



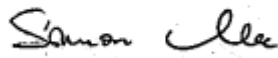
SAR EXCLUSION EVALUATION REPORT

For

Liquid Image Co., LLC.

5610 Skylane Blvd.,
Santa Rosa, CA 95403, USA

FCC ID: WGI-EGO-LS

Report Type: Original Report	Product Type: Action Camera
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1506012-SAR EX	Initial Report	2015-12-01

1 General Description

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of Liquid Image Co., LLC, and their product, FCC ID: WGI-EGO-LS, model: EGO LS or the "EUT" as referred to in this report, is a camera with 2.4 GHz 802.11b/g/n Wi-Fi and Bluetooth Low Energy function.

1.2 EUT Technical Specification

Item	Description
Modulation	CCK, OFDM, GFSK
Frequency Range	802.11b/g/n: 2412-2462 MHz Bluetooth LE: 2402-2480 MHz
Maximum Conducted Power Tested	BLE: -13.92 dBm 802.11b/g/n: 15.96 dBm
Dimensions (L*W*H)	84 (L) x 48 mm (W) x 45 mm (H)
Power Source	5.0 Vdc (adapter) 3.7 Vdc 1800 mAh (Li-ion battery)
Weight	0.15 kg
Normal Operation	Head & Body-worn

The test data gathered are from typical production sample, Sample ID: 359692052003168 provided by the manufacturer.

2 SAR Measurement Exclusion Considerations

2.1 SAR Measurement Exclusion Considerations

The EUT will be sold together with the 4G LTE dock (Model Number: EGO LS 800 4G LTE SLED, Contain FCC ID: HFS-LI172), thus the form factor of the dock is considered in the EUT's SAR evaluation.

