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RF Exposure Evaluation Report

Report No.: CQASZ20210100064E-03

Applicant: THINKCAR TECH CO.,LTD.

Address of Applicant: 2606, building 4, phase II, TiananYungu, Gangtou community, Bantian, Longgang District, Shenzhen

Equipment Under Test (EUT):

EUT Name: THINKDIAG MINI, THINKCAR pro

Model No.: TKD02, TKCA3

Test Model No.: TKD02

Brand Name: N/A

FCC ID: 2AUARDIAGMINI

Standards: 47 CFR Part 1.1307

47 CFR Part 2.1091

KDB447498D01 General RF Exposure Guidance v06

Date of Receipt: 2021-01-22

Date of Test: 2021-01-22 to 2021-02-01

Date of Issue: 2021-02-01

Test Result : **PASS***

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

Tested By:

Martin Lee

(Martin Lee)

Reviewed By:

Ares Liu

(Ares Liu)

Approved By:

Sheek Luo

(Sheek Luo)



1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20210100064E-03	Rev.01	Initial report	2021-02-01

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3 General Information

3.1 Client Information

Applicant:	THINKCAR TECH CO.,LTD.
Address of Applicant:	2606, building 4, phase II, TiananYungu, Gangtou community, Bantian, Longgang District, Shenzhen
Manufacturer:	THINKCAR TECH CO.,LTD.
Address of Manufacturer:	2606, building 4, phase II, TiananYungu, Gangtou community, Bantian, Longgang District, Shenzhen
Factory:	THINKCAR TECH CO.,LTD.
Address of Factory:	2606, building 4, phase II, TiananYungu, Gangtou community, Bantian, Longgang District, Shenzhen

3.2 General Description of EUT

Product Name:	THINKDIAG MINI, THINKCAR pro
Model No.:	TKD02, TKCA3
Test Model No.:	TKD02
Trade Mark:	N/A
Test sample SN:	989140304647 V0
Hardware Version:	V1.00.000
Software Version:	V11.85
EUT Supports Radios application:	Bluetooth dual mode: 2402-2480MHz
Power Supply:	DC 9-18V

3.3 General Description of BLE

Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	V4.2
Modulation Type:	GFSK
Transfer Rate:	1Mbps
Number of Channel:	40
Product Type:	<input type="checkbox"/> Mobile <input type="checkbox"/> Portable <input checked="" type="checkbox"/> Fix Location
Test Software of EUT:	Bluetooth RF test Tool V2017.10.20 (manufacturer declare)
Antenna Type:	Integral antenna
Antenna Gain:	1.28dBi

3.4 General Description of BT Classic

Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	V4.2
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)

Modulation Type:	GFSK, π/4DQPSK, 8DPSK
Transfer Rate:	1Mbps/2Mbps/3Mbps
Number of Channel:	79
Hopping Channel Type:	Adaptive Frequency Hopping systems
Product Type:	<input type="checkbox"/> Mobile <input type="checkbox"/> Portable <input checked="" type="checkbox"/> Fix Location
Test Software of EUT:	Bluetooth RF test Tool V2017.10.20 (manufacturer declare)
Antenna Type:	Integral antenna
Antenna Gain:	1.28dBi

Note:

Model No.: TKD02, TKCA3

Only the model TKD02 was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above models, with difference being color and appearance.

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: $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2)$

Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

$\pi = 3.1416$

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: 1.28dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.34 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)	1.58	1.0±1.0	2.0	1.585
Middle(2440MHz)	2.92	2.0±1.0	3.0	1.995
Highest(2480MHz)	3.66	3.0±1.0	4.0	2.512

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
2.512	1.28	0.00067	1.0	PASS

Note: 1) Refer to report No. CQASZ20210100064E-01 for EUT test Max Conducted Peak Output Power value.

$$2) P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2) = (2.512 \cdot 1.34) / (4 \cdot 3.1416 \cdot 20^2) = 0.00067$$

2) For BT Classic

Antenna Gain: 1.28dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.34 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)	1.130	0.5±1.0	1.5	1.413
Middle(2441MHz)	2.530	2.0±1.0	3.0	1.995
Highest(2480MHz)	3.250	2.5±1.0	3.5	2.239
π/4DQPSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	2.570	2.0±1.0	3.0	1.995
Middle(2441MHz)	3.890	3.0±1.0	4.0	2.512
Highest(2480MHz)	4.610	4.0±1.0	5.0	3.162
8DPSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	3.050	2.5±1.0	3.5	2.239
Middle(2441MHz)	4.380	3.5±1.0	4.5	2.818
Highest(2480MHz)	2.150	1.5±1.0	2.5	1.778

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
3.162	1.28	0.00085	1.0	PASS

Note: 1) Refer to report No. CQASZ20210100064E-02 for EUT test Max Conducted Peak Output Power value.

2) $Pd = (Pout \cdot G) / (4 \cdot \pi \cdot R^2) = (3.162 \cdot 1.34) / (4 \cdot 3.1416 \cdot 20^2) = 0.00085$

BDR and BLE can not simultaneous transmitting at same time.