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RF Exposure Evaluation Report

Report No. :	CQASZ20181200010E-03
Applicant:	Shenzhen Hesibond IOT Technology Corp., Ltd.
Address of Applicant:	Room 418, 4th Floor, Shenyi Industrial Building, Nanshan Avenue, Nanshan Street, Nanshan District, Shenzhen, China
Manufacturer:	Shenzhen Hesibond IOT Technology Corp., Ltd.
Address of Manufacturer:	Room 418, 4th Floor, Shenyi Industrial Building, Nanshan Avenue, Nanshan Street, Nanshan District, Shenzhen, China
Equipment Under Test (EUT):	
Product:	IOT Lock Gateway
Model No.:	2ASI7-HB-WLK-02
Brand Name:	hesibond IOT Tech
FCC ID:	2ASI7-HB-WLK-02
Standards:	47 CFR Part 1.1307 47 CFR Part 1.1310 KDB447498D01 General RF Exposure Guidance v06
Date of Test:	2018-12-06 to 2019-05-14
Date of Issue:	2019-05-14
Test Result :	**PASS***

Tested By: Tiny You

(Tiny You)

Reviewed By: Aaron Ma

(Aaron Ma)

Approved By:

(Jack Ai)

SHENZHEN HUAXIA TESTING TECHNOLOGY CO., LTD. 华夏准测 APPROVED

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

1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20181200010E-03	Rev.01	Initial report	2019-05-14

2 Contents

3 General Information

3.1 Client Information

Applicant:	Shenzhen Hesibond IOT Technology Corp., Ltd.
Address of Applicant:	Room 418, 4th Floor, Shenyi Industrial Building, Nanshan Avenue, Nanshan Street, Nanshan District, Shenzhen, China
Manufacturer:	Shenzhen Hesibond IOT Technology Corp., Ltd.
Address of Manufacturer:	Room 418, 4th Floor, Shenyi Industrial Building, Nanshan Avenue, Nanshan Street, Nanshan District, Shenzhen, China

3.2 General Description of EUT

Name:	IOT Lock Gateway
Model No.:	2ASI7-HB-WLK-02
Trade Mark :	hesibond IOT Tech
Hardware Version:	DOR007
Software Version:	2.4G-SWG2X-V1.0

3.3 General Description of 2.4G

Frequency Range:	2419 MHz
Modulation Type:	ASK
Number of Channels:	1 (declared by the client)
Test Software of EUT:	RF test (manufacturer declare)
Maximum tune-up Power:	3dBm/1.995mW
Antenna Type:	Internal antenna
Antenna Gain:	0dBi

3.4 General Description of LTE

Supported Frequency Range	LTE BAND7	Transmission (TX): 2500 to 2570 MHz
		Receiving (RX): 2620 to 2690 MHz
Maximum tune-up Power:	LTE BAND7: 23dBm/199.526mW	
Supported Channel Bandwidth	LTE BAND7	☒5MHz☒10MHz☒15 MHz☒20 MHz
Antenna Type:	Integral antenna	
Antenna Gain:	LTE BAND7: 0dBi.	

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: $Pd = (Pout*G)/(4* Pi * R^2)$

Where

Pd = power density in mW/cm2

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

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

Pd id 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 EUT RF Exposure Evaluation

1) For 2.4GHz

Antenna Gain: 0dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

eirp = pt x gt = $(E \times d)^2/30$

where:

pt = transmitter output power in watts,

gt = 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,

So pt = $(E \times d)^2/30$ / gt

The worst case (refer to report CQASZ20181200010E-01) is below:

Antenna polarization: Horizontal		
Frequency (MHz)	Level (dBuV/m)	Polarization
2419	95.46	Peak
2419	88.24	Average

Antenna polarization: Vertical		
Frequency (MHz)	Level (dBuV/m)	Polarization
2419	97.64	Peak
2419	88.75	Average

For 2419MHz wireless:

Field strength = 97.64dBμV/m @3m

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

So pt={[$10^{(97.64/20)}/10^6$x3]^2/30 /1.0}x1000mW =1.742mW

Maximum tune-up Power (mW)	**Antenna Gain (dBi)**	**Power Density at R = 20 cm (mW/cm^2)**	**Limit**	**Result**
1.995	0	0.0004	1.0	PASS

Note: 1) Pd = (Pout*G)/(4* Pi * R^2)=(1.995*1)/(4*3.1416*20^2)=0.0004

2) For LTE

Antenna Gain: 0dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

Channel Bandwidth: 5 MHz				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
LCH	22.74	23	23	199.526
MCH	22.51	23	23	199.526
HCH	22.74	23	23	199.526
Channel Bandwidth: 10 MHz				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
LCH	22.76	23	23	199.526
MCH	22.57	23	23	199.526
HCH	22.77	23	23	199.526
Channel Bandwidth: 15 MHz				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
LCH	22.82	23	23	199.526
MCH	22.62	23	23	199.526
HCH	22.83	23	23	199.526
Channel Bandwidth: 20 MHz				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
LCH	22.85	23	23	199.526
MCH	22.65	23	23	199.526
HCH	22.86	23	23	199.526

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm^2)	Limit	Result
199.526	0	0.04	1.0	PASS

Note: 1) Refer to report No. C CQASZ20181200010E-02 for EUT test Max Conducted Average Output Power value.

2) Pd = (Pout*G)/(4* Pi * R^2)=(199.526*1)/(4*3.1416*20^2)=0.04

3) For 2.4GHz and LTE

the 2.4G and LTE radios can not transmit simultaneously.

END OF THE RPORT