Maximum Permissible Exposure Report

Product	:	Essential 2 Camera Family
Model Name	:	VMC3052
Series Model	:	VMC2052, VMC3050, VMC2050
FCC ID	:	2APLE18300425
Test Regulation	:	47 CFR FCC Part 2.1091
Received Date	:	2023/3/16
Test Date	:	2023/4/7 ~ 2023/4/20
Issued Date	:	2023/6/26
Applicant	:	Arlo Technologies Inc 2200 Faraday Avenue, Suite 150, Carlsbad, CA 92008, USA
Issued By	:	Underwriters Laboratories Taiwan Co., Ltd. Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Testing Laboratory
3398

REVISION HISTORY

Original Test Report No.: 4790738132-US-R2-V0

Revision	Test report No.	Date	Page revised	Contents
Original	4790738132-US-R2-V0	2023/6/26	-	Initial issue

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1. Attestation of Test Results

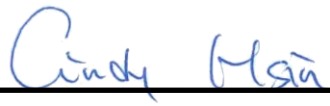
APPLICANT:	Arlo Technologies Inc 2200 Faraday Avenue, Suite 150, Carlsbad, CA 92008, USA
MANUFACTURER:	Fuyu Precision Component Company Limited Lot M1 and Lot F, Quang Chau Industrial Park, Van Trung Commune, Viet Yen District, Bac Giang Province,Viet Nam
EUT DESCRIPTION:	Essential 2 Camera Family
BRAND:	Arlo
MODEL:	VMC3052
SERIES MODEL:	VMC2052, VMC3050, VMC2050
SAMPLE STAGE:	Engineering Verification Test sample

APPLICABLE STANDARDS	
STANDARD	**Test Results**
47 CFR FCC Part 2.1091	PASS

Underwriters Laboratories Taiwan Co., Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by Underwriters Laboratories Taiwan Co., Ltd. based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Underwriters Laboratories Taiwan Co., Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Underwriters Laboratories Taiwan Co., Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Prepared By:



Cindy Hsin Date : 2023/6/26
Project Handler

Approved and Authorized By:

Eric Lee Date : 2023/6/26
Senior Laboratory Engineer

2. Test Methodology and Reference Procedures

The tests documented in this report were performed in accordance with KDB 447498 D04 Interim General RF Exposure Guidance v01.

3. Facilities and Accreditation

Test Location	Underwriters Laboratories Taiwan Co., Ltd.
Address	Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan
Accreditation Certificate	Underwriters Laboratories Taiwan Co., Ltd. is accredited by TAF, Laboratory Code 3398.

4. Equipment Under Test

4.1. Description of EUT

Product Name	Essential 2 Camera Family	
Brand Name	Arlo	
Model Name	VMC3052	
Series Model	VMC2052, VMC3050, VMC2050	
Operating Frequency	Bluetooth LE	2402MHz ~ 2480MHz
	WLAN	2412MHz ~ 2462MHz
Modulation	Bluetooth LE	GFSK
	WLAN	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Number of Channel	Bluetooth LE	40
	2.4G WLAN 2412 ~ 2462 MHz	11 for 802.11b, 802.11g, 802.11n (HT20)
Normal Voltage	6.6Vdc from adapter 3.63Vdc for battery	
Sample ID	5971598	

Note:

1. The models difference table as below:

Model	Main Board (PCBA Board)	LED Board (PCBA board)	Image Sensor (2K/FHD)	LED (IR)	Lens (2K/FHD)	MECH (Enclosure)	Battery Type
VMC3052	PCB layout and circuit is the same except for image sensor	PCB layout and circuit is the same except for IR LED quantity	2K 2560 x 1440 Image Sensor : GC4023	IR LED *2	2K lens	Large housing	4 cell battery (A-18)
VMC3050						Regular housing	1 cell battery (A-19)
VMC2052			FHD 1920 x 1080 Image Sensor : SC2333	IR LED *1	FHD Lens	Large housing	4 cell battery (A-18)
VMC2050						Regular housing	1 cell battery (A-19)

2. The EUT provides one completed transmitters and one receivers.

Modulation Mode	Tx,Rx Function
802.11b	1TX,1RX
802.11g	1TX,1RX
802.11n (HT20)	1TX,1RX

3. The EUT contains following accessory devices:

Product	Brand	Model	Description
USB Cable	Nienyi	310-50024-01	Length: 0.9 m

4. The EUT could be supplied with rechargeable battery as the following table:

Brand Name	Model	Description
Arlo	A-19	4650mAh,3.69V, 17.1585Wh For VMC3050 & VMC2050
Arlo	A-18	18.6Ah,3.69V, 68.63Wh For VMC3052 & VMC2052

5. For this report measurement uncertainty, statement of conformity, determining compliance, it is necessary to refer to the original measurement report of EUT.

