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RF Exposure Evaluation Report

Report No. :	CQASZ20190700647E-04
Applicant:	AKSys Co., Ltd.
Address of Applicant:	A706, Ace Cheonggye Tower, 53 Seonggogae-ro, Uiwang-si, Gyeonggi-do, Korea
Equipment Under Test (EUT):	
Product:	Wi-Fi Network Player
Model No.:	BOSK-NP210L
Brand Name:	RÖTH&MYERS
FCC ID:	2AQKJ-NP210L
Standards:	47 CFR Part 1.1307 47 CFR Part 1.1310 KDB447498D01 General RF Exposure Guidance v06
Date of Receipt:	2019-07-26
Date of Test:	2019-07-26 to 2019-08-09
Date of Issue:	2019-08-09
Test Result :	**PASS***

Tested By: Tom Chen.

(Tom Chen)

Reviewed By: Sheek Luo

(Sheek Luo)

Approved By:

(Jack Ai)

SHENZHEN HUAXIA TESTING TECHNOLOGY CO.,LTD 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
CQASZ20190700647E-04	Rev.01	Initial report	2019-08-09

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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, Korea
Manufacturer:	AKSys Co., Ltd.
Address of Manufacturer:	A706, Ace Cheonggye Tower, 53 Seonggogae-ro, Uiwang-si, Gyeonggi-do, Korea

3.2 General Description of EUT

Product Name:	Wi-Fi Network Player
Model No.:	BOSK-NP210L
Trade Mark:	RÖTH&MYERS
Hardware Version:	V1.0
Software Version:	V20
Sample Type:	☐ Mobile ☐ Portable ☒ Fix Location
Power Supply:	DC 15V by adapter Adapter: Model: FY0681504000 Input: 100~240V 50/60Hz 1.8A, Output: 15V 4A

3.3 General Description of BT

Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	V4.0
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Modulation Type:	GFSK, π/4DQPSK, 8DPSK
Number of Channel:	79
Hopping Channel Type:	Adaptive Frequency Hopping systems
Test Software of EUT:	BK32xx RF Test_V1.7 (manufacturer declare)
Antenna Type:	PCB antenna
Antenna Gain:	0dBi

3.4 General Description of BLE

Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	V5.0
Modulation Type:	GFSK
Transfer Rate:	1Mbps
Number of Channel:	40
Test Software of EUT:	BK32xx RF Test_V1.7 (manufacturer declare)
Antenna Type:	PCB antenna
Antenna Gain:	0dBi

3.5 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 and HT40) : 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:	MT7628 QA 0.0.0.96 (manufacturer declare)
Antenna Type:	internal antenna with ipex connector
Antenna Gain:	2dBi

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 1.1.3 EUT RF Exposure Evaluation

1) For BT

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

GFSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	0.480	1±1	2	1.585
Middle(2441MHz)	1.840	2±1	3	1.995
Highest(2480MHz)	2.670	2±1	3	1.995
π/4DQPSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	-1.440	-1±1	0	1.000
Middle(2441MHz)	1.050	1±1	2	1.585
Highest(2480MHz)	1.990	1.5±1	2.5	1.778
8DPSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	-1.110	-1±1	0	1.000
Middle(2441MHz)	1.200	1±1	2	1.585
Highest(2480MHz)	2.130	1.5±1	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**
1.585	0	0.0004	1.0	PASS

Note: 1) Refer to report No. CQASZ20190700647E-03 for EUT test Max Conducted Peak Output Power value.

2) $Pd = (Pout*G)/(4* Pi * R^2)=(1.585*1)/(4*3.1416*20^2)=0.0004$

2) For BLE

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

GFSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2403.5MHz)	0.705	0.5±1	1.5	1.413
Middle(2438.9MHz)	0.705	0.5±1	1.5	1.413
Highest(2477.3MHz)	0.692	0.5±1	1.5	1.413

The worst case:

Maximum tune-up Power (mW)	**Antenna Gain (dBi)**	**Power Density at R = 20 cm (mW/cm^2)**	**Limit**	**Result**
1.413	0	0.0003	1.0	PASS

Note: 1) Refer to report No. CQASZ20190700647E-02 for EUT test Max Conducted Peak Output Power value.

2) $Pd = (Pout*G)/(4* Pi * R^2)=(1.413*2.51)/(4*3.1416*20^2)=0.01003$

3) For WIFI

Antenna Gain: 2dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.58 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

IEEE for 802.11b mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	12.65	12.5±1	13.5	22.387
Middle(2437MHz)	13.12	12.5±1	13.5	22.387
Highest(2462MHz)	13.27	12.5±1	13.5	22.387
IEEE for 802.11g mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	9.54	10±1	11	12.589
Middle(2437MHz)	9.84	10±1	11	12.589
Highest(2462MHz)	10.12	10±1	11	12.589
IEEE for 802.11n(HT20) mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	9.63	10±1	11	12.589
Middle(2437MHz)	9.87	10±1	11	12.589
Highest(2462MHz)	10.45	10±1	11	12.589
IEEE for 802.11n(HT40) mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2422MHz)	9.02	10±1	11	12.589
Middle(2437MHz)	9.6	10±1	11	12.589
Highest(2452MHz)	9.91	10±1	11	12.589

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm^2)	Limit	Result
22.387	2	0.0071	1.0	PASS

Note: 1) Refer to report No. CQASZ20190700647E-01 for EUT test Max Conducted Peak Output Power value.
2) $Pd = (Pout*G)/(4* Pi * R^2)=(22.387*1.58)/(4*3.1416*20^2)=0.0071$

WIFI, BDR, EDR and BLE can not simultaneous transmitting at same time.