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RF Exposure Evaluation Report

Report No. : CQASZ20180600057E-04

Applicant: AKSys Co., Ltd.

Address of Applicant: A706, Ace Cheonggye Tower, 53 Seonggogae-ro, Uiwang-si, Gyeonggi-do, Republic of Korea

Manufacturer: Plack Audio Co.,Ltd

Address of Manufacturer: No.4 Zhangbei Street, Ailian Community, Longgang District, Shezhen City, China

Equipment Under Test (EUT):

Product: Wi-Fi Network Speaker

Model No.: BOSK, BOSK-Twin

Test Model No.: BOSK

Brand Name: **AKS**

FCC ID: 2AQKJ-BOSK

Standards: 47 CFR Part 1.1307
47 CFR Part 1.1310
KDB447498D01 General RF Exposure Guidance v06

Date of Test: 2018-06-15 to 2018-06-27

Date of Issue: 2018-06-27

Test Result : **PASS***

Tested By:

Martin Lee

(Martin Lee)

Reviewed By:

Owen Zhou

(Owen Zhou)

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
CQASZ20180600057E-04	Rev.01	Initial report	2018-06-27

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3 General Information

3.1 Client Information

Applicant:	AKSys Co., Ltd.
Address of Applicant:	A706, Ace Cheonggye Tower, 53 Seonggogae-ro, Uiwang-si, Gyeonggi-do, Republic of Korea
Manufacturer:	Plack Audio Co.,Ltd
Address of Manufacturer:	No.4 Zhangbei Street, Ailian Community, Longgang District, Shenzhen City, China

3.2 General Description of EUT

Product Name:	Wi-Fi Network Speaker
Model No.:	BOSK, BOSK-Twin
Test Model No.:	BOSK
Trade Mark:	AKS
Hardware Version:	V1.0
Software Version:	V1.0
Sample Type:	portable production
Power Supply:	Adapter :INPUT:100-240~50/60Hz 2.0A OUTPUT:15V 4A

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
Hopping Channel Type:	Adaptive Frequency Hopping systems
Test Software of EUT:	RTLBTAPP (manufacturer declare)
Antenna Type:	PCB antenna
Antenna Gain:	4dBi

3.4 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)
Test Software of EUT:	MT7628 (manufacturer declare)
Antenna Type:	Integral antenna
Antenna Gain:	0dBi

3.5 General Description of BLE

Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	V4.0
Modulation Type:	GFSK
Number of Channel:	40
Test Software of EUT:	RTLBTAPP (manufacturer declare)
Antenna Type:	PCB antenna
Antenna Gain:	0dBi

All model: BOSK, BOSK-Twin

Only the model BOSK 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 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 BT classic

Antenna Gain: 0dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.0 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)	-2.490	-2.0±1	-1.0	0.794
Middle(2441MHz)	-2.100	-2.0±1	-1.0	0.794
Highest(2480MHz)	-1.330	-1.0±1	0.0	1.000
π/4DQPSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	-3.340	-3.0±1	-2.0	0.631
Middle(2441MHz)	-2.750	-2.0±1	-1.0	0.794
Highest(2480MHz)	-2.000	-1.5±1	-0.5	0.891
8DPSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	-3.230	-3.0±1	-2.0	0.631
Middle(2441MHz)	-2.970	-2.0±1	-1.0	0.794
Highest(2480MHz)	-2.140	-2.0±1	-1.0	0.794

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
1.000	0	0.0002	1.0	PASS

Note: 1) Refer to report No. CQASZ20180600057E-01 for EUT test Max Conducted Peak Output Power value.

2) $P_d = (P_{out} * G) / (4 * \pi * R^2) = (1.000 * 1.0) / (4 * 3.1416 * 20^2) = 0.0002$

2) For WIFI

Antenna Gain: 0dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.0 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)	15.39	15.0±1	16.0	39.811
Middle(2437MHz)	15.20	15.0±1	16.0	39.811
Highest(2462MHz)	15.24	15.0±1	16.0	39.811
802.11g mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	14.74	14.0±1	15.0	31.623
Middle(2437MHz)	14.45	14.0±1	15.0	31.623
Highest(2462MHz)	14.58	14.0±1	15.0	31.623
802.11n(HT20) mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	13.11	13.0±1	14.0	25.119
Middle(2437MHz)	12.75	12.0±1	13.0	19.953
Highest(2462MHz)	13.05	13.0±1	14.0	25.119
802.11n(HT40)mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2422MHz)	13.89	13.0±1	14.0	25.119
Middle(2437MHz)	13.68	13.0±1	14.0	25.119
Highest(2452MHz)	13.71	13.0±1	14.0	25.119

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
39.811	0	0.00792	1.0	PASS

Note: 1) Refer to report No. CQASZ20180600057E-02 for EUT test Max Conducted average Output Power value.

2) $P_d = (P_{out} * G) / (4 * \pi * R^2) = (39.811 * 1) / (4 * 3.1416 * 20^2) = 0.00792$

3) For BLE

Antenna Gain: 0dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.0 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)	3.54	4.0±1	5.0	3.162
Middle(2440MHz)	2.99	3.0±1	4.0	2.512
Highest(2480MHz)	3.48	3.0±1	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
3.162	0	0.00063	1.0	PASS

Note: 1) Refer to report No. CQASZ20180600057E-03 for EUT test Max Conducted Peak Output Power value.

2) $P_d = (P_{out} * G) / (4 * \pi * R^2) = (3.162 * 1.0) / (4 * 3.1416 * 20^2) = 0.00063$