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RF Exposure Evaluation Report

Report No.: CQASZ20240901930E-04

Applicant: Shenzhen Gibbs Technology Co., Ltd

Address of Applicant: 502, Building 2, No. 48 Kangzheng Road, Danzhutou Community, Nanwan Street, Longgang District, Shenzhen, China

Equipment Under Test (EUT):

EUT Name: Wireless Visual Doorbell

Model No.: i5, A5, e5, c5, d5, f5, h5, p5, g5, x5, w5

Test Model No.: i5

Brand Name: N/A

FCC ID: 2BFLG-1633

Standards: 47 CFR Part 1.1307

47 CFR Part 1.1310

KDB447498 D01 General RF Exposure Guidance v06

Date of Receipt: 2024-09-05

Date of Test: 2024-09-05 to 2024-09-14

Date of Issue: 2024-10-16

Test Result: **PASS***

*In the configuration tested, the EUT complied with the standards specified above

Tested By: Lewis Zhou
(Lewis Zhou)

Reviewed By: Timo Lei
(Timo Lei)

Approved By: Alex
(Alex Wang)



1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20240901930E-04	Rev.01	Initial report	2024-10-16

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3 General Information

3.1 Client Information

Applicant:	Shenzhen Gibbs Technology Co., Ltd
Address of Applicant:	502, Building 2, No. 48 Kangzheng Road, Danzhutou Community, Nanwan Street, Longgang District, Shenzhen, China
Manufacturer:	Shenzhen Gibbs Technology Co., Ltd
Address of Manufacturer:	502, Building 2, No. 48 Kangzheng Road, Danzhutou Community, Nanwan Street, Longgang District, Shenzhen, China
Factory:	Shenzhen Gibbs Technology Co., Ltd
Address of Factory:	502, Building 2, No. 48 Kangzheng Road, Danzhutou Community, Nanwan Street, Longgang District, Shenzhen, China

3.2 General Description of EUT

Product Name:	Wireless Visual Doorbell
Model No.:	i5, A5, e5, c5, d5, f5, h5, p5, g5, x5, w5
Test Model No.:	i5
Trade Mark:	N/A
Software Version:	XW168-WIFI-P10-P0_V1.0
Hardware Version:	XW168-WIFI-P10-P0_V1.2
EUT Power Supply:	Li-ion battery DC 3.7V 800mAh, Charge by DC 5V for adapter

3.3 General Description of BLE

Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	Bluetooth Spec 5.2
Modulation Type:	GFSK
Number of Channel:	40
Transfer Rate:	1Mbps
Sample Type:	☒ Mobile ☐ Portable
Antenna Type:	PCB antenna
Antenna Gain:	1.92dBi

3.4 General Description of 2.4G WIFI Classic

Operation Frequency:	2412MHz~2462MHz
Type of Modulation:	IEEE for 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE for 802.11g : OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE for 802.11n(HT20) : OFDM (64QAM, 16QAM, QPSK, BPSK)
Number of Channel:	IEEE 802.11b/g, IEEE 802.11n HT20: 11 Channels
Channel Separation:	5MHz
Transfer Rate:	IEEE for 802.11b: 1Mbps/2Mbps/5.5Mbps/11Mbps IEEE for 802.11g : 6Mbps/9Mbps/12Mbps/18Mbps/24Mbps/36Mbps/48Mbps/54Mbps IEEE for 802.11n(HT20) : 6.5Mbps/13Mbps/19.5Mbps/26Mbps/39Mbps/52Mbps/58.5Mbps/65Mbps
Sample Type:	☒ Mobile ☐ Portable
Antenna Type:	PCB antenna
Antenna Gain:	1.92dBi

3.5 General Description of 433.92MHz

Operation Frequency:	433.92MHz
Modulation Type:	FSK
Number of Channel:	1
Transfer Rate:	1Mbps
Sample Type:	☒ Mobile ☐ Portable
Antenna Type:	PCB antenna
Antenna Gain:	2dBi

4 RF Exposure Evaluation

4.1 RF Exposure Compliance Requirement

4.1.1 Limits

According to FCC Part1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in part1.1307(b)

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f ²)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
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

F= Frequency in MHz

Friis Formula

Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d is the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

4.1.2 Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

4.2 1.1.3 EUT RF Exposure Evaluation

1) For BLE

Antenna Gain: 1.92dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.56 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

GFSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	3.8	4.0±1	5.0	3.16
Middle(2440MHz)	2.07	2.0±1	3.0	2.00
Highest(2480MHz)	2.67	2.5±1	3.5	2.24

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
3.16	1.92	0.00098	1.0	PASS

Note: 1) Refer to report No. CQASZ20240901930E-01 for EUT test Max Conducted Peak Output Power value.

2) $P_d = (P_{out} * G) / (4 * \pi * R^2) = (2.239 * 1.58) / (4 * 3.1416 * 20^2) = 0.00098$

2) For 2.4G WIFI

Antenna Gain: 1.92dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.56 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

11B mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	12.42	12.5±1	13.5	22.39
Middle(2437MHz)	11.30	11.0±1	12.0	15.85
Highest(2462MHz)	11.73	11.5±1	12.5	17.78
11G mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	7.00	7.0±1	8.0	6.31
Middle(2437MHz)	6.41	6.5±1	7.5	5.62
Highest(2462MHz)	7.40	7.5±1	8.5	7.08
11N20 mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	6.74	6.5±1	7.5	5.62
Middle(2437MHz)	6.43	6.5±1	7.5	5.62
Highest(2462MHz)	6.98	7.0±1	8.0	6.31

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
22.39	1.92	0.0069	1.0	PASS

Note: 1) Refer to report No. CQASZ20240901930E-02 for EUT test Max Conducted AV Output Power value.

2) $P_d = (P_{out} * G) / (4 * \pi * R^2) = (2.239 * 1.58) / (4 * 3.1416 * 20^2) = 0.0069$

2) For 433.92MHz

Measurement Data

Antenna Gain: 2dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.58 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

$$EIRP = E_{Meas} + 20\log(d_{Meas}) - 104.7$$

where

$EIRP$ is the equivalent isotropically radiated power, in dBm
 E_{Meas} is the field strength of the emission at the measurement distance, in dBμV/m
 d_{Meas} is the measurement distance, in m

Channel	EIRP (dBuV/m)	EIRP (dBm)	Max Conducted Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
					(dBm)	(mW)
433.92MHz	84.24	-10.92	-12.92	-13.0±1	-12.0	0.063

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm²)	Limit	Result
0.063	2	0.00002	0.28928	PASS

Note: 1) Refer to report No. CQASZ20240901930E-03 for EUT test Max Peak Output Power value.

$$2) Pd = (Pout * G) / (4 * \pi * R^2) = (2.239 * 1.58) / (4 * 3.1416 * 20^2) = 0.0069$$

Simultaneous transmission operations evaluate:

$$BLE + 2.4G WIFI + 433.92MHz = 0.00098/1 + 0.0069/1 + 0.00002 / 0.28928 = 0.0011 \leq 1$$