



Radio Frequency Exposure Evaluation Report

For:

Zipcar

Model Name:

Z001

Product Description:

Automotive access and telematics system

FCC ID: 2AHNP-Z00102

IC ID: 21726-Z00102

Per:

CFR Part Part 1 (1.1307 & 1.1310), Part 2 (2.1091),
FCC KDB 447498 D01 General RF Exposure Guidance v06

Report number: EMC_ZIPCA-006-16001_FCC_IC_MPE

DATE: September 29, 2016



CETECOM Inc.

411 Dixon Landing Road ♦ Milpitas, CA 95035 ♦ U.S.A.

Phone: + 1 (408) 586 6200 ♦ Fax: + 1 (408) 586 6299 ♦ E-mail: info@cetecom.com ♦ <http://www.cetecom.com>
CETECOM Inc. is a Delaware Corporation with Corporation number: 2905571

1 Assessment

This RF Exposure evaluation report provides information about 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 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 and IC rule parts based on available specifications.

Company	Description	Model #
Zipcar	Automotive access and telematics system	Z001

Report reviewed by: TCB Evaluator

September 29,
2016 Compliance James Donnellan
(Senior EMC Engineer)

Date	Section	Name	Signature
------	---------	------	-----------

Responsible for the Report:

September 29,
2016 Compliance Yu-Chien Ho
(EMC 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
Address:	6370 Nancy Ridge Drive San Diego, CA 92121 U.S.A.
Telephone:	+1 (858) 362 2400
Fax:	+1 (858) 687-4809
Compliance Manager:	Franz Engert
Project Engineer:	Yu-Chien Ho

2.2 Identification of the Client / Manufacturer

Applicant's Name:	Zipcar
Street Address:	15 N Ellsworth Ave Ste 100
City/Zip Code	San Mateo, CA 94401
Country	USA

3 Equipment under Assessment

Model #:	Z001
Product Description:	Automotive access and telematics system
FCC-ID:	2AHNP-Z00102
IC certification number with HVIN, PMN, FVIN:	IC: 21726-Z00102 / HVIN: Z001 / PMN: Z001 / FVIN: N/A.
Module Information:	Manufacturer: SIMCOM Module: SIM5320A; FCC-ID: UDV-1103022011008 ; IC: 8460A-20110302008;
Technology/ Type(s) of Modulation:	GSM/GPRS/EGPRS 850/900/1800/1900MHz, multislots class 12; UMTS/HSPA FDD BAND II, V; (per integrated pre-certified Module SIMCOM SIM5320A with FCC-ID: UDV-1103022011008, IC: ?) Bluetooth LE version 4.1, using Direct Sequence Spread Spectrum with GFSK modulation.
Operating Frequency Ranges (MHz)/ Channels:	GSM 850: 824 - 848 MHz; 124 channels; GSM 1900: 1850 - 1910 MHz; 373 channels; UMTS FDD BAND V: 826 - 847 MHz; 288 channels; UMTS FDD BAND II: 1852 - 1908 MHz; 107 channels; BTLE: Nominal band: 2400 – 2483.5 MHz; 2402 MHz (Ch. 0) – 2480 (Ch.39), 40 channels;
Antenna info:	cellular radio: YNX-GSM-SMA-003 sticker mounting antenna., peak gain: 3 dBi@850, 3dBi@1850 BT: 0.5 dBi@2.4 GHz.
Co-located Transmitters/ Antennas?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Device Category:	<input type="checkbox"/> Fixed Installation <input checked="" type="checkbox"/> Mobile <input type="checkbox"/> Portable <input type="checkbox"/> Mixed Mobile and Portable
Exposure Category:	<input type="checkbox"/> Occupational/ Controlled <input checked="" type="checkbox"/> General Population/ Uncontrolled
Power Supply/ Rated Operating Voltage Range:	Vehicle 12VDC
operating temperature range	Tlow: -40° C/ Tnom: 22° C/ Tmax: 85° C
Test Sample Status:	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	$f \text{ (MHz)} / 1500$	30
1500 – 100.000	1.0	30

IC

300 – 6000	$0.02619 \times f \text{ (MHz)}^{0.6834}$	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 < $0.0131 \times f \text{ (MHz)}^{0.6834}$ W

4.3 EMC Output Power Limits (ERP/EIRP) acc. to FCC part 22/24 / IC RSS-132, RSS-133 (to be additionally taken into account for maximum antenna gain considerations)

part 22: 7W ERP / 38.5dBm (IC: 11.5W / 40.6dBm EIRP)

part 24: 2W EIRP / 33.0dBm

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 can not be claimed for mobile applications MPE measurement is required for TCB approval.

