Radio Frequency Exposure Evaluation Report

FOR: Digi Keep Truckin.

Model Name: LBB-3.5CA

Product Description:
Uses BT to synchronize log data to companion app running on smartphone or tablet.
Can use LTE to synchronize with cloud directly when companion device is not connected.

FCC ID: 2AQM7-35
IC ID: 24516-35

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_KPTRK_006_18001_FCC_ISED_MPE

DATE: 03/15/2019

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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 #
Keep Truckin	Uses BT to synchronize log data to companion app running on smartphone or tablet. Can use LTE to synchronize with cloud directly when companion device is not connected. There are IOS and Android versions of the app.	LBB-3.5CA

Report reviewed by: TCB Evaluator

Date	Section	Name	Signature
03/15/2019	Compliance	Cindy Li (Lab Manager)	Cindy Li Digitally signed by Cindy Li DN: cn=Cindy Li, o=Cetecom Inc., ou=EMC, email=cindy.li@cetecom.com, c=US Date: 2019.03.16 21:21:55 -07'00'

Responsible for the Report:

Date	Section	Name	Signature
03/15/2019	Compliance	Issa Ghanma (EMC Engineer)	Digitally signed by: Issa Ghanma DN: CN = Issa Ghanma email = issa.ghanma@cetecom.com C = US O = CETECOM INC. OU = EMC Date: 2019.03.15 21:16:54 -07'00'

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:	Trina Noor

2.2 Identification of the Client / Manufacturer

Applicant's Name:	Keep Truckin
Street Address:	370 Townsend St.
City/Zip Code	San Francisco, CA 94107
Country	USA

2.3 Identification of the Manufacturer

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

3 Equipment under Assessment

HW Version :	3.5
SW Version :	62040
Firmware Version Identification Number (FVIN):	HL75xx.A.2.13
Hardware Version Identification Number (HVIN):	1
Product Marketing Name (PMN):	LBB-3.5CA
Regulatory Band:	❖ **Cellular Module:** ▪ WCDMA/UMTS FDD Band II: 1852.4 ~ 1907.6 MHz ▪ WCDMA/UMTS FDD Band V: 826.4 ~ 846.4 MHz ▪ LTE Band 2: 1850.7 ~ 1909.3 MHz ▪ LTE Band 4: 1710.7 ~ 1754.3 MHz ▪ LTE Band 5: 829.0 ~ 844.0 MHz ▪ LTE Band 13: 779.5 ~ 784.5 MHz ▪ LTE Band 17: 706.5 ~ 713.5 MHz ❖ **Bluetooth:** ▪ 2402 MHz (ch0) – 2480 MHz (ch39), 40 channels. ❖ **Wi-Fi:** ▪ 2412 MHz (Ch.1) – 2462 MHz (Ch.11), 11 Channels.
Integrated Module Info:	❖ **Cellular Module:** ▪ Module name: Sierra Wireless HL7588 ▪ Model number: 7588 ▪ FCC ID: N7NHL7588 ▪ IC ID: 2417C-HL7588 ❖ **Bluetooth Classic EDR 2.1 and Wi-Fi 802.11b/g/n:** ▪ Module name: LSR Sterling-LWB ▪ Model number: LSR 450-0152 ▪ FCC ID: TFB-1003 ▪ IC ID: 5969A-1003 ❖ **GPS:** ▪ Product name: Ublox ▪ Model number: NEO-M8u-0-10

