RF Exposure Evaluation Report

FOR:
Motive Technologies, Inc.

Brand:
Motive Technologies, Inc.

Marketing Name:
Omnicam

Model Number:
OC-1

Product Description:
Is a vehicle camera, designed to be powered by vehicle power (12 or 24 V DC). It is designed to be always on and recording video while the vehicle is on. It will upload small video files to Motive back-end servers via LTE on request.

FCC ID: 2AQM7-OC1
IC: 24516-OC1

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_KPTRK_040_23001_FCC_ISED_RF_Exposure

DATE: 6/28/2023

A2LA Accredited

IC recognized # 3462B

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1 Assessment

This RF Exposure evaluation report provides evidence for compliance of the equipment (as identified in section 3 of this test report) with the RF Exposure limits for mobile devices as defined in FCC CFR Part 1 1.1307, Part 2 (2.1091) and ISED standard RSS-102 issue 5 under worst case conditions (measured or rated RF output power including tune-up tolerance, antenna gain, the distance towards the 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 stipulated by the above given FCC and ISED rule parts based on available specifications for worst-case conditions at a separation distance greater than 20cm to the body.

Company	Description	Model #
Motive Technologies, Inc.	Is a vehicle camera, designed to be powered by vehicle power (12 or 24 V DC). It is designed to be always on and recording video while the vehicle is on. It will upload small video files to Motive back-end servers via LTE on request.	OC-1

Responsible for Testing Laboratory:

Date	Section	Name	Signature
6/28/2023	Compliance	Stoecker, Arndt (Director of Regulatory Services)	Arndt Stoecker Digitally signed by: Arndt Stoecker DN: CN = Arndt Stoecker email = arndt.stoecker@cetecom.com C = US O = CETECOM Inc Date: 2023.06.28 17:57:52 -07'00'

Responsible for the Report:

Date	Section	Name	Signature
6/28/2023	Compliance	Ghanma, Issa (Deputy Lab Manager)	Digitally signed by: Issa Ghanma DN: CN = Issa Ghanma email = Issa.Ghanma@cetecom.com C = US O = CETECOM, Inc. OU = EMC Date: 2023.06.28 17:34:47 -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
EMC Lab Manager:	Stoecker, Arndt
Responsible Project Leader:	Quintal, Phillip

2.2 Identification of the Client / Manufacturer

Applicant's Name:	Motive Technologies, Inc.
Street Address:	55 Hawthorne St., Suite 400
City/Zip Code	San Francisco, CA 94105
Country	USA

2.3 Identification of the Manufacturer

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

3 Equipment under Assessment

Brand:	Motive Technologies, Inc.
Model No:	OC-1
Marketing name:	Omnicam
FCC-ID :	2AQM7-OC1
IC:	24516-OC1
HW Version :	1
SW Version :	0.7.2
HVIN:	OC-1
PMN:	Omnicam
Product Description:	Is a vehicle camera, designed to be powered by vehicle power (12 or 24 V DC). It is designed to be always on and recording video while the vehicle is on. It will upload small video files to Motive back-end servers via LTE on request.
Frequency Range/number of channels:	❖ Cellular: o UMTS II, IV, V o LTE 2, 4, 5, 12, 13 ❖ BT LE v5.2 o Nominal band: 2400 MHz – 2483.5 MHz o Center to center: 2402 MHz (ch 0) – 2480 MHz (ch 39), 40 Channels ❖ WLAN 2.4 GHz 802.11b/g/n o Nominal band: 2400 MHz – 2483.5 MHz o Center to center: 2412 MHz (ch 1) – 2462 MHz (ch 11), 11 Channels ❖ WLAN 5.0 GHz 802.11a/n/ac o Nominal band: 5725 MHz – 5850 MHz o 802.11a/n-HT20/ac-VHT20 ▪ Center to center: 5745 MHz (ch 149) – 5825 MHz (ch 165), 5 Channels o 802.11n-HT40/ac-VHT40 ▪ Center to center: 5755 MHz (ch 151) – 5795 MHz (ch 159), 2 Channels o 802.11ac-VHT80 ▪ Center to center: 5775 MHz (ch 155), 1 Channels
Radio information:	❖ Cellular: Sierra Wireless RC7612 ❖ BT LE/WLAN: Murata LBEE5XV1XZ

