Radio Frequency Exposure Evaluation Report

FOR:
Geotab Inc.

Model Name:
GP9-LTE

Product Description:
GO9 Telematics device with on-board Wi-Fi hotspot functionality.

FCC ID: 2AV57GP9LTE
IC ID: 11140A-GP9LTE

Per:
CFR 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_GEOTA_032_20001_FCC_ISED_MPE

DATE: 6/12/2020

***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 Part1 (1.1307 &1.1310), Part 2 (2.1091), and IC standard ISED 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 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 Name
Geotab Inc.	GO9 Telematics device with on-board Wi-Fi hotspot functionality.	GP9-LTE

Report reviewed by: TCB Evaluator

Date	Section	Name	Signature
6/12/2020	Compliance	Cindy Li (Lab Manager)	Cindy Li Digitally signed by cindy.li@cetecom.com DN: CN=cindy.li@cetecom.com Reason: I am approving this document Location: Date: 2020-06-12 15:36:27

Responsible for the Report:

Date	Section	Name	Signature
6/12/2020	Compliance	Issa Ghanma (EMC Engineer)	Digitally signed by: Issa W Ghanma DN: CN = Issa W Ghanma email = Issaghanma@cetecom.com C = US O = CETECOM Inc. OU = EMC Date: 2020.06.12 12:51:21 -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:	Li, Cindy
Responsible Project Leader:	Sivaraman, Sangeetha

2.2 Identification of the Client / Manufacturer

Applicant's Name:	Geotab Inc.
Street Address:	2440 Winston Park Drive
City/Zip Code	Oakville, ON L6H 7V2
Country	Canada

2.3 Identification of the Manufacturer

Manufacturer's Name:	Same as client.
Manufacturers Address:	----------
City/Zip Code	----------
Country	----------

3 Equipment under Assessment

Model name:	GP9-LTE
FCC ID:	2AV57GP9LTE
IC ID:	11140A-GP9LTE
HVIN:	GP9-LTE
PMN:	GP9-LTE
Power Supply/ Rated Operating Voltage Range:	Vehicle: 12, 24 V DC
Integrated Module Info:	❖ **Cellular:** ▪ Module name : Wistron NeWeb ▪ Model number : M18Q2F-1 ▪ FCC ID : NKRM18Q2 ▪ IC ID : 4441A-M18Q2 ❖ **WLAN (Wi-Fi):** ▪ Module name : Qualcomm Chipset ▪ Model number : 9377
H.W Version:	A
S.W Version:	123
Regulatory Band:	❖ **Cellular :** ▪ UMTS Band II : 1852.4 ~ 1907.6 MHz ▪ UMTS Band V : 826.4 ~ 846.6 MHz ▪ LTE Band 2 : 1850 ~ 1910 MHz ▪ LTE Band 4 : 1710 ~ 1755 MHz ▪ LTE Band 5 : 824.0 ~ 849 MHz ▪ LTE Band 12 : 699 ~ 716 MHz ❖ **WLAN (Wi-Fi):** ▪ 802.11b, g, n : Center to center: 2412 MHz (ch 1) – 2462 MHz (ch 11), 11 channels.

Antenna Type and Peak gain:	**Internal, 3D printed** ❖ **Cellular** Gain (dBi): ▪ 699 MHz : - 0.89 ▪ 704-716 MHz : - 0.73 ▪ 824-849 MHz : - 0.27 ▪ 1710-1785 MHz : 2.10 ▪ 1850-1880 : 3.90 ▪ 1910 MHz : 4.28 ❖ **WLAN (Wi-Fi):** 4.2 dBi
Maximum Conducted Output Power:	❖ **Cellular** [Watts]:*1 ▪ UMTS Band II : 0.260 ▪ UMTS Band V : 0.280 ▪ LTE Band 2 : 0.203 ▪ LTE Band 4 : 0.240 ▪ LTE Band 5 : 0.280 ▪ LTE Band 12 : 0.282 ❖ **WLAN (Wi-Fi):** ▪ 802.11g : 23.37 dBm / 0.22 Watts
Sample Revision:	☐ Prototype Unit; ☐ Production Unit; ■ Pre-Production

