



Radio Frequency Exposure Evaluation Report

FOR:

Motive Technologies, Inc.

Model Name:

LBB-3.6CA

Product Description:

LBB-3.6CA is a Vehicle Gateway. Its purpose is to act as the primary gateway between various pieces of hardware and software in a motor vehicle and the Motive Technologies, Inc. database back-end in the cloud.

FCC ID: 2AQM7-36

IC ID: 24516-36

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_KPTRK-027-21001_FCC_ISED_MPE

DATE: 04-19-2022



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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 #
Motive Technologies, Inc.	LBB-3.6CA is a Vehicle Gateway. Its purpose is to act as the primary gateway between various pieces of hardware and software in a motor vehicle and the Motive Technologies, Inc. database back-end in the cloud.	LBB-3.6CA

Report reviewed by: TCB Evaluator

04-19-2022	Compliance	Kevin Wang (Lab Manager)	
Date	Section	Name	Signature

Responsible for the Report:

04-19-2022	Compliance	Kris Lazarov (Test Engineer)	
Date	Section	Name	Signature

The test results of this test report relate exclusively to the test item specified in Section 3. CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the Test Report

Company Name:	CETECOM Inc.
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Country	USA
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Lab Manager:	Kevin Wang
Responsible Project Leader:	Akanksha Baskaran

2.2 Identification of the Client / Manufacturer

Client's Name:	Motive Technologies, Inc.
Street Address:	55 Hawthorne Street #400
City/Zip Code	San Francisco, California 94105
Country	USA

2.3 Identification of the Manufacturer

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

3 Equipment under Assessment

Model No:	LBB-3.6CA
HW Version :	5
SW Version :	77006
Hardware Version Identification Number (HVIN):	LBB-3.6CA
Product Marketing Name (PMN):	Vehicle Gateway
Regulatory Band:	<ul style="list-style-type: none"> ❖ Cellular Module: <ul style="list-style-type: none"> ▪ 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 ~ 1910 MHz ▪ LTE BAND 4: 1710 ~ 1755 MHz ▪ LTE BAND 5: 824 ~ 849 MHz ▪ LTE BAND 12: 699 ~ 716 MHz ▪ LTE BAND 13: 777 ~ 787 MHz ❖ BT: <ul style="list-style-type: none"> ▪ Nominal band: 2400 MHz – 2483.5 MHz ▪ Center to center: 2402 MHz (ch 0) – 2480 MHz (ch 78), 79 Channels ❖ WLAN : <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
Integrated Module Info:	<ul style="list-style-type: none"> ❖ WCDMA, LTE <ul style="list-style-type: none"> ▪ Manufacture: Sierra Wireless ▪ Module name/number: WP7611 ▪ FCC ID: N7NWP76B ▪ IC ID: 2417C-WP76B ❖ WLAN, BT <ul style="list-style-type: none"> ▪ Manufacture: Laird Connectivity ▪ Module name/number: LSR 450-0159R ▪ FCC ID: TFB-1003 ▪ IC ID: 5969A-1003
Antenna Type:	<ul style="list-style-type: none"> ❖ Cellular: <ul style="list-style-type: none"> ▪ Model Name : WCDMA/LTE Main Antenna ▪ Part No. : CWT0020P ▪ Type & Gain : Inverted-F Antenna (IFA), Max Gain 2.7dBi ❖ BT, WLAN: <ul style="list-style-type: none"> ▪ Model Name : LTE Diversity with GPS & Wi-Fi Antenna ▪ Part No. : CWT0031P ▪ BT/WiFi Type & Gain: Inverted F Antenna (IFA), 1.92 dBi
Maximum Conducted Output Power:	<ul style="list-style-type: none"> ❖ Cellular: From modular grant [Watts]: <ul style="list-style-type: none"> ▪ WCDMA Band II: 0.2421 ▪ WCDMA Band IV: 0.2366 ▪ WCDMA Band V: 0.2153 ▪ LTE Band 2: 0.2173 ▪ LTE Band 4: 0.2188 ▪ LTE Band 5: 0.25 ▪ LTE Band 12: 0.2339 ▪ LTE Band 13: 0.2218 ❖ BT: From modular grant [Watts]: 0.0078 ❖ WLAN: From modular grant [Watts]: 0.2519
Power Supply/ Rated Operating Voltage Range:	Vmin: 10 VDC/ Vnom: 12 VDC / Vmax: 24 VDC
Operating Temperature Range:	Low -20°C, Nominal 20°C, High 65°C
Sample Revision:	<input type="checkbox"/> Prototype Unit; <input type="checkbox"/> Production Unit; <input checked="" 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 (MHz) /1500	30
1500 – 100000	1.0	30

IC

300 – 6000	0.02619 x f (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 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.
- Cellular can transmit simultaneously with WLAN and BT.

Radio	Freq [MHz]	Max Conducted power [W]	Max Conducted power + Tune up [W]	Gain [dBi]	Gain [lin]	EIRP [W]	IC Limit [W/m ²]	FCC Limit [W/m ²]	Actual [W/m ²]	How much of limit is used up
WCDMA II	1850	0.2421	0.25	2.7	1.86	0.466	4.476	10.000	0.926	20.69%
WCDMA IV	1710	0.2366	0.25	2.7	1.86	0.466	4.242	10.000	0.926	21.83%
WCDMA V	824	0.2153	0.25	2.7	1.86	0.466	2.576	5.493	0.926	35.96%
LTE 2	1850	0.2173	0.25	2.7	1.86	0.466	4.476	10.000	0.926	20.69%
LTE 4	1710	0.2188	0.25	2.7	1.86	0.466	4.242	10.000	0.926	21.83%
LTE 5	824	0.25	0.25	2.7	1.86	0.466	2.576	5.493	0.926	35.96%
LTE 12	699	0.2339	0.25	2.7	1.86	0.466	2.302	4.660	0.926	40.24%
LTE 13	777	0.2218	0.25	2.7	1.86	0.466	2.474	5.180	0.926	37.43%
WLAN	2400	0.2519	0.2519	1.92	1.56	0.392	5.348	10.000	0.780	14.57%
BTLE	2402	0.0078	0.0078	1.92	1.56	0.012	5.351	10.000	0.024	0.45%

5.2 Conclusion:

The worst-case simultaneous transmission is LTE Band 12 simultaneous with WLAN, which is using 54.81% of a limit of 100%. The equipment is passing RF exposure requirements for 20cm distance.

6 Revision History

Date	Report Name	Changes to report	Prepared by
04-19-2022	EMC_KPTRK-027-21001_FCC_ISED_MPE	Initial Release	Kris Lazarov

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