Max. Output Power:	❖ Cellular o UMTS: 23 dBm ± 1dB Power class 3 o LTE: 23 dBm ± 1dB Power class 3 ❖ BT LE (Measured): 4.89 dBm ❖ WLAN 0 2.4 GHz (Measured) o 802.11b: 17.79 dBm o 802.11g: 25.06 dBm ❖ WLAN 1 2.4 GHz (Measured) o 802.11b: 20.4 dBm o 802.11g: 25.23 dBm ❖ WLAN MIMO 2.4 GHz (Measured) 802.11n-HT20: 27.59 dBm ❖ WLAN 0 U-NII-3 (Measured) 802.11a: 16.03 dBm ❖ WLAN 1 U-NII-3 (Measured) 802.11a: 16.02 dBm ❖ WLAN MIMO U-NII-3 (Calculated total power) o 802.11n-HT20: 18.77 dBm o 802.11n-HT40: 16.95 dBm o 802.11ac-VHT20: 18.75 dBm o 802.11ac-VHT40: 16.76 dBm o 802.11ac-VHT80: 15.74 dBm
Power Supply/ Rated Operating Voltage Range:	12 or 24 V DC
Operating Temperature Range:	T min: -40 °C / T Nom: 20 °C / T max: +60 °C
Antenna Information as declared:	❖ LTE Main o Type: Monopole Antenna o Tx/Rx o Max Gain ▪ 704 – 894 MHz: 4.6 dBi ▪ 1710 – 2155 MHz: 5.3 dBi ❖ LTE Diversity o Type: Inverted-F Antenna o Rx only o Max Gain ▪ 1710 – 2170 MHz: -1.1 dBi ❖ BLE/WLAN 0 o Type: Inverted-F Antenna o Tx/Rx o Max Gain ▪ 2.4 -2.48 GHz: 1.7 dBi ▪ 5.0 – 6.0 GHz: 4.4 dBi ❖ BLE/WLAN 1 o Type: Inverted-F Antenna o Tx/Rx o Max Gain ▪ 2.4 -2.48 GHz: 0.8 dBi ▪ 5.0 – 6.0 GHz: 5.6 dBi
Sample Revision:	☐ Production Unit; ☑ Pre-Production
Product dimensions [mm]:	82mm tall x 82mm wide x 67mm deep
Note: The information of the EUT specifications in the table above is provided by the client except the specified (Measured or calculated) output power.	

4 RF Exposure Limits and FCC and ISED Basic Rules

4.1 FCC

4.1.1 § 2.1091(c)(1)

Evaluation of compliance with the exposure limits in § 1.1310 of this chapter, and preparation of an EA if the limits are exceeded, is necessary for mobile devices with single RF sources having either more than an available maximum time-averaged power of 1 mW or more than the ERP listed in Table 1 to § 1.1307(b)(3)(i)(C), whichever is greater. For mobile devices not exempt by § 1.1307(b)(3)(i)(C) at distances from 20 centimeters to 40 centimeters and frequencies from 0.3 GHz to 6 GHz, evaluation of compliance with the exposure limits in § 1.1310 of this chapter is necessary if the ERP of the device is greater than ERP20cm in the formula below. If the ERP of a single RF source at distances from 20 centimeters to 40 centimeters and frequencies from 0.3 GHz to 6 GHz is not easily obtained, then the available maximum time-averaged power may be used (i.e., without consideration of ERP) in comparison with the following formula only if the physical dimensions of the radiating structure(s) do not exceed the electrical length of λ/4 or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

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

4.1.2 § 2.1091(c)(2)

For multiple mobile or portable RF sources within a device operating in the same time averaging period, routine environmental evaluation is required if the formula in § 1.1307(b)(3)(ii)(B) of this chapter is applied to determine the exemption ratio and the result is greater than 1.

4.1.3 § 1.1307(b)(3)(ii)(B)

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.

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

4.2 ISED RSS 102

4.2.1 Clause 2.5.2 Exemption Limits for Routine Evaluation – RF Exposure Evaluation

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 x 10-2 f0.6834 W (adjusted for tune-up tolerance), where f is in MHz;

