



Radio Frequency Exposure Evaluation Report

FOR:
Zonar Systems

Model Name:
ZTCU4B

Product Description:
Vehicle mounted Telematics device

FCC ID: SEJ-ZTCU4B
IC ID: 5266A-ZTCU4B

Per:

CFR Part Part1 (1.1307 &1.1310), Part 2 (2.1091),
FCC KDB 447498 D01 General RF Exposure Guidance v06
ISED RSS-102 Issue 5

Report number: EMC_ZONAR_019_19001_FCC_ISED_MPE

DATE: 2019-06-21



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1 Assessment

This RF Exposure evaluation report provides evidence for compliance of the below identified device with the RF Exposure limits for mobile devices as defined in FCC CFR Part 1 (1.1307 & 1.1310), Part 2 (2.1091) and IC standard RSS-102 issue 5 under worst case conditions (measured or rated RF output power, antenna gain, distance towards human body, multiple transmitter information as presented by the applicant).

In addition, maximum antenna gain or minimum distance towards the human body is calculated respectively, where relevant.

The device meets the limits as stipulated by the above given FCC and IC rule parts based on available specifications for worst case conditions at 20cm distance to the body.

| Company | Description | Model # |
|---------------|-----------------------------------|---------|
| Zonar Systems | Vehicle mounted Telematics device | ZTCU4B |

Report reviewed by: TCB Evaluator

| 2019-06-21 | Compliance | Cindy Li (Lab Manager) | |
|------------|------------|---------------------------|-----------|
| Date | Section | Name | Signature |

Responsible for the Report:

| 2019-06-21 | Compliance | Yuchan Lu (Test Engineer) | |
|------------|------------|------------------------------|-----------|
| Date | Section | Name | Signature |

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the Test Report

| | |
|------------------------------------|------------------------|
| Company Name: | CETECOM Inc. |
| Department: | Compliance |
| Street Address: | 411 Dixon Landing Road |
| City/Zip Code | Milpitas, CA 95035 |
| Country | USA |
| Telephone: | +1 (408) 586 6200 |
| Fax: | +1 (408) 586 6299 |
| Lab Manager: | Cindy Li |
| Responsible Project Leader: | Sangeetha Sivaraman |

2.2 Identification of the Client / Manufacturer

| | |
|--------------------------|----------------------------|
| Applicant's Name: | Zonar Systems |
| Street Address: | 18200 Cascade Avenue North |
| City/Zip Code | Seattle Washington, 98188 |
| Country | USA |

Identification of the Manufacturer

| | |
|-------------------------------|----------------|
| Manufacturer's Name: | Same as Client |
| Manufacturers Address: | |
| City/Zip Code | |
| Country | |

3 Equipment under Assessment

| | |
|---|---|
| Marketing name: | V4 Base |
| HW Version : | 2 |
| SW Version : | 4.8 |
| Firmware Version Identification Number (FVIN): | 4.8 |
| Hardware Version Identification Number (HVIN): | ZTCU4B |
| Product Marketing Name (PMN): | V4 Base |
| Regulatory Band: | <ul style="list-style-type: none"> ❖ <u>Cellular Module:</u> <ul style="list-style-type: none"> ▪ GSM 850: 824.2 ~ 848.8 MHz ▪ GSM 1900: 1850.2 ~ 1909.8 MHz ▪ WCDMA/UMTS FDD BAND II: 1852.4 ~ 1907.6 MHz ▪ WCDMA/UMTS FDD BAND IV: 1712.4 ~ 1752.6 MHz ▪ WCDMA/UMTS FDD BAND V: 826.4 ~ 846.6 MHz ▪ LTE BAND 2: 1850.7 ~ 1909.3 MHz ▪ LTE BAND 4: 1710.7 ~ 1754.3 MHz ▪ LTE BAND 5: 824.7 ~ 848.3 MHz ▪ LTE BAND 7: 2502.5 ~ 2567.5 MHz ▪ LTE BAND 17: 706.5 ~ 713.5 MHz ❖ <u>Bluetooth Classic:</u> <ul style="list-style-type: none"> ▪ 2402 MHz (ch0) – 2480 MHz (ch78), 79 channels ❖ <u>Bluetooth LE:</u> <ul style="list-style-type: none"> ▪ 2402 MHz (ch0) – 2480 MHz (ch39), 40 channels ❖ <u>WLAN</u> <ul style="list-style-type: none"> ▪ 2412 MHz (ch1) – 2462 MHz (ch11), 11 channels |
| Integrated Module Info: | <ul style="list-style-type: none"> ❖ <u>Cellular Module:</u> <ul style="list-style-type: none"> ▪ Module name: ublox ▪ Module number: TOBY-R200 ▪ FCC/IC ID: XPYTOBYL200 / 8595A-TOBYL200 ❖ <u>Bluetooth Classic, Bluetooth LE:</u> <ul style="list-style-type: none"> ▪ Module name: ublox ▪ Module number: NINA-B222 ▪ FCC/IC ID: XPYNINAB22 / 8595A-NINAB22 ❖ <u>WLAN:</u> <ul style="list-style-type: none"> ▪ Module name: ublox |

