



# Radio Frequency Exposure Evaluation Report

For:

CalAmp

Model Name:

LMU-3640 HSPA

Product Description:

Telematics Gateway

FCC ID: APV-3640HEB

IC ID: 5843A-3640HEB

Applied Rules and Standards:

CFR Part 1 (1.1307 & 1.1310), Part 2 (2.1091),  
ISED RSS-102 Issue 5

Report number: EMC\_CALAM\_064\_FCC\_ISED\_MPE

DATE: 2018-06-20



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IC recognized #  
3462B-1

**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 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 ISERC standard RSS-102, 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/ISERC rule parts based on available specifications.

| Company Name | Product Description | Model Name    |
|--------------|---------------------|---------------|
| CalAmp       | Telematics Gateway  | LMU-3640 HSPA |

### Responsible for Testing Laboratory:

| 2018-06-20 | Compliance | James Donnellan<br>(Lab Manager-EMC) |           |
|------------|------------|--------------------------------------|-----------|
| Date       | Section    | Name                                 | Signature |

### Responsible for the Report:

| 2018-06-20 | Compliance | Kevin Wang<br>(Senior EMC 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.

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## **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>Street Address:</b>             | 411 Dixon Landing Road |
| <b>City/Zip Code</b>               | Milpitas, CA 95035     |
| <b>Country</b>                     | USA                    |
| <b>Telephone:</b>                  | +1 (408) 586 6200      |
| <b>Fax:</b>                        | +1 (408) 586 6299      |
| <b>Compliance Manager:</b>         | James Donnellan        |
| <b>Responsible Project Leader:</b> | Kevin Wang             |

### **2.2. Identification of the Client / Manufacturer**

|                          |                          |
|--------------------------|--------------------------|
| <b>Applicant's Name:</b> | CalAmp                   |
| <b>Street Address:</b>   | 2177 Salk Ave, Suite 200 |
| <b>City/Zip Code</b>     | Carlsbad, CA 90228       |
| <b>Country</b>           | United States            |

### 3. Equipment under Assessment

|                                                       |                                                                                                                                                                                                                                                                                        |
|-------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Model No</b>                                       | LMU-3640 HSPA                                                                                                                                                                                                                                                                          |
| <b>HW Version</b>                                     | REV A                                                                                                                                                                                                                                                                                  |
| <b>SW Version</b>                                     | 6.2                                                                                                                                                                                                                                                                                    |
| <b>FCC-ID</b>                                         | APV-3640HEB                                                                                                                                                                                                                                                                            |
| <b>IC-ID</b>                                          | 5843A-3640HEB                                                                                                                                                                                                                                                                          |
| <b>Product Description</b>                            | Telematics Logging Module                                                                                                                                                                                                                                                              |
| <b>Transceiver Technology / Type(s) of Modulation</b> | CINTERION EHS6<br>FCC ID: QIPEHS6; IC ID: 7830A-EHS6<br>GSM/GPRS/EDGE/UMTS/HSPA Module<br><br>TI CC2564, Dual -mode Bluetooth Controller<br>FCC ID: APV-3640LAB/APV-3640LVB<br>IC ID: 5843A-3640LAB/5843A-3640LVB<br>Bluetooth and Bluetooth Low Energy: GFSK / $\pi/4$ -DQPSK / 8DPSK |
| <b>Frequency Range</b>                                | GSM 850: 824.2-848.8;<br>GSM 1900: 1850.2-1909.8;<br>FDD II: 1850 – 1910;<br>FDD V: 824 - 849;<br><br>Bluetooth: 2402-2480;<br>Bluetooth Low Energy: 2402-2480;                                                                                                                        |
| <b>Max. declared antenna gain</b>                     | Ethertronic model: M830820; Peak Gain: 1.39dBi<br>Cellular Antenna, Peak Gain: 850MHz, 1.3dBi; 1900MHz, 2.4dBi<br>(Calculated) <b>Note1</b>                                                                                                                                            |
| <b>Co-located Transmitters/ Antennas?</b>             | Yes – the 2 cellular radio modules operate independently and may transmit simultaneously                                                                                                                                                                                               |
| <b>Power Supply/ Rated Operating Voltage Range</b>    | 8V (Low) / 12-24V (Nominal) / 32V (Max), DC                                                                                                                                                                                                                                            |
| <b>Operating Temperature Range</b>                    | -30°C ~ +75°C                                                                                                                                                                                                                                                                          |
| <b>Sample Revision</b>                                | <input type="checkbox"/> Prototype <input type="checkbox"/> Production <input checked="" type="checkbox"/> Pre-Production                                                                                                                                                              |
| <b>Device Category</b>                                | <input type="checkbox"/> Fixed Installation <input checked="" type="checkbox"/> Mobile <input type="checkbox"/> Portable                                                                                                                                                               |
| <b>Exposure Category</b>                              | <input type="checkbox"/> Occupational/ Controlled <input checked="" type="checkbox"/> General Population/ Uncontrolled                                                                                                                                                                 |

**Note1:** the Cellular Antenna gain was calculated as below:

|        | Max Measured EIRP<br>(dBm) | Max documented conducted output<br>power(dBm) | Antenna Gain<br>(dBi) |
|--------|----------------------------|-----------------------------------------------|-----------------------|
| FDD V  | 24.592                     | 23.33                                         | 1.262                 |
| FDD II | 25.753                     | 23.33                                         | 2.423                 |

#### 4. RF Exposure Limits

For the specific described radio apparatus the following basic limits and rules apply