5 Evaluations

5.1 FCC RF Exposure (Standalone)

Radio	Technology / Band	Frequency [GHz]	Power [mW]	Gain [dBi]	ERP [mW]	FCC 2.1091(c)(1) $Pth_{[mW]} = ERP_{20cm}$	ERP<Threshold
Cellular	UMTS II	1852.4	251.2	5.30	518.80	3060.00	Exempt
	UMTS IV	1712.4	251.2	5.30	518.80	3060.00	Exempt
	UMTS V	826.4	251.2	4.60	441.57	1685.86	Exempt
	LTE 2	1855.0	251.2	5.30	518.80	3060.00	Exempt
	LTE 4	1715.0	251.2	5.30	518.80	3060.00	Exempt
	LTE 5	829.0	251.2	4.60	441.57	1691.16	Exempt
	LTE 12	704.0	251.2	4.60	441.57	1436.16	Exempt
	LTE 13	779.5	251.2	4.60	441.57	1590.18	Exempt
BT	LE	2402.0	3.1	1.70	2.78	3060.00	Exempt
WLAN	802.11 b Ant 0	2412.0	60.1	1.70	54.20	3060.00	Exempt
	802.11 b Ant 1	2412.0	109.6	0.80	80.35	3060.00	Exempt
	802.11 g Ant 0	2412.0	320.6	1.70	289.07	3060.00	Exempt
	802.11 g Ant 1	2412.0	333.4	0.80	244.34	3060.00	Exempt
	802.11 n-HT20 MIMO	2412.0	574.1	1.27	468.81	3060.00	Exempt
	802.11 a Ant 0	5745.0	40.1	4.40	67.27	3060.00	Exempt
	802.11 a Ant 1	5745.0	40.0	5.60	88.51	3060.00	Exempt
	802.11 n-HT20 MIMO	5745.0	75.3	5.04	146.55	3060.00	Exempt
	802.11 ac-VHT20 MIMO	5745.0	75.0	5.04	145.88	3060.00	Exempt
	802.11 n-HT40 MIMO	5755.0	49.5	5.04	96.27	3060.00	Exempt
	802.11 ac-VHT20 MIMO	5755.0	47.4	5.04	92.17	3060.00	Exempt
	802.11 ac-VHT80 MIMO	5775.0	37.5	5.04	72.98	3060.00	Exempt

5.2 ISED RF Exposure (Standalone)

Radio	Technology / Band	Frequency [GHz]	Power [W]	Gain [dBi]	E.I.R.P [W]	Exemption limit for Routine Evaluation [W]	E.I.R.P <Threshold
Cellular	UMTS II	1852.4	0.251	5.30	0.851	2.2	Exempt
	UMTS IV	1712.4	0.251	5.30	0.851	2.12	Exempt
	UMTS V	826.4	0.251	4.60	0.724	1.29	Exempt
	LTE 2	1855.0	0.251	5.30	0.851	2.24	Exempt
	LTE 4	1715.0	0.251	5.30	0.851	2.13	Exempt
	LTE 5	829.0	0.251	4.60	0.724	1.29	Exempt
	LTE 12	704.0	0.251	4.60	0.724	1.16	Exempt
	LTE 13	779.5	0.251	4.60	0.724	1.24	Exempt
BT	LE	2402.0	0.003	1.70	0.005	2.68	Exempt
WLAN	802.11 b Ant 0	2412.0	0.060	1.70	0.089	2.68	Exempt
	802.11 b Ant 1	2412.0	0.110	0.80	0.132	2.68	Exempt
	802.11 g Ant 0	2412.0	0.321	1.70	0.474	2.68	Exempt
	802.11 g Ant 1	2412.0	0.333	0.80	0.401	2.68	Exempt
	802.11 n-HT20 MIMO	2412.0	0.574	1.27	0.769	2.68	Exempt
	802.11 a Ant 0	5745.0	0.040	4.40	0.110	4.86	Exempt
	802.11 a Ant 1	5745.0	0.040	5.60	0.145	4.86	Exempt
	802.11 n-HT20 MIMO	5745.0	0.075	5.04	0.240	4.86	Exempt
	802.11 ac-VHT20 MIMO	5745.0	0.075	5.04	0.239	4.86	Exempt
	802.11 n-HT40 MIMO	5755.0	0.049	5.04	0.158	4.86	Exempt
	802.11 ac-VHT20 MIMO	5755.0	0.047	5.04	0.151	4.86	Exempt
	802.11 ac-VHT80 MIMO	5775.0	0.038	5.04	0.120	4.87	Exempt

5.3 Multiple RF sources

The worst case of simultaneous transmission is LTE 12 + BT LE + WLAN 802.11 n-HT20 MIMO (2.4 GHz):
(251.2/1436.16) + (3.1/3060) + (574.1/3060) = 0.496 ≤ 1

The sum of the fractional contributions to the applicable thresholds is less than or equal to 1, hence the multiple RF sources are exempt

6 Revision History

Date	Report Name	Changes to report	Prepared by
6/28/2023	EMC_KPTRK_040_23001_FCC_ISED_RF_Exposure	Initial Version	Ghanma, Issa

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