| | |
|---|---|
| | <ul style="list-style-type: none"> ▪ Module number: ELLA-W131 ▪ FCC/IC ID: PV7-WIBEAR11N-SF1 / 7738A-WB11NSF1 <p>❖ <u>GPS</u></p> <ul style="list-style-type: none"> ▪ Module name: ublox ▪ Module number: MAX-M8Q-0-01 |
| <p>Antenna Type:</p> | <p>❖ <u>Cellular: Primary antenna maximum gains:</u></p> <ul style="list-style-type: none"> ▪ GSM 850: 0.77 dBi ▪ GSM 1900: 2.92 dBi ▪ WCDMA II: 2.92 dBi ▪ WCDMA IV: 3.05 dBi ▪ WCDMA V: 0.77 dBi ▪ LTE Band 2: 2.92 dBi ▪ LTE Band 4: 3.05 dBi ▪ LTE Band 5: 0.77 dBi ▪ LTE Band 7: 3.72 dBi ▪ LTE Band 17: -0.21 dBi <p>❖ <u>Bluetooth Classic, Bluetooth LE:</u></p> <ul style="list-style-type: none"> ▪ PIFA ▪ Antenna gain: 3 dBi <p>❖ <u>WLAN:</u></p> <ul style="list-style-type: none"> ▪ Ceramic chip, solder SMD ▪ Antenna gain: 0.5 dBi |
| <p>Maximum Conducted Output Power:</p> | <p>❖ <u>Cellular:</u> From modular grant [Watts]:</p> <ul style="list-style-type: none"> ▪ GSM 850: 1.476 ▪ GSM1900: 1.117 ▪ WCDMA Band II: 0.2218 ▪ WCDMA Band IV: 0.2432 ▪ WCDMA Band V: 0.182 ▪ LTE Band 2: 0.2748 ▪ LTE Band 4: 0.2858 ▪ LTE Band 5: 0.271 ▪ LTE Band 7: 0.2244 ▪ LTE Band 17: 0.2427 <p>❖ <u>Bluetooth Classic:</u> From modular report [Watts]: 0.00692</p> <p>❖ <u>Bluetooth LE:</u> From modular grant [Watts]: 0.014</p> <p>❖ <u>WLAN:</u> From modular grant [Watts]: 0.27</p> |

| | |
|---|---|
| Power Supply/ Rated Operating Voltage Range: | Low 9VDC, Nominal 13-14VDC, High 32VDC |
| Operating Temperature Range: | Low -40° C, Nominal 23° C, High 85° C |
| Sample Revision: | <input type="checkbox"/> Prototype Unit; <input checked="" type="checkbox"/> Production Unit; <input type="checkbox"/> Pre-Production |

4 RF Exposure Limits and FCC and IC Basic Rules

For the specific described radio apparatus the following basic limits and rules apply for both, FCC and IC where not indicated differently.

