Radio Frequency Exposure Evaluation Report

FOR:
OpenTV Inc

Model Number:
HW1868

Product Description:
Asset Locator

Contains FCC ID: 2AYG4-HW1868-1

Applied Rules and Standards:
CFR 47 Part 2 (2.1093),
FCC KDB 447498 D01 General RF Exposure Guidance v06

Report number: EMC_LOOMA-001-21001_FCC_SAR_EX

DATE: 2021-03-25

A2LA Accredited

***CETECOM* Inc.**
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Contents

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.

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

Company	Description	Model #
OpenTV Inc	Asset Locator	HW1868

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2021-03-25	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: 2021-03-30 12:35:54 Foxit Reader Version: 10.0.1

Responsible for the Report:

Date	Section	Name	Signature
2021-03-25	Compliance	Yuchan Lu (Test Engineer)	Yuchan Lu Digitally signed by: Yuchan Lu DN: CN = Yuchan Lu email = Yuchan.Lu@cetecom.com C = US O = CETECOM Inc. OU = EMC Date: 2021.03.25 16:16:39 -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:	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	HW1868
HW Version	V1
SW Version	1.0.4
Contains FCC-ID	2AYG4-HW1868-1
Product Description	Asset Locator
Device Category	☐ Fixed Installation ☐ Mobile ■ Portable ☐ Mixed Mobile and Portable
Frequency Range / number of channels	CAT-M1 LTE Band 5: 823.3 – 824.7 MHz; NB-IOT LTE Band 5: 823.9 – 824.1 MHz; LTE Band 12: 699 – 716 MHz; LTE Band 13: 777 – 787 MHz; LTE Band 14: 788 – 798 MHz; LTE Band 25: 1850 – 1915 MHz; LTE Band 26: 814 – 849 MHz; LTE Band 66: 1710 – 1780 MHz;
Type(s) of Modulation	LTE Bands: QPSK Modulation
Modes of Operation / Declared Output power	**CAT-M1:** LTE Band 5: 209.89 mW; LTE Band 12: 194.02 mW; LTE Band 13: 200.45 mW; LTE Band 14: 211.84 mW; LTE Band 25: 217.77 mW; LTE Band 26: 217.77 mW; LTE Band 66: 213.8 mW; **NB-IOT:** LTE Band 5: 200.45 mW; LTE Band 12: 200.91 mW; LTE Band 13: 205.12 mW; LTE Band 25: 217.77 mW; LTE Band 26: 202.3 mW; LTE Band 66: 211.35 mW;
Max. declared antenna gain	LTE Band 13: Chip Ethertronics 1004795: • 698-960MHz:1.6dBi • 1710-2400MHz: 3.1dBi BTLE/WLAN: Chip Ethertronics 1001013: 2.6dBi
Minimum distance of antenna or radiating parts to user	10 mm
Power Supply/ Rated Operating Voltage Range	Vmin: 2.0 VDC / Vnom: 3.6 VDC / Vmax: 5 VDC

Operating Temperature Range	-40 ºC to 85 ºC
Other Radios included in the device	BT LE: Receive mode only WLAN: Receive mode only
Co-located Transmitters / Antennas	☐Yes ■ No
Sample Revision	☐Prototype ☐ Production ■ Pre-Production
Exposure Category	☐ Occupational/ Controlled ■ General Population/ Uncontrolled

4. FCC Exemption Limits for Routine Evaluation

4.1. FCC SAR test exclusions per KDB 447498

KDB 447498 D01 General RF Exposure Guidance v06 Section: 4.3.1.
Standalone SAR test exclusion considerations states

4) For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR, 30 where

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- The values 3.0 and 7.5 are referred to as *numeric thresholds.*

The test exclusions are applicable only when the minimum *test separation distance* is ≤ 50 mm, and for transmission frequencies between 100 MHz and 6 GHz. When the minimum *test separation distance* is < 5 mm, a distance of 5 mm according to 4.1 f) is applied to determine SAR test exclusion.

SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≤ 50 mm

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	*SAR Test Exclusion Threshold* (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	

5. Stand-alone Transmission SAR Exclusion Evaluation

5.1. Justification for using the 10 mm Distance

The devise intends to be used on human body. The conservative distance of 10 mm is an estimate of how close a human body can be to the device in its typical application.

5.2. Justification for use of load based time averaging

The worst case loading for each of the radios was determined from the following information provided by the manufacturer:

EUT Operating Conditions

Only cellular can transmit. WiFi and BLE can only be in receive mode.

5.3. SAR Exclusion Calculation Table

FCC Standalone Transmission SAR Exclusion Calculations									
Band	**d [mm]**	**f [GHz]**	**Max Power [mW]**	**Max Power + Tune Up [mW]**	**Source Based Duty Cycle**	**Load based duty cycle based on Maximum payload.**	**Effective Time Average Max Power [mW]**	**P1/D*SQRT(F) at ≤ 10mm**	**1-g ≤ 3.0**
CAT-M1 LTE Band 5	10	0.8233	209.89	251.19	1	0.074	18.58806	1.69	Yes
CAT-M1 LTE Band 12	10	0.699	194.02	251.19	1	0.074	18.58806	1.55	Yes
CAT-M1 LTE Band 13	10	0.777	200.45	251.19	1	0.074	18.58806	1.64	Yes
CAT-M1 LTE Band 14	10	0.788	211.84	251.19	1	0.074	18.58806	1.65	Yes
CAT-M1 LTE Band 25	10	1.85	217.77	251.19	1	0.074	18.58806	2.53	Yes
CAT-M1 LTE Band 26	10	0.814	217.77	251.19	1	0.074	18.58806	1.68	Yes
CAT-M1 LTE Band 66	10	1.71	213.80	251.19	1	0.074	18.58806	2.43	Yes
NB-IOT LTE Band 5	10	0.8239	200.45	251.19	1	0.074	18.58806	1.69	Yes
NB-IOT LTE Band 12	10	0.699	200.91	251.19	1	0.074	18.58806	1.55	Yes
NB-IOT LTE Band 13	10	0.777	205.12	251.19	1	0.074	18.58806	1.64	Yes
NB-IOT LTE Band 25	10	1.85	217.77	251.19	1	0.074	18.58806	2.53	Yes
NB-IOT LTE Band 26	10	0.814	202.30	251.19	1	0.074	18.58806	1.68	Yes
NB-IOT LTE Band 66	10	1.71	211.35	251.19	1	0.074	18.58806	2.43	Yes

Note 1: The FCC limit was derived by calculating the maximum output power passing the threshold for 1-g SAR exclusion.
Note 2: The customer declares that the worst case LTE-CATM1 uplink payload size with all possible features enabled is 525 bytes and shortest interval of uplink is 1 uplink every 1 minute.

The Minimum CAT M1 data rate per 3 GPP is 16 bits / ms.
525 Bytes x 8 = 4200 bits
Duty cycle = (4200/16)/60000=**0.4375%**

The connection setup is not be affected by our transmission control mechanism as there is not user plane data involved here.
MSG1 (RACH preamble) is a maximum 2.3 ms in length.
MSG3 (RRC connection request) is a maximum of 100 bits long. In worst-case resource allocation of 16 bits /ms this will lead to a 7 ms transmission time
MSG5 (RRC connection setup complete) is a maximum of 100 Bytes long. In worst-case resource allocation of 16 bits /ms this will lead to a 50 ms transmission time.
In case the RRC connection is not successful because the MSG5 does not get through, a conservative RRC timeout is defined by RecovR with 800 ms. Only after this timer runs down the UE may attempt another connection requests.
59.3 ms in 800 ms leads to a worst-case duty cycle of **7.4%**.
All above values have been taken from the LTE physical layer standard 3GPP TS 36.213 and the LTE MAC layer standard 3GPP TS 36.321

6. Revision History

Date	Report Name	Changes to report	Report prepared by
2021-03-25	EMC_LOOMA-001-21001_FCC _SAR_EX	Initial version	Yuchan Lu