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RF Exposure Evaluation Report

Report No. : CQASZ20180800034E-04
Applicant: Shenzhen DophiGo IoT Technology Co., Ltd.
Address of Applicant: 16/F, Building B1, Nanshan Park, No.1001 Xueyuan Ave, Nanshan District, Shenzhen, China.
Manufacturer: Shenzhen DophiGo IoT Technology Co., Ltd.
Address of Manufacturer: 16/F, Building B1, Nanshan Park, No.1001 Xueyuan Ave, Nanshan District, Shenzhen, China.
Equipment Under Test (EUT):
Product: Smart Doorbell
Model No.: DPH-DV-200, DPH-DV-100, DPH-DV-2XX Series, DPH-DV-3XX Series, DPH-DV-4XX Series, DPH-DV-5XX Series (XX stands for the numbers from 0~99)
Test Model No.: DPH-DV-200
Brand Name: DophiGo
FCC ID: 2ARG7-DPHDV200
Standards: 47 CFR Part 1.1307
47 CFR Part 2.1093
KDB447498D01 General RF Exposure Guidance v06
Date of Test: 2018-08-23 to 2018-11-13
Date of Issue: 2018-11-13
Test Result : PASS*

Tested By:

Martin Lee

(Martin Lee)

Reviewed By:

Aaron Ma

(Aaron Ma)

Approved By:

Jack Ai

(Jack Ai)



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

The test report is effective only with both signature and specialized stamp, The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CQA, this report can't be reproduced except in full.

1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20180800034E-04	Rev.01	Initial report	2018-11-13

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3 General Information

3.1 Client Information

Applicant:	Shenzhen DophiGo IoT Technology Co., Ltd.
Address of Applicant:	16/F, Building B1, Nanshan Park, No.1001 Xueyuan Ave, Nanshan District, Shenzhen, China.
Manufacturer:	Shenzhen DophiGo IoT Technology Co., Ltd.
Address of Manufacturer:	16/F, Building B1, Nanshan Park, No.1001 Xueyuan Ave, Nanshan District, Shenzhen, China.

3.2 General Description of EUT

Product Name:	Smart Doorbell
All Model No.:	DPH-DV-200, DPH-DV-100, DPH-DV-2XX Series, DPH-DV-3XX Series, DPH-DV-4XX Series, DPH-DV-5XX Series (XX stands for the numbers from 0~99)
Test Model No.:	DPH-DV-200
Trade Mark:	DophiGo
Hardware Version:	DPH000_E18B60_ZB_V0.3
Software Version:	dph_vdoorbell_zb_v2.1.5
Sample Type:	☐ Mobile ☐ Portable ☒ Fix Location
Power Supply:	lithium battery:DC3.7V, Charge by USB

3.3 General Description of WIFI

Operation Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz IEEE 802.11n(HT40): 2422MHz to 2452MHz
Channel Numbers:	IEEE 802.11b/g, IEEE 802.11n HT20: 11 Channels IEEE 802.11n HT40: 7 Channels
Channel Separation:	5MHz
Type of Modulation:	IEEE for 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE for 802.11g : OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE for 802.11n(HT20/40): OFDM (64QAM, 16QAM,QPSK,BPSK)
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 IEEE for 802.11n(HT40) : 13.5Mbps/27Mbps/40.5Mbps/54Mbps/81Mbps/108Mbps/121.5Mbps/135Mbps
Test Software of EUT:	RF test (manufacturer declare)
Antenna Type:	internal antenna with ipex connector
Antenna Gain:	2.1dBi

3.4 General Description of BLE

Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	V4.0
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Modulation Type:	GFSK
Number of Channel:	40
Hopping Channel Type:	Adaptive Frequency Hopping systems
Test Software of EUT:	Bluetooth RF test Tool (manufacturer declare)
Antenna Type:	PCB antenna
Antenna Gain:	1.2dBi

3.5 General Description of 433.92MHz

Operation Frequency:	433.92MHz
Channel Numbers:	1
Modulation Type:	ASK
Operation Frequency:	433.92MHz
Antenna Type:	integral antenna
Antenna Gain:	0dBi

Note:

All model: DPH-DV-200, DPH-DV-100, DPH-DV-2XX Series, DPH-DV-3XX Series, DPH-DV-4XX Series, DPH-DV-5XX Series (XX stands for the numbers from 0~99)

Only the model DPH-DV-200 was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above models, with difference being color of appearance and model name.

4 SAR Evaluation

4.1 RF Exposure Compliance Requirement

4.1.1 Standard Requirement

According to KDB447498D01 General RF Exposure Guidance v06

4.3.1. Standalone SAR test exclusion considerations

Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied.

