# **FCC RF Exposure Evaluation**

# 1. Product Information

FCC ID	2AWECGU10CCT2		
Product name	smart bulb		
Model number	GU10 CCT 2-A LENS		
Additional Model No.	C37 CCT 2-A, C37 RGB+W 4-A, C37 RGB+CCT 5-A, GU10 CCT 2-A PC, GU10 RGB+W 4-A PC, GU10 RGB+CCT 5-A PC, GU10 RGB+W 4-A LENS, GU10 RGB+CCT 5-A LENS		
Model Declaration PCB board, structure and internal of these model(s) are the sai no additional models were tested			
Power supply Input: AC 120V, 60Hz			
Modulation Type	GFSK for Bluetooth V5.0(DTS) IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM (64QAM, 16QAM, QPSK, BPSK)		
Antenna Type	Internal Antenna		
Antenna Gain 1.9dBi(Max.)			
Hardware version CBLC5			
Software version	are version 20210607		
FCC Operation frequency	2402MHz ~ 2480MHz 2412MHz-2462MHz		
Exposure category	General population/uncontrolled environment		
EUT Type	Production Unit		
Device Type	Mobile Devices		

### 2. Evaluation Method

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.

In accordance with KDB447498D01 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modelled or measured field strengths or power density, is  $\leq$  1.0. The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

## 3. Limit

### 3. 1 Refer Evaluation Method

ANSI C95.1–1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

<u>FCC KDB publication 447498 D01 General 1 RF Exposure Guidance v06:</u> Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

FCC CFR 47 part1 1.1310: Radiofrequency radiation exposure limits.

FCC CFR 47 part2 2.1091: Radiofrequency radiation exposure evaluation: mobile devices

### 3. 2 Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency	Electric Field	Magnetic Field	Power Density	Averaging Time
Range(MHz)	Strength(V/m)	Strength(A/m)	(mW/cm²)	(minute)
	Limits for O	ed Exposure		
0.3 - 3.0	614	1.63	(100) *	6
3.0 – 30	1842/f	4.89/f	(900/f <sup>2</sup> )*	6
30 – 300	61.4	0.163	1.0	6
300 – 1500	/	/	f/300	6
1500 – 100,000	/	/	5	6

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency	Electric Field	Magnetic Field	Power Density	Averaging Time
Range(MHz)	Strength(V/m)	Strength(A/m)	(mW/cm²)	(minute)
Limits for Occupational/Controlled			ed Exposure	
0.3 - 3.0	614	1.63	(100)_*	30
3.0 - 30	824/f	2.19/f	(180/f <sup>2</sup> )*	30
30 – 300	27.5	0.073	0.2	30
300 – 1500	/	/	f/1500	30
1500 - 100,000	/	/	1.0	30

F=frequency in MHz

# 4. MPE Calculation Method

Predication of MPE limit at a given distance Equation from page 18 of OET Bulletin 65, Edition 97-01

 $S=PG/4\pi R^2$ 

Where: S=power density

P=power input to antenna

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

## 5. Antenna Information

Artemis Antenna can only use antennas certificated as follows provided by manufacturer;

Internal Identification	Antenna type and antenna number	Operate frequency band	Maximum antenna gain	Note
Antenna	Internal Antenna	2402MHz ~ 2480MHz 2400MHz-2500MHz	1.9dBi	BT WIFI Antenna

<sup>\*=</sup>Plane-wave equivalent power density

# 6. Conducted Power

## < BT LE Max Conducted Power >

Mode	Channel	Frequency(MHz)	Max Conducted Power (dBm)
	0	2402	5.91
GFSK	19	2440	7.26
	39	2480	5.81

## <2.4GWLAN Max Conducted Power >

Mode	Channel	Frequency(MHz)	Max Conducted Power (dBm)
	1	2412	16.19
IEEE 802.11b	6	2437	15.89
	11	2462	16.17
	1	2412	12.36
IEEE 802.11g	6	2437	12.51
	11	2462	12.18
	1	2412	12.51
IEEE 802.11n HT20	6	2437	12.54
	11	2462	12.32
	3	2422	12.47
IEEE 802.11n HT40	6	2437	12.62
	9	2452	12.41

# 7. Manufacturing Tolerance

## <BT LE>

GFSK (Peak)				
Channel	Channel 0	Channel 19	Channel 39	
Target (dBm)	5.0	7.0	5.0	
Tolerance ±(dB)	1.0	1.0	1.0	

# <2.4G WIFI>

	11B (Peak)					
Channel	Channel 1	Channel 6	Channel 11			
Target (dBm)	16.0	15.0	16.0			
Tolerance ±(dB)	1.0	1.0	1.0			
	11G (	Peak)				
Channel	Channel 1	Channel 6	Channel 11			
Target (dBm)	12.0	12.0	12.0			
Tolerance ±(dB)	1.0	1.0	1.0			
11N2OSISO (Peak)						
Channel	Channel 1	Channel 6	Channel 11			
Target (dBm)	12.0	12.0	12.0			
Tolerance ±(dB)	1.0	1.0	1.0			
11N4OSISO (Peak)						
Channel	Channel 3	Channel 6	Channel 9			
Target (dBm)	12.0	12.0	12.0			
Tolerance ±(dB)	1.0	1.0	1.0			

### 8. Measurement Results

## 8.1 Standalone MPE

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, r =20cm, as well as the gain of the used antenna refer to antenna information, the RF power density can be obtained.

[Antenna]

### <BT LE>

	RF ou	tput power	Antenna Gain	MPE	MPE
Band/Mode	dBm	mW	(dBi)	(mW/cm2)	Limits (mW/cm2)
GFSK	8.0	6.3096	1.9	0.0019	1.0000

### <2.4G WIFI>

	RF output power		Antenna Gain	MPE	MPE
Band/Mode	dBm	mW	(dBi)	(mW/cm2)	Limits (mW/cm2)
IEEE 802.11b	17.0	50.1187	1.9	0.0155	1.0000
IEEE 802.11g	13.0	19.9526	1.9	0.0062	1.0000
IEEE 802.11n HT20	13.0	19.9526	1.9	0.0062	1.0000
IEEE 802.11n HT40	13.0	19.9526	1.9	0.0062	1.0000

### Remark:

- 1. Output power including tune-up tolerance;
- 2. MPE evaluate distance is 20cm from user manual provide by manufacturer;

## 8.2 Simultaneous Transmission MPE

## 9. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

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