Radio Frequency Exposure Evaluation Report

for

Manufacturer: Verizon Telematics Inc.
Model number: AT-155

Product Description: GPS Navigation Device with CDMA2000 and Bluetooth

FCC ID: ZOQAT-155

Applied Rules and Standards

CFR Part Part 1 (1.1307 &1.1310), Part 2 (2.1091),
FCC KDB 447498 D01 General 24 RF Exposure Guidance v05r02

Report number: EMC_VERIT-007-15001_AT_155_MPE

DATE: 2015-06-10

IC recognized # 3462B-1

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1 Administrative Data

1.1 Identification of the Testing Laboratory Issuing the Test Report

Company Name:	CETECOM Inc.
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Lab Manager	Josie Sabado

1.2 Identification of the Client / Manufacturer

Applicant's Name:	Verizon Telematics Inc.
Street Address:	2002 Summit Blvd., Suite 1800
City/Zip Code	Atlanta, GA 30319
Country	USA
Contact Person:	Bryant Elliott
Phone No.	+1 404 573 5800
e-mail:	bryant.elliott@verizon.com

2 Equipment under Assessment

Marketing Name:	**in-Drive Communicator AT-155**
Model Number:	**AT-155**
FCC ID:	**ZOQAT-155**
IC Certification Number:	**n.a.**
Product Description:	**GPS Navigation Device with CDMA2000 and Bluetooth**
Transmitter information:	1. Sierra Wireless 850/1900MHz CDMA2000 radio module SL3010T (initially SL5011) with FCC-ID: N7NSL5011 2. Bluetooth BDR/EDR and LE radio, max. EIRP 4mW/6dBm; 3. GPS 1575.42 MHz;
Antenna info (antenna as presented for testing with the development board):	cellular: internal; -1.7 dBi at 850MHz; +0.4 dBi at 1900MHz; BT: ceramic chip; 0.4 dBi peak gain;
Co-located Transmitters/ Antennas?	■ Yes (Bluetooth and Cellular) ☐ No
Device Category:	■ Fixed Installation ☐ Mobile ☐ Portable ☐ mixed Mobile and Portable
Exposure Category:	☐ Occupational/ Controlled ■ General Population/ Uncontrolled
Rated Operating Voltage Range:	+6 to +24Vdc
Rated Operating Temperature Range:	–40°C ~ +85°C
Test Sample Status:	Prototype

3 Assessment

This RF Exposure evaluation report provides information about compliance of the below identified device with the RF Exposure limits for mobile or fixed devices as defined in FCC CFR Part 1 (1.1307 &1.1310), Part 2 (2.1091) under given 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 rule parts based on available specifications.

Company	Description	Model #
Verizon Telematics, Inc.	**GPS Navigation Device with CDMA2000 and Bluetooth**	**AT-155**

Report reviewed by:

Date	Section	Name	Signature
2015-06-10	Compliance	Josie Sabado (Test Lab Manager)	

Responsible for the Report:

Date	Section	Name	Signature
2015-06-10	Compliance	Danh Le (EMC Engineer)	Digitally signed by Danh Le DN: cn=Danh Le, o=Cetecom, ou=Compliance, email=danh.le@cetecom.com, c=US Date: 2015.06.12 19:02:43 -07'00'

4 RF Exposure Limits and FCC Basic Rules

For the specific described radio apparatus the following basic limits and rules apply.

4.1 Maximum Permissible Exposure (MPE) Limits acc. to FCC 1.1310(e):

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

4.2 Routine Environmental Evaluation Categorical Exclusion Limits acc. to FCC 2.109(c) (rounded to 1 decimal point):

Operating frequency < 1.5GHz: excluded if ERP < 1.5W / 31.8dBm
Operating frequency > 1.5GHz: excluded if ERP < 3.0W / 34.8dBm

4.3 EMC Output Power Limits (ERP/EIRP) acc. to FCC part 22/24/27 (to be additionally taken into account for maximum antenna gain considerations)

part 22: 7W ERP / 38.5dBm
part 24: 2W EIRP / 33.0dBm
part 27: 1W EIRP / 30.0dBm

Per KDB 447498 D01 FCC allows calculative estimation of RF exposure for mobile applications when routine environmental evaluation categorical exclusion applies and also for fixed applications.
When categorical exclusion cannot be claimed for mobile applications MPE measurement is required for TCB approval.

4.4 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^2 or W/m^2)
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 Routine Environmental Evaluation Applicability

Transmission Mode	Pmax	Peak Gain	Duty Cycle	EIRP, source based time averaged ($EIRP_{max}$)	Total EIRP simultaneous transmissions intra-band (worst cases only)	FCC & IC Limit for Routine Environmental Evaluation Applicability, EIRP	Excluded?
	dBm	dBi	%	dBm	dBm	dBm	
CDMA 850	24+1 (1)	-1.7	100	23.3	n.a.	33.9	yes
CDMA 1900	24+1 (1)	+0.4	100	25.4	n.a.	36.9	yes
Bluetooth (2.4 GHz)			<100	6.0 (2)	n.a.	36.9	yes

(1)max acc. to CDMA 2000 3GPP spec; (2) max eirp acc. to related part 15.247 test report;

Result: The transmitters in the equipment are categorically excluded from Routine Environmental Evaluation.

5.2 Compliance with MPE (Power Density) limits

Limits:
Smax @ 824MHz = 0.55mW/cm^2 (824MHz is worst case as lowest operating frequency in the cellular band);
Smax @ 1900MHz and @ 2400MHz = 1.0mW/cm^2;

The highest source base time averaged EIRPmax per band calculated with the rated peak antenna gain values are taken from the table in section 5.1 above;
The highest power density is resulting from the formula: $S = EIRPmax / 4*\pi*r^2$;
The power density is calculated for the minimum distance r = 20cm;

Highest EIRP for CDMA2000 at 850 MHz: 23.3dBm;
Resulting maximum power density at 850MHz at 20cm distance: **S(850MHz) = 0.04mW/cm^2**

Highest EIRP for CDMA2000 at 1900 MHz: 25.4dBm;
Resulting maximum power density at 1900MHz at 20cm distance: **S(1900MHz) = 0.07mW/cm^2**

Result: The equipment fulfills the MPE limits for the minimum distance between the antenna and the human body of 20cm.

5.3 Simultaneous Transmission MPE Test Exclusion (per KDB 447498 D01)

Possible simultaneous transmissions: Cellular Radio and Bluetooth.
Consideration of simultaneous transmission with the Bluetooth radio is obsolete due to the low Bluetooth output power of 4mW.

Result: The equipment is excluded from simultaneous transmission MPE test.

6 Revision History

Date	Report Name	Changes to report	Report prepared by
2015-06-11	EMC_VERIT-007-15001_AT_155_MPE	First Version	Danh Le