6. The above EUT information is declared by manufacturer and for more detailed features description, please refer the manufacturer's or user's manual, the laboratory shall not be held responsible.

4.2. Description of Available Antennas

For WLAN & Bluetooth LE

Ant. No.	Transmitter Circuit	Brand Name	Model Name	Ant. Type	Maximum Gain (dBi)
1	Chain (0)	N/A	N/A	PIFA	2.8

Note: The above antenna information was provided from customer and for more detailed features description, please refer the manufacturer's specification or user's manual, the laboratory shall not be held responsible.

5. Requirement

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (E) (V/m)**	**Magnetic Field Strength (H) (A/m)**	**Power Density (S) (mW/cm^2)**	**Averaging Time |E|2, |H|2 or S (minutes)**
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	$*180/f^2$	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30
Note 1: f = frequency in MHz, * means Plane-wave equivalent power density				
Note 2: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.				

Power Density (S) is calculated by the following formula:

$S=(P*G)/4\pi R^2$

where: S = power density (in appropriate units, e.g. mW/cm^2)
P = power input to the antenna (in appropriate units, e.g., mW)
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 (appropriate units, e.g., cm)

6. General RF Exposure Test Exemption

The corresponding Exclusion Threshold condition, listed below:

1) Blanket Exempt: Following 47 CFR 1.1307(b)(3)(i)(A), the available maximum time-averaged power is no more than 1 mW.

2) SAR Exempt: Following 47 CFR 1.1307(b)(3)(i)(B), 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:

$$P_{th}\ (\text{mW}) = \begin{cases} ERP_{20\ cm}(d/20\ \text{cm})^{x} & d \le 20\ \text{cm} \\ ERP_{20\ cm} & 20\ \text{cm} < d \le 40\ \text{cm} \end{cases}$$

Where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\ cm}\sqrt{f}}\right) \text{ and } f \text{ is in GHz;}$$

and

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

d = the separation distance (cm);

3) MPE Exempt: Following 47 CFR 1.1307(b)(3)(i)(C), using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

Table 1 to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	1,920 R^2.
1.34-30	3,450 R^2/f^2.
30-300	3.83 R^2.
300-1,500	0.0128 R^2f.
1,500-100,000	19.2R^2.

7. Radio Frequency Radiation Exposure Evaluation

(1) General RF Exposure Test Exemption

Option	Evaluation Method	Clause
☐	Blanket Exempt	47 CFR 1.1307(b)(3)(i)(A)
☐	SAR Exempt	47 CFR 1.1307(b)(3)(i)(B)
☒	MPE Exempt	47 CFR 1.1307(b)(3)(i)(C)

Note: Max. ERP (dBm) = Max. Average power (dBm) + Antenna Gain (dBi) - 2.15 (dB)

Bluetooth LE

Evaluation Frequency	λ/2π	R	Max. ERP	Max. ERP	Threshold ERP
(MHz)	(m)	(m)	(dBm)	(W)	(W)
2402 ~ 2480	0.0199	0.2	9.05	0.008	0.768

WLAN 2.4GHz

Evaluation Frequency	λ/2π	R	Max. ERP	Max. ERP	Threshold ERP
(MHz)	(m)	(m)	(dBm)	(W)	(W)
2412 ~ 2462	0.0198	0.2	24.82	0.303	0.768

Note :
1. $\lambda(m) = 3*10^8$ (m/s) / frequency (Hz)
2. Max. ERP (dBm) = Max. Average power (dBm) + Antenna Gain (dBi) -2.15
3. Max. ERP (mW) = $10^{(\text{Max. ERP (dBm)} / 10)}$
4. Threshold ERP (RF Source Frequency 300 – 1500 MHz) = 0.0128 R^2f

Conclusion:

According to 47 CFR §2.1091, the RF exposure analysis concludes that the RF Exposure is FCC compliant.

END OF REPORT