4.1.2 Limits

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:

$$\left[\frac{\text{max. power of channel, including tune-up tolerance, mW}}{\text{min. test separation distance, mm}} \right] \cdot \sqrt{f(\text{GHz})} \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR, where}$$

$f(\text{GHz})$ is the RF channel transmit frequency in GHz

Power and distance are rounded to the nearest mW and mm before calculation¹⁷

The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

4.1.3 EUT RF Exposure

1) For BLE

Measurement Data

GFSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	-2.04	-2.0±0.5	-1.5	0.708
Middle(2442MHz)	-1.45	-1.5±0.5	-1.0	0.794
Highest(2480MHz)	0.1	0±0.5	0.5	1.122

Worst case: GFSK						
Channel	Maximum Peak Conducted Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power		Calculated value	Exclusion threshold
			(dBm)	(mW)		
Lowest (2402MHz)	-2.04	-2.0±0.5	-1.5	0.708	0.22	3.0
Middle (2442MHz)	-1.45	-1.5±0.5	-1.0	0.794	0.25	
Highest (2480MHz)	0.1	0±0.5	0.5	1.122	0.35	
Conclusion: the calculated value ≤3.0, SAR is exempted.						

Remark: The Max Conducted Peak Output Power data refer to report Report No.: CQASZ20180800034E-01

2)For WIFI:

Measurement Data

802.11b mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	8.42	8.0 ± 1	9.0	7.943
Middle(2437MHz)	8.71	8.0 ± 1	9.0	7.943
Highest(2462MHz)	8.75	8.0 ± 1	9.0	7.943
802.11g mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	8.65	8.0 ± 1	9.0	7.943
Middle(2437MHz)	8.31	8.0 ± 1	9.0	7.943
Highest(2462MHz)	8.72	8.0 ± 1	9.0	7.943
802.11n(HT20)mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	8.08	8.0 ± 1	9.0	7.943
Middle(2437MHz)	8.37	8.0 ± 1	9.0	7.943
Highest(2462MHz)	8.37	8.0 ± 1	9.0	7.943
802.11n(HT40)mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2422MHz)	7.16	7.0 ± 1	8.0	6.310
Middle(2437MHz)	7.29	7.0 ± 1	8.0	6.310
Highest(2452MHz)	7.15	7.0 ± 1	8.0	6.310

Worst case: 802.11b mode						
Channel	Average Conducted Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune- up Power		Calculated value	Exclusion threshold
			(dBm)	(mW)		
Lowest (2402MHz)	8.42	8.0±1	9.0	7.943	2.47	3.0
Middle (2440MHz)	8.71	-8.0±1	9.0	7.943	2.48	
Highest (2480MHz)	8.75	8.0±1	9.0	7.943	2.49	
Conclusion: the calculated value ≤3.0, SAR is exempted.						

Remark: The Max Conducted Average Output Power data refer to report Report No.: CQASZ20180800034E-02

3) For 433.92MHz

$$e_{irp} = p_t \times g_t = (E \times d)^2 / 30$$

where:

p_t = transmitter output power in watts,

g_t = numeric gain of the transmitting antenna (unitless),

E = electric field strength in V/m, $10^{((dB\mu V/m)/20)/10^6}$,

d = measurement distance in meters (m)---3m,

$$\text{So } p_t = (E \times d)^2 / 30 / g_t$$

The worst case (refer to report CQASZ20180800034E-03) is below:

Antenna polarization: Horizontal		
Frequency (MHz)	Level (dBuV/m)	Polarization
433.92	78.30	Peak
433.92	73.92	Average

Antenna polarization: Vertical		
Frequency (MHz)	Level (dBuV/m)	Polarization
433.92	70.24	Peak
433.92	65.86	Average

For 433.92MHz wireless:

Field strength = 78.30dB μ V/m @3m

Ant. gain 0dBi; so Ant numeric gain=1.0

$$\text{So } p_t = \{ [10^{(78.30/20)} / 10^6 \times 3]^2 / 30 / 1.0 \} \times 1000 \text{mW} = 0.020 \text{mW}$$

$$\text{So } (0.020 \text{mW} / 5 \text{mm}) \times \sqrt{0.43392 \text{GHz}} = 0.0027,$$

$$0.0027 < 3.0 \text{ for 1-g SAR}$$

So the SAR report is not required.

BLE , WIFI and 433.92MHz transmit at the same time,
the SAR is $0.35 + 2.49 + 0.0027 = 2.8427 \leq 3.0$