*1: Power from modular certification report(s) # FG622601A, FG622601B

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 2.1091(c) / RSS-102, cl. 2.5 (rounded to 1 decimal point):

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

5.1 Analysis to Exclude Routine RF Exposure evaluation for Stand Alone Operation

Band	Lowest frequency [MHz]	Max.Power [dBm \ W]	EIRP [dBm \ W]	FCC EIRP limit [dBm]	ISED EIRP limit [W]	Verdict
UMTS II	1852.4	25.50 \ 0.35	29.40 \ 0.87	36.90	2.24	Complies
UMTS V	826.4	25.50 \ 0.35	25.23 \ 0.33	33.90	1.29	Complies
LTE 2	1850.7	24.50 \ 0.35	28.78 \ 0.76	36.90	2.24	Complies
LTE 2	1860.0	24.50 \ 0.35	28.78 \ 0.76	36.90	2.25	Complies
LTE 4	1710.7	25.00 \ 0.32	27.10 \ 0.51	36.90	2.12	Complies
LTE 4	1720.0	25.00 \ 0.32	27.10 \ 0.51	36.90	2.13	Complies
LTE 5	825.5	25.00 \ 0.32	24.73 \ 0.30	33.90	1.29	Complies
LTE 5	829.0	25.00 \ 0.32	24.73 \ 0.30	33.90	1.29	Complies
LTE 12	699.7	25.00 \ 0.32	24.11 \ 0.26	33.90	1.15	Complies
LTE 12	704.0	25.00 \ 0.32	24.27 \ 0.27	33.90	1.16	Complies
WLAN	2412	23.37 \ 0.22	27.57 \ 0.57	36.90	2.68	Complies

The single radios are exempt from routine environmental evaluation.

6 Analysis of RF Exposure for simultaneous transmission

- Evaluation based on worst-case power density limits for Canada.
- Calculation made for 20cm.
- Evaluations are based on EIRP measured or calculated from known gain and conducted output power.
- Cellular can transmit simultaneously with Wi-Fi 2.4 GHz 802.11g radio.

Band	Lowest frequency [MHz]	Max.Power [W]	EIRP [W]	Actual [W/m2]	ISED [W/m2]	FCC [W/m2]	How much of limit is used up [%]
UMTS II	1852.4	0.35	0.87	1.73	4.48	10.00	**38.67**
UMTS V	826.4	0.35	0.33	0.66	2.58	5.51	25.70
LTE 2	1850.7	0.28	0.76	1.50	4.48	10.00	33.55
LTE 2	1860.0	0.28	0.76	1.50	4.49	10.00	33.44
LTE 4	1710.7	0.32	0.51	1.02	4.24	10.00	24.05
LTE 4	1720.0	0.32	0.51	1.02	4.26	10.00	23.96
LTE 5	825.5	0.32	0.30	0.59	2.58	5.50	22.93
LTE 5	829.0	0.32	0.30	0.59	2.59	5.53	22.86
LTE 12	699.7	0.32	0.26	0.51	2.30	4.66	22.25
LTE 12	704.0	0.32	0.27	0.53	2.31	4.69	22.99
WLAN	2412	0.22	0.57	**1.14**	5.37	10.00	**21.19**

Conclusion:

- **The worst-case simultaneous transmission is UMTS II simultaneous with Wi-Fi 2.4 GHz 802.11g, which is using 59.86 % of a limit of 100 %. The equipment is passing RF exposure requirements for 20cm distance.**

7 Revision History

Date	Report Name	Changes to report	Report prepared by
6/11/2020	EMC_GEOTA_032_20001_FCC_ISED_MPE	Initial Version	Issa Ghanma

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