##### 4.1. Power Density Limits acc. to FCC 1.1310(e)

| Frequency Range (MHz) | Power density (mW/cm <sup>2</sup> ) | Averaging time (minutes) |
|-----------------------|-------------------------------------|--------------------------|
| 1500 – 100.000        | 1.0                                 | 30                       |

##### 4.2. Routine Environmental Evaluation Categorical Exclusion Limits acc. to FCC 2.1091(c)

- Operating frequency > 1.5GHz: excluded if ERP < 3.0W / 34.8dBm;

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

##### 4.3. Exemption Limits for Routine Evaluation to RSS-102 2.5.2

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $1.31 \times 10^{-2} f^{0.6834}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;
- Operating frequency > 300MHz < 6GHz: excluded if ERP < 2.7W / 34.3dBm;

##### 4.4. Exposure Limits RSS-102 4

For the purpose of this standard, ISERC has adopted the SAR and RF field strength limits established in Health Canada's RF exposure guideline, Safety Code 6

| Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment) |                          |                          |                                   |                            |
|-----------------------------------------------------------------------------------------------------|--------------------------|--------------------------|-----------------------------------|----------------------------|
| Frequency Range (MHz)                                                                               | Electric Field (V/m rms) | Magnetic Field (A/m rms) | Power Density (W/m <sup>2</sup> ) | Reference Period (minutes) |
| 300-6000                                                                                            | $3.142 f^{0.3417}$       | $0.008335 f^{0.3417}$    | $0.02619 f^{0.6834}$              | 6                          |

##### 4.5. 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. Routine Environmental Evaluation Applicability Stand Alone transmission

| Transmission Mode | Time-Averaged EIRP dBm | Duty Cycle % | FCC Limits for Routine Environmental Evaluation Applicability, ERP dBm | IC Limits for Routine Environmental Evaluation Applicability, EIRP dBm | Exempt from Routine evaluation (Yes/No) |
|-------------------|------------------------|--------------|------------------------------------------------------------------------|------------------------------------------------------------------------|-----------------------------------------|
| GSM850            | 30.7                   | 50           | < 31.76                                                                | < 31.19                                                                | Yes                                     |
| GSM1900           | 28.7                   | 50           | < 34.77                                                                | < 33.60                                                                | Yes                                     |
| FDD V             | 24.8                   | 100          | < 31.76                                                                | < 31.19                                                                | Yes                                     |
| FDD II            | 26.1                   | 100          | < 34.77                                                                | < 33.60                                                                | Yes                                     |
| Bluetooth/EDR     | 12.9                   | 100          | < 34.77                                                                | < 34.37                                                                | Yes                                     |
| Bluetooth LE      | 10.3                   | 100          | < 34.77                                                                | < 34.37                                                                | Yes                                     |

Note: EIRP power calculation is based on the Stated RF output power and tune-up tolerance provided by the manufacturer

#### Conclusion:

- Since the EIRP is less than the FCC and IC limit, this device is exempt from Routine evaluation.

### 5.2. Compliance with MPE (Power Density) limits

| Power Density Calculation |               |                      |             |                                  |                              |                             |         |
|---------------------------|---------------|----------------------|-------------|----------------------------------|------------------------------|-----------------------------|---------|
| Band of Operation MHz     | Peak EIRP dBm | Maximum Duty Cycle % | Distance cm | Power Density mW/cm <sup>2</sup> | FCC Limit mW/cm <sup>2</sup> | IC Limit mW/cm <sup>2</sup> | Verdict |
| GSM850                    | 33.7          | 50                   | 20          | 0.23492                          | <0.56600                     | <0.26288                    | Pass    |
| GSM1900                   | 31.7          | 50                   | 20          | 0.14822                          | <1.00000                     | <0.45750                    | Pass    |
| FDD V                     | 24.8          | 100                  | 20          | 0.06053                          | <0.56600                     | <0.26288                    | Pass    |
| FDD II                    | 26.1          | 100                  | 20          | 0.08053                          | <1.00000                     | <0.45750                    | Pass    |
| Bluetooth/EDR             | 12.9          | 100                  | 20          | 0.00388                          | <1.00000                     | <0.54742                    | Pass    |
| Bluetooth LE              | 10.3          | 100                  | 20          | 0.00212                          | <1.00000                     | <0.54742                    | Pass    |

#### Conclusion:

- The equipment fulfills the MPE limits for the minimum 20cm distance between the antenna and the human body

## 6. Routine Environmental Evaluation Applicability Simultaneous Transmission

- Possible simultaneous transmissions: According to the manufacturer, the cellular radio module and the Bluetooth module incorporated within the device operate independently from each other. Theoretically, the worst case of simultaneous transmission is with the two transmitters operating at the highest output power mode, within GSM 850 and Bluetooth/EDR.

| Transmission Mode         | Ratio of Power Density to Applicable limit for Stand Alone Operation | Sum of the Ratios for the Highest Possible Simultaneous Operation | Limits for the Highest Combined Ratio | Exempt from Routine evaluation |
|---------------------------|----------------------------------------------------------------------|-------------------------------------------------------------------|---------------------------------------|--------------------------------|
| GSM 850 and Bluetooth/EDR | GSM 850: 89.3%<br>Bluetooth/EDR: 3.6%                                | $89.3\% + 3.6\% = 92.9\%$                                         | < 1                                   | Yes                            |

Note: Power Density to Applicable limit for Stand Alone Operation are derived from table in section 5.2

### Conclusion:

- The equipment is excluded from simultaneous transmission MPE test.

## 7. Revision History

| Date       | Report Name                | Changes to report | Report prepared by |
|------------|----------------------------|-------------------|--------------------|
| 2018-06-20 | EMC_CALAM_064_FCC_ISED_MPE | Initial Version   | Kevin Wang         |