



# Radio Frequency Exposure Evaluation Report

For:  
CalAmp

Model Name:  
LMU3640LVB

Product Description:  
Vehicle tracking and telemetry device

FCC ID: APV-3640LVB  
IC ID: 5843A-3640LVB

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\_CALAM-063-17001\_FCC\_IC\_MPE\_SVL

**DATE:** 10/9/2017



**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](mailto: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 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 #    |
|---------|---------------------------------------|------------|
| CalAmp  | Vehicle tracking and telemetry device | LMU3640LVB |

### Report reviewed by: TCB Evaluator

Peter Nevermann



10/9/2017 Compliance (Director Radio Communications and EMC)

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

### Responsible for the Report:

Issa Ghanma  
(EMC Engineer)



Digitally signed by Issa Ghanma  
DN: cn=Issa Ghanma, c=US, o=CETECOM INC., email=issa.ghanma@cetecom.com  
Date: 2017.10.09 18:36:46 -07'00'

10/9/2017 Compliance

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

## 2 Administrative Data

### 2.1 Identification of the Testing Laboratory Issuing the Test Report

|                          |                                                        |
|--------------------------|--------------------------------------------------------|
| <b>Company Name:</b>     | CETECOM Inc.                                           |
| <b>Department:</b>       | Compliance                                             |
| <b>Address:</b>          | 411 Dixon Landing Road<br>Milpitas, CA 95035<br>U.S.A. |
| <b>Telephone:</b>        | +1 (408) 586 6200                                      |
| <b>Fax:</b>              | +1 (405) 586-6299                                      |
| <b>Project Manager:</b>  | Laith Saman                                            |
| <b>Project Engineer:</b> | Issa Ghanma                                            |

### 2.2 Identification of the Client / Manufacturer

|                          |                          |
|--------------------------|--------------------------|
| <b>Applicant's Name:</b> | Calamp                   |
| <b>Street Address:</b>   | 2177 Dalk Ave, Suits 200 |
| <b>City/Zip Code</b>     | Carlsbad, CA 90228       |
| <b>Country</b>           | USA                      |

### 3 Equipment under Assessment

|                                |                                                                                                                                                                                                 |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Model #:</b>                | LMU3640LVB                                                                                                                                                                                      |
| <b>HW Version :</b>            | REV A                                                                                                                                                                                           |
| <b>SW Version :</b>            | 6.1                                                                                                                                                                                             |
| <b>FCC-ID :</b>                | APV-3640LVB                                                                                                                                                                                     |
| <b>IC ID:</b>                  | 5843A-3640LVB                                                                                                                                                                                   |
| <b>HVIN:</b>                   | LMU3640LVB                                                                                                                                                                                      |
| <b>PMN:</b>                    | LMU-3640                                                                                                                                                                                        |
| <b>Product Description:</b>    | Vehicle tracking and telemetry device                                                                                                                                                           |
| <b>Regulatory Band:</b>        | <b>Bluetooth EDR/BDR, Bluetooth LE</b><br>Nominal band: 2400 – 2483.5 MHz<br><br><b>Cellular:</b><br>LTE BAND 4 : 1710.7MHz ~ 1754.3MHz<br>LTE BAND 13 : 779.5MHz ~ 784.5MHz                    |
| <b>Integrated Module Info:</b> | <b>Bluetooth EDR/BDR, Bluetooth LE</b><br>Chipset name: CC2564.<br><br><b>Cellular:</b><br>LE910-SVL, FCC ID: RI7LE910SVL / IC ID: 5131A-LE910SVL.                                              |
| <b>Antenna Type:</b>           | <b>Bluetooth EDR/BDR, Bluetooth LE</b><br>Ethertronics M830320 BT Peak Gain 1.39dBi<br><br><b>Cellular:</b><br>EIRP measurements from OTA testing results used because antenna gain is unknown. |

|                                                           |                                                                                                                                                        |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Maximum Conducted Output Power from modular grant:</b> | <b>Bluetooth EDR/BDR:</b><br>11.51dBm<br><br><b>Bluetooth LE:</b><br>8.89dBm<br><br><b>Cellular:</b><br>LTE Band 4: 22.88 dBm<br>LTE Band 13: 22.3 dBm |
| <b>Power Supply:</b>                                      | No Power supply is part of the sales package.                                                                                                          |
| <b>Rated Operating Voltage Range:</b>                     | 8 VDC – 32 VDC                                                                                                                                         |
| <b>Operating Temperature Range:</b>                       | -10 <sup>0</sup> to 60 <sup>0</sup> C                                                                                                                  |
| <b>Sample Revision:</b>                                   | <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 <sup>2</sup> ) | Averaging time (minutes) |
|-----------------------|-------------------------------------|--------------------------|
| 300 – 1500            | f (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 2.1091(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);  
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 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<sup>2</sup> or W/m<sup>2</sup>)

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

| band       | lowest frequency<br>[MHz] | FCC EIRP limit | IC EIRP limit in W | IC EIRP limit in dBm | EIRP in dBm | Verdict |
|------------|---------------------------|----------------|--------------------|----------------------|-------------|---------|
| LTE 4      | 1710.00                   | 36.900         | 2.12               | 33.27                | 27.87       | Exempt  |
| LTE 13     | 777                       | 33.900         | 1.24               | 30.94                | 25.68       | Exempt  |
|            |                           |                |                    |                      |             |         |
| BT-LE      | 2400                      | 36.900         | 2.68               | 34.28                | 10.28       | Exempt  |
| BT EDR/BDR | 2400                      | 36.900         | 2.68               | 34.28                | 12.9        | Exempt  |

The single radios are exempt from routine environmental evaluation.

## 5.2 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 EIRP measured or calculated from known gain and conducted output power.
- Cellular and BT can transmit simultaneously

| Radio      | freq MHz | EIRP in W | Canada W/m2 | Actual W/m2 | How much of limit is used up |
|------------|----------|-----------|-------------|-------------|------------------------------|
| Band 4     | 1717.5   | 0.46      | 4.255       | 1.218       | 28.63%                       |
| Band 13    | 779.5    | 0.19      | 2.480       | 0.736       | 29.67%                       |
|            |          |           |             |             |                              |
| BT-LE      | 2402     | 0.011     | 5.351       | 0.021       | 0.40%                        |
| BT EDR/BDR | 2402     | 0.019     | 5.351       | 0.039       | 0.72%                        |

### Conclusion:

- The worst case simultaneous transmission is Band 13 simultaneous with BT EDR/BDR which is using 30.4% of a limit of 100%. The equipment is passing RF exposure requirements for 20cm distance.

## 6 Revision History

| Date      | Report Name                        | Changes to report | Report prepared by |
|-----------|------------------------------------|-------------------|--------------------|
| 10/9/2017 | EMC_CALAM-063-17001_FCC_IC_MPE_SVL | Initial Release   | Issa Ghanma        |