2.1.1 2.4 GHz Wi-Fi Antenna Location and Distance

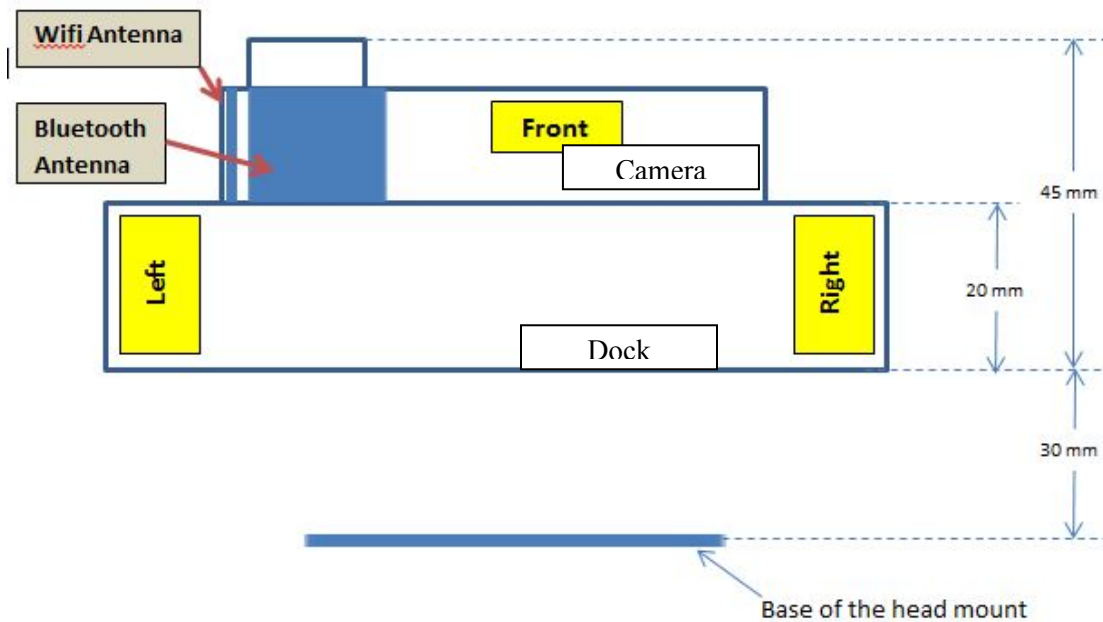


Figure-1 Head Parallel Mount Top View

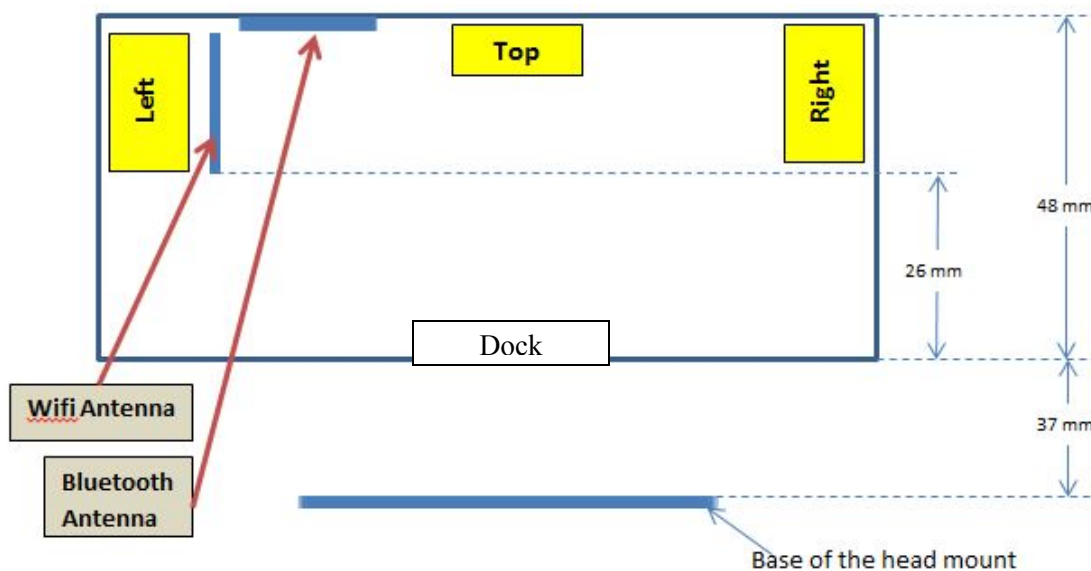


Figure-2 Head Vertical Mount Back View

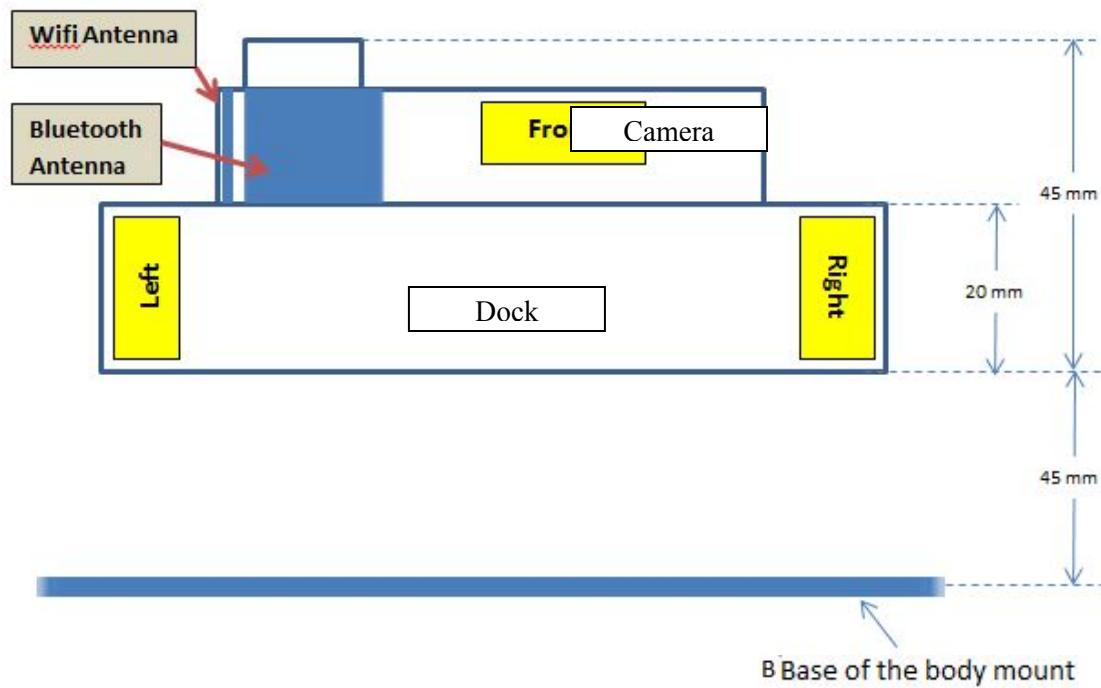


Figure-3 Body Parallel Mount Top View

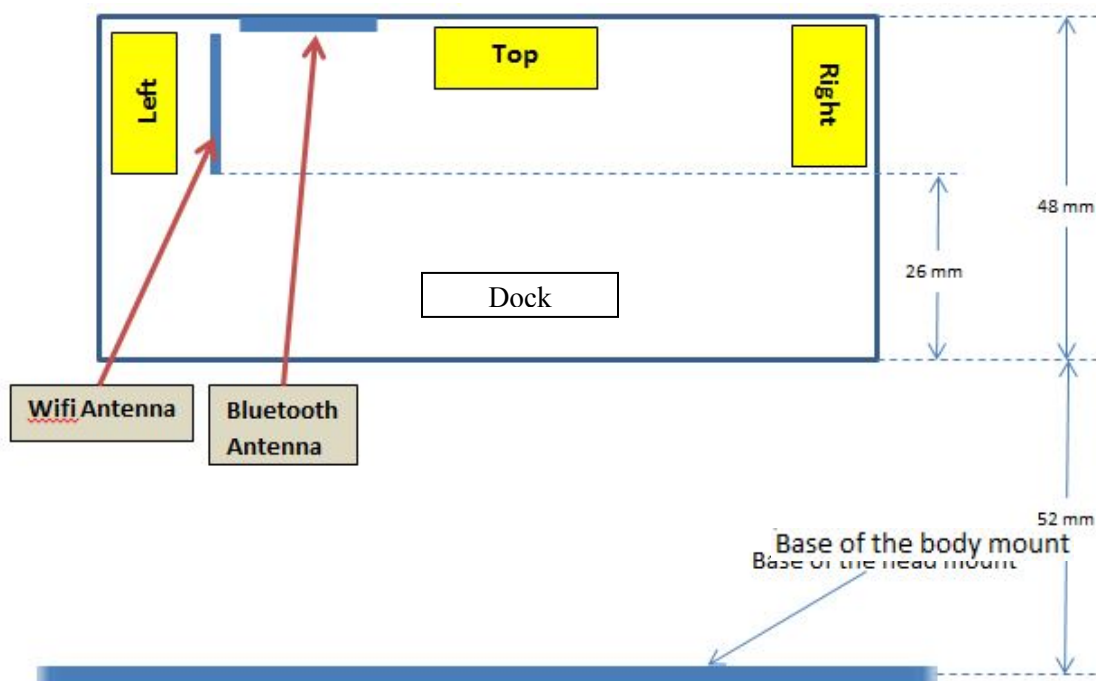


Figure-4 Body Vertical Mount Back View

Manufacturer provides off-shelf accessories, i.e. chest mount and head mount, to enable user wearing the camera close to chest or head.

Configuration	Antenna	Distance to Back Side (mm)	Distance to Bottom Side (mm)
Head wear	Bluetooth LE	50	85
	Wi-Fi	50	63
Body wear	Bluetooth	65	100
	Wi-Fi LE	65	78

(A) Top Side

The top side of the EUT is where one of the function button located and none of the accessories will enable user to use the product with top side be in close proximity to human body or head.

(B) Bottom Side

Shown in Figure-2 and Figure-4, when the unit is mounted in vertical with the base of the mounting device, the unit's bottom surface will be in close proximity to human body or head. Thus, bottom side SAR evaluation needs to be considered.

Per KDB 447498 D01 v05r02, at 100 MHz to 6 GHz and for test separation distances > 50 mm, the SAR test exclusion threshold is determined according to the following:

