



Radio Frequency Exposure Evaluation Report

FOR:
CalAmp

Model:
HMU3640LB

Product Description:
Heavy Duty Telematics Gateway

FCC ID: APV-3640LB
IC: 5843C-3640LB

Per:
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_CALAM_136_23001_FCC_ISED_RF_Exposure

DATE: 2023-12-11



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	Model
CalAmp	Heavy Duty Telematics Gateway	HMU3640LB

Report reviewed by: TCB Evaluator

2023-12-11 Compliance Arndt Stoecker
 (Director of Regulatory Services)

Date	Section	Name	Signature
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Responsible for the Report:

2023-12-11 Compliance Cheng Song
 (EMC Engineer)

Date	Section	Name	Signature
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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
Director of Regulatory Services:	Arndt Stoecker
Responsible Project Leader:	Cathy Palacios

2.2 Identification of the Client / Manufacturer

Client's Name:	CalAmp
Street Address:	2200 Faraday Ave #220
City/Zip Code	Carlsbad, CA 92008
Country	USA

Identification of the Manufacturer

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

3 Equipment under Assessment⁽¹⁾

Model No:	HMU3640LB
HW Version :	REV A
SW Version :	8.6L
FCC-ID :	APV-3640LB
IC:	5843C-3640LB
FVIN:	N/A
HVIN:	HMU3640LB
PMN:	HMU3640LB
Product Description:	Heavy Duty Telematics Gateway
Radio Information:	<p><u>Cellular:</u></p> <ul style="list-style-type: none"> • Module: Quectel EG21-GL_D • FCC ID: XMR202212EG21GL; IC: 10224A-2022EG21GL • LTE, UMTS, GSM <p><u>Bluetooth:</u></p> <ul style="list-style-type: none"> • Chipset: TI SimpleLink™ CC2652R7 • 2400 MHz – 2483.5 MHz
Antenna Information as declared:	<p><u>Cellular:</u></p> <ul style="list-style-type: none"> • Taoglas PCS.06.A <p><u>Bluetooth:</u></p> <ul style="list-style-type: none"> • AVX/Ethertronics 1001312
Power Supply/ Rated Operating Voltage Range:	Battery powered only: 9-30 VDC
Operating Temperature Range	-30 C to 60 C
Sample Revision	<input type="checkbox"/> Prototype Unit; <input type="checkbox"/> Production Unit; <input checked="" type="checkbox"/> Pre-Production

Note 1: Information provided by the customer

4 RF Exposure Limits and FCC and IC Basic Rules

4.1 Routine Environmental Evaluation Categorical Exclusion Limits acc. to FCC 1.1307(b)(3)(i)(B).

Single RF sources is exempt if the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}}(d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

In the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

4.2 ISED Exemption Limits for Routine Evaluation – RF Exposure Evaluation per IC RSS-102 Issue 5 section 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:

- below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- 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;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

5 Evaluations

5.1 Analysis of RF Exposure

FCC:

