----------------|
| Antenna Information | ANT                       | Model        | Type                         | Frequency (MHz) | Max. Gain (dBi) |
|                     | Module: Telit, LE910C4-NF |              |                              |                 |                 |
|                     | Main                      | 98619ZSAX053 | Replacement Antenna          | WCDMA Band II   | 2.14            |
|                     |                           |              |                              | WCDMA Band IV   | 2.56            |
|                     |                           |              |                              | WCDMA Band V    | 1.80            |
|                     |                           |              |                              | LTE Band 2      | 2.14            |
|                     |                           |              |                              | LTE Band 4      | 2.56            |
|                     |                           |              |                              | LTE Band 5      | 1.80            |
|                     |                           |              |                              | LTE Band 12     | 1.71            |
|                     |                           |              |                              | LTE Band 13     | 1.87            |
|                     |                           |              |                              | LTE Band 14     | 1.66            |
|                     |                           |              |                              | LTE Band 66     | 2.56            |
|                     |                           |              |                              | LTE Band 71     | 1.50            |
|                     | Module: Sierra, MC7455    |              |                              |                 |                 |
|                     | Main                      | 98619ZSAX025 | Replacement Antenna          | WCDMA Band II   | 3.77            |
|                     |                           |              |                              | WCDMA Band IV   | 3.74            |
|                     |                           |              |                              | WCDMA Band V    | 1.69            |
|                     |                           |              |                              | LTE Band 2      | 3.77            |
|                     |                           |              |                              | LTE Band 4      | 3.74            |
|                     |                           |              |                              | LTE Band 5      | 1.69            |
|                     |                           |              |                              | LTE Band 7      | 2.77            |
|                     |                           |              |                              | LTE Band 12     | 1.93            |
|                     |                           |              |                              | LTE Band 13     | 1.93            |
|                     |                           |              |                              | LTE Band 25     | 3.77            |
|                     |                           |              |                              | LTE Band 26     | 1.69            |
|                     |                           |              |                              | LTE Band 30     | 2.64            |
|                     |                           |              |                              | LTE Band 41     | 2.80            |
|                     | WLAN                      |              |                              |                 |                 |
|                     | ANT-0 / ANT-1             | 98614PRSX000 | Replacement antenna (RP SMA) | 2412-2462       | 2.44            |
|                     |                           |              |                              | 5150-5250       | 4.10            |
|                     |                           |              |                              | 5725-5850       | 4.73            |
|                     | G <sub>ANT</sub>          |              |                              | 2412-2462       | 2.44            |
|                     |                           |              |                              | 5150-5250       | 4.10            |
|                     |                           |              |                              | 5725-5850       | 4.73            |
|                     | Directional Gain          |              |                              | 2412-2462       | 5.45            |
|                     |                           |              |                              | 5150-5250       | 7.11            |
|                     |                           |              |                              | 5725-5850       | 7.74            |



|                     |   |
|---------------------|---|
| Antenna Delivery    | IEEE 802.11b: 1TX (Diversity)<br>IEEE 802.11g: 2TX (CDD)<br>IEEE 802.11n 2.4 GHz 20 MHz / 40 MHz: 2TX (MIMO)<br>IEEE 802.11a: 2TX (CDD)<br>IEEE 802.11ac 20 MHz / 40 MHz / 80 MHz: 2TX (MIMO) |
| RF Evaluation       | 0.445 mW/cm <sup>2</sup>  |
| Operate Temp. Range | -10 ~ 45°C  |

The above equipment was tested by A Test Lab Techno Corp. For compliance with the requirements set forth in 47 CFR § 2.1091 / 47 CFR § 1.1310. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties



### 3. *Human Exposure Assessment*

Due to the design and installation of this product, it is not possible to conduct SAR evaluation. This is because client either manufactures or supplies the antenna(s) that will be used in the installation of this product. Therefore, this product will be evaluated as a mobile device per 47 CFR § 1.1310 titled "Radiofrequency radiation exposure limits", generally referred to as MPE limits.

In 47 CFR § 2.1091, paragraph (b) defines a mobile device 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 cm is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. " This product is intended to be installed into a vehicle such that the unit is physically secured at one location. In the installation guide supplied with the product,

Client has made the following statement: "IMPORTANT: To meet the FCC's RF Exposure Guidelines, the antenna should be installed so there is at least 20 cm of separation between the body of the user and nearby persons and the antenna". Based on the installation of the transceiver and the antenna, the transmitters radiating structure is more than 20 cm from the user. Thus, this product is a "mobile device" as defined in section § 2.1091 paragraph (b).

| Exposure evaluation   |
|---|
| $S = \frac{PG}{4\pi R^2}$ <p>Where<br/>S: power density<br/>P: power input to the antenna<br/>G: power gain of the antenna in the direction of interest relative to an isotropic radiator.<br/>R: distance to the center of radiation of the antenna.</p> |



## 4. RF Output Power

Note: The WWAN power results are refer to Sierra MC7455 & LE910C4-NF Module report.