4.1 Power Density Limits acc. to FCC 1.1310(e) / RSS-102 i5, cl. 4:

FCC

| Frequency Range (MHz) | Power density (mW/cm ²) | Averaging time (minutes) |
|-----------------------|-------------------------------------|--------------------------|
| 300 – 1500 | f (MHz) /1500 | 30 |
| 1500 – 100.000 | 1.0 | 30 |

IC

| | | |
|------------|-------------------------------------|---|
| 300 – 6000 | 0.02619 x f (MHz) ^{0.6834} | 6 |
|------------|-------------------------------------|---|

4.2 Routine Environmental Evaluation Categorical Exclusion Limits acc. to FCC 2.109(c) / RSS-102, cl. 2.5 (rounded to 1 decimal point):

FCC

operating frequency < 1.5GHz: excluded if ERP < 1.5W / 31.8dBm (EIRP: 33.9);
operating frequency > 1.5GHz: excluded if ERP < 3.0W / 34.8dBm (EIRP: 36.9);

IC

300MHz <= operating frequency < 6 GHz: excluded if EIRP < 0.0131 x f (MHz)^{0.6834} W

4.3 RF Exposure Estimation (MPE Estimation)

Having available the source based average output power and peak antenna gain or the ERP/EIRP of the specified device and for a known minimum distance of its radiating structures from the body of persons according to its use cases (at least 20cm) the power density at that distance can be estimated by the following formula for plane-wave equivalent conditions (far-field conditions), when ground reflection is neglected.

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density (mW/cm² or W/m²)

P = power input to the antenna (mW or W)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna (cm or m)

5 Evaluations

5.1 Analysis of RF Exposure for simultaneous transmission

- Evaluations are based on worst case power density limits for Canada.
- Calculations are made for 20cm.
- Evaluations are based on ERP/EIRP measured or calculated from known gain and conducted output power.
- Cellular can transmit simultaneously with WLAN.

| Radio | freq [MHz] | Max Conducted power [W] | Gain [dBi] | Gain [lin] | EIRP [W] | IC Limit [W/m ²] | FCC Limit [W/m ²] | Actual [W/m ²] | How much of limit is used up |
|-----------------|------------|-------------------------|------------|------------|----------|------------------------------|-------------------------------|----------------------------|------------------------------|
| GSM 850 | 824 | 1.4760 | 0.77 | 1.19 | 1.762 | 2.576 | 5.493 | 1.753 | 68.06% |
| GSM 1900 | 1850 | 1.1170 | 2.92 | 1.96 | 2.188 | 4.476 | 10.000 | 2.176 | 48.62% |
| WCDMA II | 1850 | 0.2218 | 2.92 | 1.96 | 0.434 | 4.476 | 10.000 | 0.864 | 19.31% |
| WCDMA IV | 1710 | 0.2432 | 3.05 | 2.02 | 0.491 | 4.242 | 10.000 | 0.977 | 23.02% |
| WCDMA V | 824 | 0.1820 | 0.77 | 1.19 | 0.217 | 2.576 | 5.493 | 0.432 | 16.79% |
| LTE 2 | 1850 | 0.2748 | 2.92 | 1.96 | 0.538 | 4.476 | 10.000 | 1.071 | 23.92% |
| LTE 4 | 1710 | 0.2858 | 3.05 | 2.02 | 0.577 | 4.242 | 10.000 | 1.148 | 27.05% |
| LTE 5 | 824 | 0.2710 | 0.77 | 1.19 | 0.324 | 2.576 | 5.493 | 0.644 | 24.99% |
| LTE 7 | 2500 | 0.2244 | 3.72 | 2.36 | 0.528 | 5.499 | 10.000 | 1.051 | 19.12% |
| LTE 17 | 704 | 0.2427 | -0.21 | 0.95 | 0.231 | 2.313 | 4.693 | 0.460 | 19.89% |
| | | | | | | | | | |
| BT | 2402 | 0.0069 | 3 | 2.00 | 0.014 | 5.351 | 10.000 | 0.027 | 0.51% |
| BT-LE | 2402 | 0.0140 | 3 | 2.00 | 0.028 | 5.351 | 10.000 | 0.056 | 1.04% |
| WLAN | 2412 | 0.2700 | 0.5 | 1.12 | 0.303 | 5.366 | 10.000 | 0.603 | 11.23% |

Note1: EIRP of GSM850 and GSM1900 was corrected for worst case DC 50%

5.2 Conclusion:

The worst-case simultaneous transmission is GSM 850 simultaneous with WLAN which is using 79.29 of a limit of 100%. The equipment is passing RF exposure requirements for 20cm distance.

6 Revision History

| Date | Report Name | Changes to report | Report prepared by |
|-------------|----------------------------------|--------------------------|---------------------------|
| 2019-06-21 | EMC_ZONAR_019_19001_FCC_ISED_MPE | Initial Release | Yuchan Lu |