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
ISEDC RSS-102 Issue 5

Report number: EMC_ ZONAR_019_19001_FCC_ISED-Rev1_MPE

DATE: 2019-08-07

***CETECOM* Inc.**
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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

Date	Section	Name	Signature
2019-08-07	Compliance	Cindy Li (Lab Manager)	Cindy Li Digitally signed by Cindy Li DN: cn=Cindy Li, o=Cetecom Inc., ou=EMC, email=cindy.li@cetecom.com , c=US Date: 2019.08.07 14:58:03 -07'00'

Responsible for the Report:

Date	Section	Name	Signature
2019-08-07	Compliance	Yuchan Lu (Test Engineer)	Yuchan Lu Digitally signed by: Yuchan Lu DN: CN = Yuchan Lu email = Yuchan.Lu@cetecom.com C = US O = CETECOM Inc. OU = EMC Date: 2019.08.07 11:33:01 -07'00'

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:	❖ **Cellular Module:** ▪ 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 ❖ **Bluetooth Classic:** ▪ 2402 MHz (ch0) – 2480 MHz (ch78), 79 channels ❖ **Bluetooth LE:** ▪ 2402 MHz (ch0) – 2480 MHz (ch39), 40 channels ❖ **WLAN** ▪ 2412 MHz (ch1) – 2462 MHz (ch11), 11 channels
Integrated Module Info:	❖ **Cellular Module:** ▪ Module name: ublox ▪ Module number: TOBY-R200 ▪ FCC/IC ID: XPYTOBYL200 / 8595A-TOBYL200 ❖ **Bluetooth Classic, Bluetooth LE:** ▪ Module name: ublox ▪ Module number: NINA-B222 ▪ FCC/IC ID: XPYNINAB22 / 8595A-NINAB22 ❖ **WLAN:** ▪ Module name: ublox

	▪ Module number: ELLA-W131 ▪ FCC/IC ID: PV7-WIBEAR11N-SF1 / 7738A-WB11NSF1 ❖ **GPS** ▪ Module name: ublox ▪ Module number: MAX-M8Q-0-01
Antenna Type:	❖ **Cellular: Primary antenna maximum gains:** ▪ 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 ❖ **Bluetooth Classic, Bluetooth LE:** ▪ PIFA ▪ Antenna gain: 3 dBi ❖ **WLAN:** ▪ Ceramic chip, solder SMD ▪ Antenna gain: 0.5 dBi
Maximum Conducted Output Power:	❖ **Cellular:** From modular grant [Watts]: ▪ 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 ❖ **Bluetooth Classic:** From modular report [Watts]: 0.00692 ❖ **Bluetooth LE:** From modular grant [Watts]: 0.014 ❖ **WLAN:** From modular grant [Watts]: 0.27

Power Supply/ Rated Operating Voltage Range:	Low 9VDC, Nominal 13-14VDC, High 32VDC
Operating Temperature Range:	Low -40º C, Nominal 23º C, High 85º C
Sample Revision:	☐Prototype Unit; ■Production Unit; ☐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/cm²)	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 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/m2]	FCC LImit [W/m2]	Actual [W/m2]	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
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