- $[\text{Power allowed at numeric threshold for } 50 \text{ mm in step 1)} + (\text{test separation distance} - 50 \text{ mm}) \cdot (f(\text{MHz})/150)] \text{mW}$, at 100 MHz to 1500 MHz
- $[\text{Power allowed at numeric threshold for } 50 \text{ mm in step 1)} + (\text{test separation distance} - 50 \text{ mm}) \cdot 10] \text{mW}$ at $>1500 \text{ MHz}$ and $\leq 6 \text{ GHz}$

SAR consideration details for Head and Body are listed in the tables below,

Radio Mode	Channel Frequency (MHz)	Max Turn-up Output Power		Distance from Head	Threshold (dBm)	SAR Consideration
		(dBm)	(mW)			
802.11b	2412	16	39.81	63	23.55	NO
	2437	16	39.81	63	23.54	NO
	2462	16	39.81	63	23.53	NO
802.11g	2412	13.5	22.39	63	23.55	NO
	2437	13.5	22.39	63	23.54	NO
	2462	13.5	22.39	63	23.53	NO
802.11n20	2412	13	19.95	63	23.55	NO
	2437	13	19.95	63	23.54	NO
	2462	13	19.95	63	23.53	NO

Radio Mode	Channel Frequency (MHz)	Max Turn-up Output Power		Distance from Body	Threshold (dBm)	SAR Consideration
		(dBm)	(mW)			
802.11b	2412	16	39.81	78	25.76	NO
	2437	16	39.81	78	25.75	NO
	2462	16	39.81	78	25.75	NO
802.11g	2412	13.5	22.39	78	25.76	NO
	2437	13.5	22.39	78	25.75	NO
	2462	13.5	22.39	78	25.75	NO
802.11n20	2412	13	19.95	78	25.76	NO
	2437	13	19.95	78	25.75	NO
	2462	13	19.95	78	25.75	NO

(C) Front Side

The front side of the EUT is the camera lens. It is not a typical operation with the front side of the EUT facing human body or head.