| Band                        | Data Rate<br>(Mbps) | Frequency<br>(MHz) | Average Conducted power<br>(dBm) |       |              |
|-----------------------------|---------------------|--------------------|----------------------------------|-------|--------------|
|                             |                     |                    | ANT-0                            | ANT-1 | ANT-0+1      |
| IEEE 802.11b                | 1                   | 2412.0             | 20.08                            | 20.46 | 23.28        |
|                             |                     | 2437.0             | 22.62                            | 22.46 | <b>25.55</b> |
|                             |                     | 2462.0             | 20.92                            | 20.95 | 23.95        |
| IEEE 802.11g                | 6                   | 2412.0             | 16.46                            | 16.42 | 19.45        |
|                             |                     | 2437.0             | 23.72                            | 23.44 | 26.59        |
|                             |                     | 2462.0             | 16.79                            | 16.61 | 19.71        |
| IEEE 802.11n 2.4 GHz 20 MHz | 13                  | 2412.0             | 16.41                            | 16.42 | 19.43        |
|                             |                     | 2437.0             | 22.31                            | 21.94 | 25.14        |
|                             |                     | 2462.0             | 15.31                            | 14.95 | 18.14        |
| IEEE 802.11n 2.4 GHz 40 MHz | 27                  | 2422.0             | 13.13                            | 13.11 | 16.13        |
|                             |                     | 2437.0             | 16.91                            | 16.82 | 19.88        |
|                             |                     | 2452.0             | 12.62                            | 12.42 | 15.53        |

Note: The relevant measured result has the offset with cable loss already.

| Band                 | Data Rate<br>(Mbps) | Frequency<br>(MHz) | Average Conducted power<br>(dBm) |       |              |
|----------------------|---------------------|--------------------|----------------------------------|-------|--------------|
|                      |                     |                    | ANT-0                            | ANT-1 | ANT-0+1      |
| IEEE 802.11a         | 6                   | 5180.0             | 16.31                            | 16.03 | 19.18        |
|                      |                     | 5200.0             | 18.22                            | 18.02 | 21.13        |
|                      |                     | 5220.0             | 18.25                            | 18.12 | 21.20        |
|                      |                     | 5240.0             | 18.31                            | 18.25 | <b>21.29</b> |
|                      |                     | 5745.0             | 17.25                            | 16.64 | <b>19.97</b> |
|                      |                     | 5765.0             | 17.15                            | 16.63 | 19.91        |
|                      |                     | 5785.0             | 17.07                            | 16.57 | 19.84        |
|                      |                     | 5805.0             | 16.93                            | 16.53 | 19.74        |
|                      |                     | 5825.0             | 16.96                            | 16.61 | 19.80        |
| IEEE 802.11ac 20 MHz | 13                  | 5180.0             | 16.35                            | 16.18 | 19.28        |
|                      |                     | 5200.0             | 18.25                            | 18.07 | 21.17        |
|                      |                     | 5220.0             | 18.31                            | 18.22 | 21.28        |
|                      |                     | 5240.0             | 18.41                            | 18.35 | <b>21.39</b> |
|                      |                     | 5745.0             | 17.25                            | 16.35 | <b>19.83</b> |
|                      |                     | 5765.0             | 17.16                            | 16.31 | 19.77        |
|                      |                     | 5785.0             | 16.98                            | 16.25 | 19.64        |
|                      |                     | 5805.0             | 16.81                            | 16.35 | 19.60        |
|                      |                     | 5825.0             | 16.84                            | 16.55 | 19.71        |
| IEEE 802.11ac 40 MHz | 27                  | 5190.0             | 13.42                            | 13.12 | 16.28        |
|                      |                     | 5230.0             | 18.35                            | 18.31 | <b>21.34</b> |
|                      |                     | 5755.0             | 17.86                            | 17.02 | <b>20.47</b> |
|                      |                     | 5795.0             | 17.64                            | 17.01 | 20.35        |
| IEEE 802.11ac 80 MHz | 58.6                | 5210.0             | 10.37                            | 10.05 | <b>13.22</b> |
|                      |                     | 5775.0             | 15.35                            | 14.55 | <b>17.98</b> |

Note: The relevant measured result has the offset with cable loss already.

