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RF Exposure Evaluation Report

Report No.: CQASZ20200901005E-03
Applicant: Shenzhen iBoard Technology Co., Ltd
Address of Applicant: 1001, Block A, Tanglangcheng Square (West Zone), Fuguang Community, Taoyuan Street, Nanshan District, Shenzhen, Guangdong, China
Equipment Under Test (EUT):
EUT Name: Digital Signage, Touch Monitor
Model No.: YY-##-XXX(ZZZ) (The YY can be A-Z, means different customer code. Marketing requests, won't affect safety. The ## can be A-Z/0-9, means different country's production name, won't affect safety. The XXX can be A-Z/0-9, means product different shape/outlook color of the product. The ZZZ can be A-Z/0-9, means product different installation way.)
Test Model No.: TE-DS-215 (WAD)
Brand Name: StarBoard, iBoard
FCC ID: 2AIHCTE-DS-215
Standards: 47 CFR Part 1.1307
47 CFR Part 1.1310
KDB447498D01 General RF Exposure Guidance v06
Date of Receipt: 2020-09-10
Date of Test: 2020-09-10 to 2020-09-18
Date of Issue: 2020-09-18
Test Result: PASS*

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

Tested By: Martin Lee
(Martin Lee)

Reviewed By: Sheek Luo
(Sheek Luo)

Approved By: Jack Ai
(Jack Ai)



1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20200901005E-03	Rev.01	Initial report	2020-09-18

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3 General Information

3.1 Client Information

Applicant:	Shenzhen iBoard Technology Co., Ltd
Address of Applicant:	1001, Block A, Tanglangcheng Square (West Zone), Fuguang Community, Taoyuan Street, Nanshan District, Shenzhen, Guangdong, China
Manufacturer:	Shenzhen iBoard Technology Co., Ltd
Address of Manufacturer:	1001, Block A, Tanglangcheng Square (West Zone), Fuguang Community, Taoyuan Street, Nanshan District, Shenzhen, Guangdong, China
Factory:	Shenzhen iBoard Technology Co., Ltd
Address of Factory:	1001, Block A, Tanglangcheng Square (West Zone), Fuguang Community, Taoyuan Street, Nanshan District, Shenzhen, Guangdong, China

3.2 General Description of EUT

Product Name:	Digital Signage, Touch Monitor
Model No.:	(The YY can be A-Z, means different customer code. Marketing requests, won't affect safety. The ## can be A-Z/0-9, means different country's production name, won't affect safety. The XXX can be A-Z/0-9, means product different shape/outlook color of the product. The ZZZ can be A-Z/0-9, means product different installation way.)
Test Model No.:	TE-DS-215 (WAD)
Trade Mark:	StarBoard, iBoard
Hardware Version:	TEDS1.0
Software Version:	Rk3288-userdebug7.1.2NHG47Keng.harris.20200427.180305tst-keys
EUT Power Supply:	110V 60Hz

3.3 General Description of BT Classic

Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	V4.0
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Modulation Type:	GFSK, $\pi/4$ DQPSK, 8DPSK
Number of Channel:	79
Transfer Rate:	1Mbps/2Mbps/3Mbps
Hopping Channel Type:	Adaptive Frequency Hopping systems
Sample Type:	☐ Mobile ☐ Portable ☒ Fix Location
Test Software of EUT:	RF Test Tool (manufacturer declare)
Antenna Type:	External Antenna
Antenna Gain:	0dBi

3.4 General Description of 2.4G WIFI

Operation Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz
Channel Numbers:	IEEE 802.11b/g, IEEE 802.11n HT20: 11 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): 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
Product Type:	☐ Mobile ☐ Portable ☒ Fix Location
Test Software of EUT:	RF Test Tool (manufacturer declare)
Antenna Type:	External Antenna
Antenna Gain:	0dBi

Note:

Model No.: YY-##-XXX(ZZZ)

(The YY can be A-Z, means different customer code. Marketing requests, won't affect safety.

The ## can be A-Z/0-9, means different country's production name, won't affect safety.

The XXX can be A-Z/0-9, means product different shape/outlook color of the product.

The ZZZ can be A-Z/0-9, means product different installation way.)

Only the model TE-DS-215 (WAD) 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 Limitst

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.

4.1.3 EUT RF Exposure

1) For BT Classic

Antenna Gain: 0dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.00 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)	5.240	4.5±1	5.5	3.548
Middle(2441MHz)	6.040	5.5±1	6.5	4.467
Highest(2480MHz)	5.590	5.0±1	6.0	3.981
π/4DQPSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	5.270	4.5±1	5.5	3.548
Middle(2441MHz)	6.010	5.5±1	6.5	4.467
Highest(2480MHz)	5.600	5.0±1	6.0	3.981
8DPSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	5.320	4.5±1	5.5	3.548
Middle(2441MHz)	6.050	5.5±1	6.5	4.467
Highest(2480MHz)	5.590	5.0±1	6.0	3.981

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm²)	Limit	Result
4.467	0	0.0009	1.0	PASS

Note: 1) Refer to report No. CQASZ20200901005E-01 for EUT test Max Conducted Peak Output Power value.

2) $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2) = (4.467 \cdot 1.00) / (4 \cdot 3.1416 \cdot 20^2) = 0.0009$

3) EUT's Bluetooth module is more than 20cm away from the human body.

2) For 2.4G WIFI

Antenna Gain: 0dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.00 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

802.11b mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	12.01	11.5±1	12.5	17.783
Middle(2437MHz)	12.67	12.0±1	13.0	19.953
Highest(2462MHz)	11.66	11.0±1	12.0	15.849
802.11g mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	7.62	7.0±1	8.0	6.310
Middle(2437MHz)	8.26	7.5±1	8.5	7.079
Highest(2462MHz)	7.5	7.0±1	8.0	6.310
802.11n(HT20)mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	7.63	7.0±1	8.0	6.310
Middle(2437MHz)	8.26	7.5±1	8.5	7.079
Highest(2462MHz)	7.49	6.5±1	7.5	5.623

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
19.953	0	0.0040	1.0	PASS

Note: 1) Refer to report No. CQASZ20200901005E-02 for EUT test Max Conducted Average Output Power value.

$$2) P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2) = (19.953 \cdot 1.00) / (4 \cdot 3.1416 \cdot 20^2) = 0.0040$$

3) EUT's 2.4G WIFI module is more than 20cm away from the human body.

4) The BT and WIFI can not transmit at the same time.