



Radio Frequency Exposure Evaluation Report

FOR:
OpenTV Inc

Model Number:
RecovR

Product Description:
LTE-CATM1 GPS locator for automotive and other applications

FCC ID: 2AYG4-HW1868C
IC: 28683- HW1868C

Applied Rules and Standards:
CFR 47 Part 2 (2.1093),
ISED RSS-102 Issue 5

Report #: EMC_LOOMA_013_22001_FCC_ISED_RF_Exposure_EX

DATE: 2023-06-13



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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: contact@etekom.com ♦ <http://www.cetekom.com>

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1. Assessment

The following device was evaluated against the limits for general population uncontrolled exposure specified in CFR 47 Part 2.1093 according to SAR evaluation exclusion requirements specified in FCC regulation as listed in KDB 447498, and ISED RSS-102 Issue 5.

The device meets the requirements for SAR exclusion as stipulated by the above given FCC/ISED rules.

Company	Description	Model #
OpenTV Inc	LTE-CATM1 GPS locator for automotive and other applications	RecovR

Responsible for Testing Laboratory:

2023-06-13	Compliance	Arndt Stoecker (Director of Regulatory Service)	Arndt Stoecker	Digitally signed by: Arndt Stoecker DN: CN = Arndt Stoecker email = arndt.stoecker@cetecom.com C = US O = CETECOM Inc Date: 2023.06.13 17:15:23 -07'00'
Date	Section	Name	Signature	

Responsible for the Report:

2023-06-13	Compliance	Cheng Song (EMC Engineer)	cheng. song@ce- etecom. com	Digitally signed by: cheng. song@cetecom. com DN: CN = cheng. song@cetecom. com Date: 2023.06.13 16:36:55 -07'00'
Date	Section	Name	Signature	

The test results of this test report relate exclusively to the test item specified in Section3.
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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
Lab Manager:	Arndt Stoecker
Responsible Project Leader:	Akanksha Baskaran

2.2. Identification of the Client / Manufacturer

Client's Name:	OpenTV Inc
Street Address:	5090 North 40th St., Suite 450
City/Zip Code	85018, Phoenix
Country	USA

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

3. Equipment under Assessment

Model No:	RecovR
HW Version :	V3
SW Version :	V1.6.1
FCC ID :	2AYG4-HW1868C
IC:	28683- HW1868C
Contains FCC ID :	2AYG4-HW1868-1
Contains IC :	28683-HW1868
PMN:	RecovR
Product Description:	LTE-CATM1 GPS locator for automotive and other applications
Radio Information:	<u>Cellular:</u> - Module: Nordic nRF9160, LTE CAT-M1 - FCC ID: 2AYG4-HW1868-1, IC: 28683-HW1868 <u>WLAN:</u> - Module: Silicon Labs RS9116-B00, 2.4GHz <u>BTLE:</u> - Module: Silicon Labs RS9116-B00, Bluetooth 5 LE
Antenna Information as declared:	<u>Peak Gain Cellular:</u> 1.6 dBi (698-960MHz) 3.1 dBi (1710-2400MHz) 1.7 dBi (2500-2700MHz) <u>Peak Gain BT/WLAN:</u> 2.6 dBi
Power Supply/ Rated Operating Voltage Range:	Vmin: 2.0 VDC/ Vnom: 3.6 VDC / Vmax: 5 VDC
Operating Temperature Range	Low -40°C, Nominal 25°C, High 85°C
Sample Revision	☐ Prototype Unit; ☒ Production Unit; ☐ Pre-Production

4. FCC and ISED Exemption Limits for Routine Evaluation

4.1. FCC SAR-Based Exemption per KDB 447498 2.1.3 and FCC CFR 47 § 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 SAR test exclusions per IC RSS-102 Issue 5

ISED RSS-102 Section: 2.5.1 Exemption Limits for Routine Evaluation — SAR Evaluation

SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in Table 1. Output power level shall be the higher of the maximum conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power.

Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of 30 mm	At separation distance of 35 mm	At separation distance of 40 mm	At separation distance of 45 mm	At separation distance of ≥50 mm
≤300	223 mW	254 mW	284 mW	315 mW	345 mW
450	141 mW	159 mW	177 mW	195 mW	213 mW
835	80 mW	92 mW	105 mW	117 mW	130 mW
1900	99 mW	153 mW	225 mW	316 mW	431 mW
2450	83 mW	123 mW	173 mW	235 mW	309 mW
3500	86 mW	124 mW	170 mW	225 mW	290 mW
5800	56 mW	71 mW	85 mW	97 mW	106 mW

5. RF Exposure Evaluation

5.1. Justification for using the 60 mm Distance (10-g Extremity)

The conservative distance of 60 mm is an estimate of how close a human body can be to the device in its typical application. 10-g extremity limit applied to limb-worn device.

FCC

Radio	Frequency	Power (dBm)	Power (W)	Antenna Gain (dBi)	ERP (mW)	Pth [mW] (60mm) 1-g	Pth [mW] (60mm) 10-g
LTE 2	1.8550	23.00	0.2	3.10	248.313	333.207	833.017
LTE 4	1.7150	23.00	0.2	3.10	248.313	340.113	850.283
LTE 5	0.8290	23.00	0.2	1.60	175.792	309.946	774.865
LTE 12	0.7040	23.00	0.2	1.60	175.792	299.210	748.026
LTE 13	0.7795	23.00	0.2	1.60	175.792	305.857	764.644
LTE 25	1.8550	23.00	0.2	3.10	248.313	333.207	833.017
LTE 26	0.8190	23.00	0.2	1.60	175.792	309.136	772.839
LTE 66	1.7150	23.00	0.2	3.10	248.313	340.113	850.283
BTLE	2.4020	5.55	0.004	2.60	3.981	311.439	778.597
802.11 g	2.4120	17.24	0.053	2.60	58.749	311.101	777.751

The worst simultaneous transmissions is LTE B2 and BTLE:

TER = 0.303

RF exposure exemption applicable

ISED

Radio	Frequency	Power (dBm)	Power (W)	Antenna Gain (dBi)	EIRP (mW)	RSS 102 Exemption Limit [mW] (60mm) 1-g	RSS 102 Exemption Limit [mW] (60mm) 10-g
LTE 2	1.8550	23.00	0.2	3.10	407.380	418.28	1045.7
LTE 4	1.7150	23.00	0.2	3.10	407.380	378.71	946.775
LTE 5	0.8290	23.00	0.2	1.60	288.403	131.29	328.225
LTE 12	0.7040	23.00	0.2	1.60	288.403	158.24	395.6
LTE 13	0.7795	23.00	0.2	1.60	288.403	141.96	354.9
LTE 25	1.8550	23.00	0.2	3.10	407.380	418.28	1045.7
LTE 26	0.8190	23.00	0.2	1.60	288.403	133.45	333.625
LTE 66	1.7150	23.00	0.2	3.10	407.380	378.71	946.775
BTLE	2.4020	5.55	0.004	2.60	6.457	319.65	799.125
802.11 g	2.4120	17.24	0.053	2.60	96.383	317.43	793.575

The worst simultaneous transmissions is LTE B26 and BTLE:

TER = 0.873

RF exposure exemption applicable

6. Revision History

Date	Report Name	Changes to report	Report prepared by
2023-05-31	EMC_LOOMA_013_22001_FCC_ISED_SAR_EX	Initial	Cheng Song
2023-06-13	EMC_LOOMA_013_22001_FCC_ISED_RF_Exposure_EX	Updated RF exposure calculation	Cheng Song