(D) Back Side

Shown in Figure-1 and Figure-3, when the unit is mounted in parallel with the base of the mounting device, the unit's back surface will be in close proximity to human body or head. Thus, back side SAR evaluation needs to be considered.

Per KDB 447498 D01 v05r02, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

(Max. power of channel, including tune-up tolerance, mW)/(Min. test distance, mm)* $[\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR and ≤ 7.5 for 10-g extremity, where

- $f(\text{GHz})$ 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

At 100 MHz to 6 GHz and for test separation distances > 50 mm, the SAR test exclusion threshold is determined according to the following:

- a). $[\text{Power allowed at numeric threshold for 50 mm in step 1}) + (\text{test separation distance} - 50 \text{ mm}) \cdot (f(\text{MHz})/150)] \text{mW}$, at 100 MHz to 1500 MHz
- b). $[\text{Power allowed at numeric threshold for 50 mm in step 1}) + (\text{test separation distance} - 50 \text{ mm}) \cdot 10] \text{mW}$ at >1500 MHz and ≤ 6 GHz

SAR consideration details for Head and Body are listed in the tables below,

Radio Mode	Channel Frequency (MHz)	Max Turn-up Output Power		Distance from Head	Threshold (dBm)	SAR Consideration
		(dBm)	(mW)			
802.11b	2412	16	39.81	50	1.24	NO
	2437	16	39.81	50	1.24	NO
	2462	16	39.81	50	1.25	NO
802.11g	2412	13.5	22.39	50	0.70	NO
	2437	13.5	22.39	50	0.70	NO
	2462	13.5	22.39	50	0.70	NO
802.11n20	2412	13	19.95	50	0.62	NO
	2437	13	19.95	50	0.62	NO
	2462	13	19.95	50	0.63	NO

Radio Mode	Channel Frequency (MHz)	Max Turn-up Output Power		Distance from Body	Threshold (dBm)	SAR Consideration
		(dBm)	(mW)			
802.11b	2412	16	39.81	65	23.92	NO
	2437	16	39.81	65	23.91	NO
	2462	16	39.81	65	23.90	NO
802.11g	2412	13.5	22.39	65	23.92	NO
	2437	13.5	22.39	65	23.91	NO
	2462	13.5	22.39	65	23.90	NO
802.11n20	2412	13	19.95	65	23.92	NO
	2437	13	19.95	65	23.91	NO
	2462	13	19.95	65	23.90	NO

(E) Left & Right Side

Manufacturer will design the accessories so that the unit cannot be rotated to either left side or right side is in close proximity to human body or head.

2.1.2 2.4 GHz Bluetooth Low Energy Antenna Location and Distance

The maximum output power of BLE including tune-up tolerance is -15 dBm (0.032 mW), which is less than the SAR test exclusion threshold level at 5 mm distance specified in KDB 447498 D01 Appendix A. Thus, SAR for BLE is excluded.

2.2 SAR Measurement Exclusion Considerations

The EUT meets SAR test exclusion requirement specified in KDB 447498 D01 when it is sold and operated with Dock and head & body accessories provided by manufacturer. Thus, SAR test is excluded.

3 Output Power

2.4 GHz Wi-Fi

Radio Mode	Frequency (MHz)	Conducted Output Power (dBm)		
		Average Power	Peak Power	Max Turn-up Average Power
802.11b	2412	15.93	17.9	16
	2437	15.96	17.95	16
	2462	15.87	17.84	16
802.11g	2412	12.94	22.2	13.5
	2437	13.17	22.35	13.5
	2462	13.13	22.33	13.5
802.11n20	2412	12.78	21.57	13
	2437	12.92	21.68	13
	2462	12.85	21.65	13

2.4 GHz BLE

Radio Mode	Frequency (MHz)	Conducted Output Power (dBm)		
		Average Power	Peak Power	Max Turn-up Average Power
BLE	2402	-16.78	-11.82	-15
	2440	-15.52	-11.27	-15
	2480	-13.92	-10.68	-15

--- END OF REPORT ---