## 5. Test Result

| Antenna                          | Band          | Frequency (MHz) | Limit (mw)/cm <sup>2</sup> | Distance [R] (cm) | Tune-up Power [P] (dBm) | ANT Gain (dBi) | Numeric Gain [G] | Duty Cycle | Power with Duty cycle [TP] (mW) | Power Density [S] (mw)/cm <sup>2</sup> |
|----------------------------------|---------------|-----------------|----------------------------|-------------------|-------------------------|----------------|------------------|------------|---------------------------------|--|
| WWAN Antenna (Telit, LE910C4-NF) | WCDMA Band II | 1852.4-1907.6   | 1.000                      | 20                | 25.00                   | 2.14           | 1.64             | 1          | 518.61                          | 0.103                                  |
|                                  | WCDMA Band IV | 1712.4-1752.6   | 1.000                      | 20                | 25.50                   | 2.56           | 1.80             | 1          | 638.66                          | 0.127                                  |
|                                  | WCDMA Band V  | 826.4-846.6     | 0.564                      | 20                | 25.50                   | 1.80           | 1.51             | 1          | 535.77                          | 0.107                                  |
|                                  | LTE Band 2    | 1850-1910       | 1.000                      | 20                | 25.00                   | 2.14           | 1.64             | 1          | 518.61                          | 0.103                                  |
|                                  | LTE Band 4    | 1710-1755       | 1.000                      | 20                | 25.50                   | 2.56           | 1.80             | 1          | 638.66                          | 0.127                                  |
|                                  | LTE Band 5    | 824-849         | 0.566                      | 20                | 25.50                   | 1.80           | 1.51             | 1          | 535.77                          | 0.107                                  |
|                                  | LTE Band 12   | 699-716         | 0.477                      | 20                | 25.00                   | 1.71           | 1.48             | 1          | 468.02                          | 0.093                                  |
|                                  | LTE Band 13   | 777-787         | 0.525                      | 20                | 25.00                   | 1.87           | 1.54             | 1          | 486.99                          | 0.097                                  |
|                                  | LTE Band 14   | 788-798         | 0.532                      | 20                | 25.00                   | 1.66           | 1.47             | 1          | 464.85                          | 0.092                                  |
|                                  | LTE Band 66   | 1710-1780       | 1.000                      | 20                | 25.00                   | 2.56           | 1.80             | 1          | 569.21                          | 0.113                                  |
| WWAN Antenna (Sierra, MC7455)    | LTE Band 71   | 663-698         | 0.465                      | 20                | 25.00                   | 1.50           | 1.41             | 1          | 445.88                          | 0.089                                  |
|                                  | WCDMA Band II | 1852.4-1907.6   | 1.000                      | 20                | 24.00                   | 3.77           | 2.38             | 1          | 597.83                          | 0.119                                  |
|                                  | WCDMA Band IV | 1712.4-1752.6   | 1.000                      | 20                | 24.00                   | 3.74           | 2.37             | 1          | 595.32                          | 0.118                                  |
|                                  | WCDMA Band V  | 826.4-846.6     | 0.564                      | 20                | 24.00                   | 1.69           | 1.48             | 1          | 371.76                          | 0.074                                  |
|                                  | LTE Band 2    | 1850-1910       | 1.000                      | 20                | 24.00                   | 3.77           | 2.38             | 1          | 597.83                          | 0.119                                  |
|                                  | LTE Band 4    | 1710-1755       | 1.000                      | 20                | 24.00                   | 3.74           | 2.37             | 1          | 595.32                          | 0.118                                  |
|                                  | LTE Band 5    | 824-849         | 0.566                      | 20                | 24.00                   | 1.69           | 1.48             | 1          | 371.76                          | 0.074                                  |
|                                  | LTE Band 7    | 2500-2570       | 1.000                      | 20                | 23.00                   | 2.77           | 1.89             | 1          | 377.10                          | 0.075                                  |
|                                  | LTE Band 12   | 699-716         | 0.477                      | 20                | 24.00                   | 1.93           | 1.56             | 1          | 391.85                          | 0.078                                  |
|                                  | LTE Band 13   | 777-787         | 0.525                      | 20                | 24.00                   | 1.93           | 1.56             | 1          | 391.85                          | 0.078                                  |
|                                  | LTE Band 25   | 1850-1915       | 1.000                      | 20                | 24.00                   | 3.77           | 2.38             | 1          | 597.83                          | 0.119                                  |
|                                  | LTE Band 26   | 814-849         | 0.566                      | 20                | 24.00                   | 1.69           | 1.48             | 1          | 371.76                          | 0.074                                  |
|                                  | LTE Band 30   | 2305-2315       | 1.000                      | 20                | 23.00                   | 2.64           | 1.84             | 1          | 367.13                          | 0.073                                  |
|                                  | LTE Band 41   | 2496-2690       | 1.000                      | 20                | 23.00                   | 2.80           | 1.91             | 1          | 381.10                          | 0.076                                  |
| Wi-Fi Antenna                    | 2.4 GHz       | 2412-2462       | 1.000                      | 20                | 27.00                   | 2.44           | 1.75             | 1          | 877.08                          | 0.174                                  |
|                                  | 5 GHz         | 5150-5250       | 1.000                      | 20                | 21.50                   | 7.11           | 5.14             | 1          | 726.04                          | 0.144                                  |
|                                  |               | 5725-5850       | 1.000                      | 20                | 20.50                   | 7.74           | 5.94             | 1          | 666.48                          | 0.133                                  |

### Note:

1. Mobile or fixed location transmitters, minimum separation distance is 20 cm, even if calculations indicate MPE distance is less.
2. We used the maximum power and gain to provide MPE results.
3. The Numeric Gain calculated by  $10^{(\text{ant. Gain(dBi)} / 10)}$ .
4. The MPE results are evaluated by lowest data rate for WLAN.

Simultaneous Transmitting :

$$\text{Total MPE} = \text{WWAN} + 2.4\text{GHz MPE} + 5\text{GHz MPE} = 0.127 + 0.174 + 0.144 = 0.445 \text{ (mw)/cm}^2 < 1 \text{ (mw)/cm}^2$$

---END---