Tech-Band	Freq-Low _[GHz]	Pwr _[dBm]	Pwr[dBm] corrected by Duty Cycle	Power _[W]	Ant-G _[dBi]	EIRP _[W]	ERP _[mW]	FCC 2.1091(c)(1) Pth _[mW] = ERP _{20cm}
UMTS II	1.8524	25.00	25.00	0.316	3.05	0.638	389.045	3060.00
UMTS IV	1.7124	25.00	25.00	0.316	3.05	0.638	389.045	3060.00
UMTS V	0.8242	25.00	25.00	0.316	0.77	0.378	230.144	1681.37
LTE 2	1.8550	25.00	25.00	0.316	3.05	0.638	389.045	3060.00
LTE 4	1.7150	25.00	25.00	0.316	3.05	0.638	389.045	3060.00
LTE 5	0.8290	25.00	25.00	0.316	0.77	0.378	230.144	1691.16
LTE 7	2.5500	25.00	25.00	0.316	3.72	0.745	453.942	3060.00
LTE 12	0.7040	25.00	25.00	0.316	-0.21	0.301	183.654	1436.16
LTE 13	0.7820	25.00	25.00	0.316	-0.21	0.301	183.654	1595.28
LTE 25	1.8550	25.00	25.00	0.316	3.05	0.638	389.045	3060.00
LTE 26	0.8255	25.00	25.00	0.316	0.77	0.378	230.144	1684.02
LTE 38	2.5750	25.00	25.00	0.316	3.72	0.745	453.942	3060.00
LTE 41	2.5010	25.00	25.00	0.316	3.72	0.745	453.942	3060.00
LTE 66	1.7150	25.00	25.00	0.316	3.05	0.638	389.045	3060.00
GSM 850	0.8242	35.00	26.00	0.398	0.77	0.475	289.734	1681.37
GSM 1900	1.8502	32.00	23.00	0.200	3.05	0.403	245.471	3060.00
Tech-Band	Freq-Low _[GHz]	Pwr _[dBm]	Pwr[dBm] corrected by Duty Cycle	Power _[W]	Ant-G _[dBi]	EIRP _[W]	ERP _[mW]	FCC 2.1091(c)(1) Pth _[mW] = ERP _{20cm}
LE	2.4020	3.02	3.02	0.002	1.88	0.003	1.884	3060.00

The worst simultaneous transmissions is GSM850 and BTLE:
 TER = 0.237
 RF exposure exemption applicable

IC:

Tech-Band	Freq-Low [MHZ]	Pwr _[dBm]	Pwr[dBm] corrected by Duty Cycle	Power _[W]	Ant-G [dBi]	Ant-G [lin]	EIRP _[W]	EIRP _[mW]	Exemption limit for Routine Evaluation
UMTS II	1852.4	25.00	25.00	0.316	3.05	2.02	0.638	638.263	2.2
UMTS IV	1712.4	25.00	25.00	0.316	3.05	2.02	0.638	638.263	2.1
UMTS V	824.2	25.00	25.00	0.316	0.77	1.19	0.378	377.572	1.3
LTE 2	1855.0	25.00	25.00	0.316	3.05	2.02	0.638	638.263	2.2
LTE 4	1715.0	25.00	25.00	0.316	3.05	2.02	0.638	638.263	2.1
LTE 5	829.0	25.00	25.00	0.316	0.77	1.19	0.378	377.572	1.3
LTE 7	2550.0	25.00	25.00	0.316	3.72	2.36	0.745	744.732	2.8
LTE 12	704.0	25.00	25.00	0.316	-0.21	0.95	0.301	301.301	1.2
LTE 13	782.0	25.00	25.00	0.316	-0.21	0.95	0.301	301.301	1.2
LTE 25	1855.0	25.00	25.00	0.316	3.05	2.02	0.638	638.263	2.2
LTE 26	825.5	25.00	25.00	0.316	0.77	1.19	0.378	377.572	1.3
LTE 38	2575.0	25.00	25.00	0.316	3.72	2.36	0.745	744.732	2.8
LTE 41	2501.0	25.00	25.00	0.316	3.72	2.36	0.745	744.732	2.8
LTE 66	1715.0	25.00	25.00	0.316	3.05	2.02	0.638	638.263	2.1
GSM 850	824.2	35.00	26.00	0.398	0.77	1.19	0.475	475.335	1.3
GSM 1900	1850.2	32.00	23.00	0.200	3.05	2.02	0.403	402.717	2.2
Tech-Band	Freq-Low [MHZ]	Pwr _[dBm]	Pwr[dBm] corrected by Duty Cycle	Power _[W]	Ant-G [dBi]	Ant-G [lin]	EIRP _[W]	EIRP _[mW]	Exemption limit for Routine Evaluation
LE	2402.0	3.02	3.02	0.002	1.88	1.54	0.003	3.090	2.68

The worst simultaneous transmissions is GSM850 and BTLE:
 TER = 0.370
 RF exposure exemption applicable

6 Revision History

Date	Report Name	Changes to report	Prepared by
2023-12-11	EMC_CALAM_136_23001_FCC_ISED_RF_Exposure	Initial Release	Cheng Song

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