Radio Frequency Exposure Evaluation Report

For:

CalAmp

Model Name:

TTU-2900

Product Description:

Telematics Gateway with built in ECU (Engine Control unit)

FCC ID: APV-2900LABL
IC ID: 5843C-2900LABL

Per:

CFR Part Part1 (1.1307 &1.1310), Part 2 (2.1091),
FCC KDB 447498 D01 General RF Exposure Guidance v06
ISEDC RSS-102 Issue 5

Report number: EMC_CALAM-116-20001_FCC_ISED_MPE_Rev1

DATE: 2020-12-16

***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	Telematics Gateway with built in ECU (Engine Control unit)	TTU-2900

Report reviewed by: TCB Evaluator

Date	Section	Name	Signature
2020-12-16	Compliance	Cindy Li (Lab Manager)	Cindy Li Digitally signed by cindy.li@cetecom.com DN: CN=cindy.li@cetecom.com Reason: I have reviewed this document Location: your signing location here Date: 2020-12-16 12:38:35 Foxit Reader Version: 10.0.1

Responsible for the Report:

Date	Section	Name	Signature
2020-12-16	Compliance	Kevin Wang (Senior EMC Engineer)	kevin.wang@cetecom.com Digitally signed by: kevin.wang@cetecom.com DN: CN = kevin.wang@cetecom.com Date: 2020.12.16 11:43:33 -08'00'

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
Lab Manager:	Cindy Li
Responsible Project Leader:	Cathy Palacios

2.2 Identification of the Client / Manufacturer

Client's Name:	CalAmp
Street Address:	2200 Faraday Avenue, Suite 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

Marketing name:	TTU-2900
HW Version :	REV B2
SW Version :	8.4
Hardware Version Identification Number (HVIN):	REV B2
Product Marketing Name (PMN):	TTU-2900
Regulatory Band:	❖ **Cellular Module:** ▪ WCDMA/UMTS FDD BAND II: 1852.4 ~ 1907.6 MHz ▪ WCDMA/UMTS FDD BAND V: 826.4 ~ 846.6 MHz ▪ LTE BAND 2: 1857.5 ~ 1902.5 MHz ▪ LTE BAND 4: 1717.5 ~ 1747.5 MHz ▪ LTE BAND 5: 824.7 ~ 848.3 MHz ▪ LTE BAND 7:2510 ~ 2560 MHz ▪ LTE BAND 12: 699.7 ~ 715.3 MHz ▪ LTE BAND 13: 777 ~ 787 MHz ❖ **BT LE:** ▪ Nominal band: 2400 MHz – 2483.5 MHz; ▪ Center to center: 2402 MHz (ch 0) – 2480 MHz (ch 39), 40 channels
Integrated Module Info:	❖ **Cellular Module:** ▪ Module name: Telit ▪ Model number: LE910-NA1 ▪ FCC/IC ID: RI7LE910NAV2 / 5131A-LE910NAV2; ❖ **BT LE:** ▪ Module name: BlueBoard ▪ FCC/IC ID: APV-BLD01 / 5843C-BLD01
Antenna Type:	❖ **Cellular:** ▪ Antenna maximum gain: o UMTS Band II: 4.81 dBi o UMTS Band V: 3.3 dBi o LTE Band 2: 4.81 dBi o LTE Band 4: 3.48 dBi o LTE Band 5: 3.3 dBi o LTE Band 12: 1.36 dBi

	○ LTE Band 13: 5.22 dBi ❖ **BT LE:** ▪ Antenna gain: 2.5 dBi
Power Supply/ Rated Operating Voltage Range:	Dedicated Battery Pack Vmin: 8 VDC/ Vnom: 12 VDC / Vmax: 32 VDC
Operating Temperature Range:	-30 ºC to 70 ºC
Sample Revision:	☐Prototype Unit; ■Production Unit; ☐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/cm²)	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

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 BT LE.

Radio	freq [MHz]	Max Conducted power [W]	Gain [dBi]	Gain [lin]	EIRP [W]	IC Limit [W/m2]	FCC LImit [W/m2]	Actual [W/m2]²	How much of limit is used up
WCDMA II	1850	0.282	4.81	3.03	0.854	4.476	10.000	1.698	37.94%
WCDMA V	824	0.282	3.3	2.14	0.603	2.576	5.493	1.199	46.56%
LTE 2	1850	0.251	4.81	3.03	0.760	4.476	10.000	1.511	33.76%
LTE 4	1710	0.251	3.48	2.23	0.559	4.242	10.000	1.113	26.22%
LTE 5	824	0.251	3.3	2.14	0.537	2.576	5.493	1.068	41.44%
LTE 12	699	0.251	1.36	1.37	0.343	2.302	4.660	0.683	29.64%
LTE 13	777	0.251	5.22	3.33	0.835	2.474	5.180	1.661	67.14%
BT LE	2400	0.001	2.5	1.78	0.002	5.351	10.000	0.004	0.06%

Note1： The calculation is based on the distance of 20cm

5.2 Conclusion:

The worst-case simultaneous transmission is LTE B13 simultaneous with BT LE, which is using 67.2% 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
2020-12-09	EMC_CALAM-116-20001_FCC_ISED_MPE	Initial Release	Kevin Wang
2020-12-16	EMC_CALAM-116-20001_FCC_ISED_MPE_Rev1	Update the Cellular Antenna Gain	Kevin Wang

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