



Radio Frequency Exposure Evaluation Report

FOR:

Geoforce Inc.

Model Name:

Geoforce GT2

Product Description:

GNSS enabled logistics modem

FCC ID: OWA00GT2X

IC ID: 10540A-00GT2X

Applied Rules and Standards:

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_Geoforce_GT2_FCC_ISED_MPE

DATE: 2020-04-17



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	Marketing Name	Model #
Geoforce Inc.	GNSS enabled logistics modem	Geoforce GT2	OWAC00 OWAS86 OWAH86

Report reviewed by: TCB Evaluator

2020-04-17 Compliance Cindy Li
(EMC Lab Manager)

Date	Section	Name	Signature
2020-04-17	Compliance	Cindy Li	

Responsible for the Report:

2020-04-17 Compliance Kevin Wang
(Senior EMC Engineer)

Date	Section	Name	Signature
2020-04-17	Compliance	Kevin Wang	

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
EMC Lab Manager:	Cindy Li
Responsible Project Leader:	Sangeetha Sivaraman

2.2 Identification of the Client / Manufacturer

Client's Name:	Geoforce Inc.
Street Address:	5830 Granite Parkway, Suite 1200
City/Zip Code	Plano, TX 75024
Country	United States

Identification of the Manufacturer

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

3 Equipment under Assessment

Marketing name:	Geoforce GT2
Model No:	OWAC00 OWAS86 OWAH86
HW Version :	R1
SW Version :	0.4.T (Test supporting software version)
Firmware Version Identification Number (FVIN):	0.4.T
Hardware Version Identification Number (HVIN):	R1
Product Marketing Name (PMN):	Geoforce GT2
Regulatory Band:	<ul style="list-style-type: none"> ❖ <u>WLAN:</u> <ul style="list-style-type: none"> ▪ Nominal band: 2400 MHz – 2483.5 MHz; ▪ Center to center: 2412 MHz (ch 1) – 2462 MHz (ch 11), 11 channels ❖ <u>Bluetooth LE:</u> <ul style="list-style-type: none"> ▪ Nominal band: 2400 MHz – 2483.5 MHz; ▪ Center to center: 2402 MHz (ch 0) – 2480 MHz (ch 39), 40 channels ❖ <u>Iridium:</u> <ul style="list-style-type: none"> ▪ Nominal band: 1616 MHz – 1626.5 MHz;
Integrated Module Info:	<ul style="list-style-type: none"> ❖ <u>WLAN:</u> <ul style="list-style-type: none"> ▪ Module name: Zentri, AMW007 ▪ FCC ID: 2ABPY-5B9198 ❖ <u>Bluetooth LE:</u> <ul style="list-style-type: none"> ▪ Module name: Nordic, nRF52840 ▪ FCC ID: OWA00GT2X ❖ <u>Iridium:</u> <ul style="list-style-type: none"> ▪ Module name: Iridium 9603N ▪ FCC ID: OWA00GT2X
Antenna Type:	<ul style="list-style-type: none"> ❖ <u>WLAN:</u> <ul style="list-style-type: none"> ▪ Model No.: Molex 479480001 ▪ Antenna gain: 3 dBi ❖ <u>Bluetooth LE:</u> <ul style="list-style-type: none"> ▪ Model No.: Molex 479480001 ▪ Antenna gain: 3 dBi

	<ul style="list-style-type: none"> ❖ <u>Iridium:</u> <ul style="list-style-type: none"> ▪ Model No.: TW11-0060-X ▪ Antenna gain: 5 dBi
Maximum Conducted Output Power:	<ul style="list-style-type: none"> ❖ <u>WLAN:</u> From modular grant [Watts]: 0.172 ❖ <u>Bluetooth LE:</u> 0.00038 [Watts] ❖ <u>Iridium:</u> 2.34963 [Watts]
Power Supply/ Rated Operating Voltage Range:	Dedicated Battery Pack Vmin: 1.8 VDC/ Vnom: 3.6 VDC / Vmax: 3.7 VDC
Operating Temperature Range:	-40 °C to 85 °C
Sample Revision:	<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 ²)	Averaging time (minutes)
300 – 1500	$f \text{ (MHz)} / 1500$	30
1500 – 100000	1.0	30

IC

300 – 6000	$0.02619 \times f \text{ (MHz)}^{0.6834}$	6
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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 / 31.8dBm (EIRP: 33.9 dBm);
operating frequency > 1.5GHz: excluded if ERP < 3.0W / 34.8dBm (EIRP: 36.9 dBm);

IC

300MHz <= operating frequency < 6 GHz: excluded if EIRP < $0.0131 \times f \text{ (MHz)}^{0.6834} \text{ W}$

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.
- All radios transmit independently.

Radio	freq [MHz]	Max Conducted power [W]	Gain [dBi]	Gain [lin]	EIRP [W]	EIRP With DC [W]	IC Limit [W/m2]	FCC Llimit [W/m2]	Actual [W/m2] ²
BT-LE	2402	0.00038	3	2.00	0.001	0.001	5.351	10.000	0.002
WLAN	2400	0.172	3	2.00	0.343	0.343	5.348	10.000	0.683
Iridium	1616	2.34963	5	3.16	7.430	0.684	4.081	10.000	1.360

Note1: EIRP of Iridium is corrected with DC 9.2%

Note2: The calculation is based on the distance of 20cm

5.2 Conclusion:

None radio can transmit simultaneous. The equipment is passing RF exposure requirements for 20cm distance.

6 Revision History

Date	Report Name	Changes to report	Report prepared by
2020-04-17	EMC_Geoforce_GT2_FCC_ISED_MPE	Initial Release	Kevin Wang

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