RSS-102 of Industry Canada does generally not require RF exposure evaluation for fixed or mobile applications which stay below the given exclusion limits.

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 it's radiating structures from the body of persons according to it's 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 to Exclude Routine RF Exposure Evaluation for Stand Alone Operation

Based on the higher value of documented and measured maximum conducted output power and peak antenna gain values, as available and appropriate.

Transmission Mode	Max. conducted output power during burst (dBm)	Duty Cycle (%)	peak antenna gain (dBi)	calculated max EIRP	FCC / IC Limits for Routine Environmental Evaluation Applicability, EIRP (dBm)	Exempt from Routine evaluation (Yes/No)
GPRS 850	32.3 (1,2)	50	3	32.3	33.9 / 31.1	Yes
UMTS FDD BAND V	23.9 (1)	100	3	26.9	33.9 / 31.1	Yes
GPRS 1900	30.0 (1,2)	50	3	30.0	36.9 / 33.5	Yes
UMTS FDD BAND II	23.6 (1)	100	3	26.6	36.9 / 33.5	Yes
BTLE	-1.45 (3)	100	0.5	-0.95	36.9 / 34.3	Yes

(1) Max. cellular output powers as measured in cellular module; Report #: 112S009R-HP-US-P07V01.

(2) As above report documents power during burst and time averaging is allowed for MPE a 3dB reduction has been used to accommodate for worst case multi slot configuration 4xTX.

(3) Based on maximum measured power from related EMC test report;

Conclusion:

- The equipment is not exempted from FCC and IC RF exposure routing evaluation.

5.2 Compliance with MPE (Power Density) limits

Power Density Calculation for a distance between the transmitter and the human body of 25cm				
Band of Operation (MHz)	calculated max EIRP (dBm)	Power Density (mW/cm ²)	FCC/IC Limit (mW/cm ²)	Verdict
GSM 850	32.3	0.2162	0.55 / 0.26	Pass
UMTS FDD BAND II	26.9	0.0624	1.0 / 0.45	Pass
GSM1900	30.0	0.1273	1.0 / 0.45	Pass
UMTS FDD BAND V	26.6	0.0582	0.55 / 0.26	Pass
BTLE	-0.95	0.0001	1.0 / 0.54	Pass

Conclusion:

- The equipment fulfills the FCC and IC MPE limits for the minimum distance between the antenna and the human body of 25cm.

5.3 Routine Environmental Evaluation Applicability Simultaneous Transmission @25cm distance

Band	worst case frequency for limit calculation	Worst case power density from gain and measured conducted power mW/(cm x cm)	Worst case FCC/IC limit mW/(cm x cm)	Single Transmitter ratio	Worst case multiple transmitter ratio	Multiple transmitter ratio limit	Verdict
EDGE850 + BTLE	824	0.2162	0.26	0.8316	1.149	0.8318	PASS
WCDMA V + BTLE	824	0.0624	0.45	0.1386	0.155	0.1388	PASS
EDGE1900 + BTLE	1850	0.1273	0.26	0.4897	0.143	0.4899	PASS
WCDMA II + BTLE	1850	0.0582	0.45	0.1293	0.087	0.1295	PASS
BTLE	2402	0.0001	0.54	0.0002	0.100	0.8318	PASS

Cellular radio access technologies cannot co-transmit. Co-transmission are only possible between BTLE and Cell.

6 Revision History

Date	Report Name	Changes to report	Report prepared by
September 29, 2016	EMC_ZIPCA-006- 16001_FCC_IC_MPE	Initial Release	Yu-Chien Ho