Antenna Type and Gain:	❖ **Cellular:** ▪ Main LTE: CWT0009P o 704 – 894 MHz: • TX: 0.6 dBi • RX: 1.4 dBi o 1710 – 2155 MHz: • TX: 0.6 dBi • RX: 1.4 dBi ▪ Diversity: CWT0011P (RX only) o 704 – 894 MHz: 0.8 dBi o 1710 – 2155 MHz: 3.7 dBi ❖ **Bluetooth Classic EDR 2.1 and Wi-Fi 802.11b/g/n:** ▪ 2.45 GHz SMD Antenna, EIA 1210, Detuning resilient, Edge Mount Design: o Part number: 2450AT18D0100 o Frequency: 2.4 – 2.48 GHz o Peak Gain: 1.5 dBi
Maximum Conducted Output Power:	❖ **Cellular:** In modular grant [Watts]: ▪ WCDMA Band II: 0.355 ▪ WCDMA Band V: 0.298 ▪ LTE Band 2: 0.247 ▪ LTE Band 4: 0.259 ▪ LTE Band 5: 0.235 ▪ LTE Band 13: 0.228 ▪ LTE Band 17: 0.224 ❖ **Bluetooth Classic EDR 2.1:** In modular grant [Watts]: 0.0078 ❖ **Wi-Fi 802.11b/g/n:** In modular grant [Watts]: 0.2519
Power Supply/ Rated Operating Voltage Range:	Low 6 VDC, Nominal 14 VDC, High 30 VDC
Operating Temperature Range:	Low -40º C, Nominal 20º C, High 115º C
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 – 100.000	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 2.109(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 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 to Exclude Routine RF Exposure evaluation for Stand Alone Operation

Band	Lowest frequency [MHz]	FCC EIRP limit [dBm]	EIRP [dBm]	ISED EIRP limit [W]	EIRP [W]	Verdict
UMTS II	**1852.4**	**36.90**	**28.602**	**2.24**	**0.725**	Exempt
UMTS V	826.4	33.90	25.342	1.29	0.342	Exempt
LTE 2	1850.7	36.90	26.829	2.24	0.482	Exempt
LTE 2	1860.0	36.90	27.027	2.25	0.504	Exempt
LTE 4	1710.7	36.90	27.182	2.12	0.523	Exempt
LTE 4	1720.0	36.90	27.233	2.13	0.529	Exempt
LTE 5	824.7	33.90	24.311	1.29	0.270	Exempt
LTE 5	829.0	33.90	24.311	1.29	0.270	Exempt
LTE 13	779.5	33.90	24.024	1.24	0.253	Exempt
LTE 13	782.0	33.90	24.179	1.24	0.262	Exempt
LTE 17	706.5	33.90	24.102	1.16	0.257	Exempt
LTE 17	709.0	33.90	24.083	1.16	0.256	Exempt
Bluetooth Classic EDR 2.1	2402	36.90	10.421	2.68	0.011	Exempt
Wi-Fi	2412	36.90	25.512	2.68	0.356	Exempt

The single radios are exempt from routine environmental evaluation.

6 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 can transmit simultaneously with either Wi-Fi or Bluetooth radios.

Radio	Frequency [MHz]	EIRP [W]	Actual [W/m²]	FCC Limit [W/m²]	ISED Limit [W/m²]	How much of limit is used up [%]
UMTS II	**1852.4**	**0.725**	**1.442**	**10.0**	**4.480**	**32.18**
UMTS V	826.4	0.342	0.415	5.509	2.581	16.08
LTE 2	1850.7	0.482	0.959	10.0	4.477	21.41
LTE 2	1860.0	0.504	1.003	10.0	4.493	22.33
LTE 4	1710.7	0.523	1.040	10.0	4.243	24.51
LTE 4	1720.0	0.529	1.052	10.0	4.259	24.70
LTE 5	824.7	0.270	0.537	5.498	2.577	20.83
LTE 5	829.0	0.270	0.537	5.527	2.586	20.75
LTE 13	779.5	0.253	0.503	5.197	2.480	20.27
LTE 13	782.0	0.262	0.521	5.213	2.485	20.96
LTE 17	706.5	0.257	0.512	4.710	2.319	22.07%
LTE 17	709.0	0.256	0.509	4.727	2.324	21.92
Bluetooth Classic EDR 2.1	2402	0.011	0.022	10.0	5.351	0.41
Wi-Fi	**2412**	**0.356**	**1.052**	**10.0**	**5.366**	**19.61**

Conclusion:

- **The worst case simultaneous transmission is UMTS Band II simultaneous with Wi-Fi which is using 51.79% of a limit of 100%. The equipment is passing RF exposure requirements for 20cm distance.**

7 Revision History

Date	Report Name	Changes to report	Report prepared by
03/15/2019	EMC_KPTRK_006_18001_FCC_ISED_MPE	Initial Release	Issa Ghanma