



# 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-Rev1\_MPE

**DATE:** 2019-08-07



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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

2019-08-07	Compliance	Cindy Li (Lab Manager)	
Date	Section	Name	Signature

### Responsible for the Report:

2019-08-07	Compliance	Yuchan Lu (Test Engineer)	
Date	Section	Name	Signature

## 2 Administrative Data

### 2.1 Identification of the Testing Laboratory Issuing the Test Report

<b>Company Name:</b>	CETECOM Inc.
<b>Department:</b>	Compliance
<b>Street Address:</b>	411 Dixon Landing Road
<b>City/Zip Code</b>	Milpitas, CA 95035
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<b>Lab Manager:</b>	Cindy Li
<b>Responsible Project Leader:</b>	Sangeetha Sivaraman

### 2.2 Identification of the Client / Manufacturer

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

### Identification of the Manufacturer

<b>Manufacturer's Name:</b>	Same as Client
<b>Manufacturers Address:</b>	
<b>City/Zip Code</b>	
<b>Country</b>	

### 3 Equipment under Assessment

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

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

<b>Power Supply/ Rated Operating Voltage Range:</b>	Low 9VDC, Nominal 13-14VDC, High 32VDC
<b>Operating Temperature Range:</b>	Low -40° C, Nominal 23° C, High 85° C
<b>Sample Revision:</b>	<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 <sup>2</sup> )	Averaging time (minutes)
300 – 1500	f (MHz) /1500	30
1500 – 100.000	1.0	30

IC

300 – 6000	0.02619 x f (MHz) <sup>0.6834</sup>	6
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##### 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)<sup>0.6834</sup> 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/cm<sup>2</sup> or W/m<sup>2</sup>)

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 including highest power from original cellular grant and the C2PC cellular grant from 2019.
- Cellular can transmit simultaneously with WLAN.

Radio	freq [MHz]	Max Conducted power [W]	Gain [dBi]	Gain [lin]	EIRP [W]	IC Limit [W/m <sup>2</sup> ]	FCC Limit [W/m <sup>2</sup> ]	Actual [W/m <sup>2</sup> ]	How much of limit is used up
<b>GSM 850</b>	824	1.4760	0.77	1.19	1.762	2.576	5.493	1.753	68.06%
<b>GSM 1900</b>	1850	1.1170	2.92	1.96	2.188	4.476	10.000	2.176	48.62%
<b>WCDMA II</b>	1850	0.2218	2.92	1.96	0.434	4.476	10.000	0.864	19.31%
<b>WCDMA IV</b>	1710	0.2432	3.05	2.02	0.491	4.242	10.000	0.977	23.02%
<b>WCDMA V</b>	824	0.1820	0.77	1.19	0.217	2.576	5.493	0.432	16.79%
<b>LTE 2</b>	1850	0.2748	2.92	1.96	0.538	4.476	10.000	1.071	23.92%
<b>LTE 4</b>	1710	0.2858	3.05	2.02	0.577	4.242	10.000	1.148	27.05%
<b>LTE 5</b>	824	0.2710	0.77	1.19	0.324	2.576	5.493	0.644	24.99%
<b>LTE 7</b>	2500	0.2244	3.72	2.36	0.528	5.499	10.000	1.051	19.12%
<b>LTE 17</b>	704	0.2427	-0.21	0.95	0.231	2.313	4.693	0.460	19.89%
<b>BT</b>	2402	0.0069	3	2.00	0.014	5.351	10.000	0.027	0.51%
<b>BT-LE</b>	2402	0.0140	3	2.00	0.028	5.351	10.000	0.056	1.04%
<b>WLAN</b>	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
2019-08-07	EMC_ZONAR_019_19001_FCC_ISED_MPE-Rev1	Updated S 5.1 of report to account for the 3/27/2019 C2PC of the Cellular module	Yuchan Lu