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RF Exposure Evaluation Report

Report No.: CQASZ20250501057E-06

Applicant: Shenzhen Kean Digital Co., Ltd.

Address of Applicant: Room 1001, Rujun Building, No. 105, Zhongxing Road, Ma'antang Community, Bantian Street, Longgang District, Shenzhen, Guangdong, China 518129

Equipment Under Test (EUT):

Product: Wireless Home Base

Model No.: N54WHF, N54WHP, N54WHQ, N54WHR, N54WHS, N58WHP, N58WHQ, N58WHR, N58WHS, N94WHF, N94WHP, N94WHQ, N94WHR, N94WHS, N98WHF, N98WHP, N98WHQ, N98WHS

Test Model No.: N54WHF

Brand Name: N/A

FCC ID: 2AKL2N54WHF

Standards: 47 CFR Part 1.1307
47 CFR Part 1.1310
KDB447498 D01 General RF Exposure Guidance v06

Date of Receipt: 2025-05-15

Date of Test: 2025-05-15 to 2025-09-11

Date of Issue: 2025-09-28

Test Result: **PASS***

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

Tested By: Lewis Zhou
(Lewis Zhou)

Reviewed By: Timo Lei
(Timo Lei)

Approved By: Jack Ai
(Jack Ai)



1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20250501057E-06	Rev.01	Initial report	2025-09-28

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3 General Information

3.1 Client Information

Applicant:	Shenzhen Kean Digital Co., Ltd.
Address of Applicant:	Room 1001, Rujun Building, No. 105, Zhongxing Road, Ma'antang Community, Bantian Street, Longgang District, Shenzhen, Guangdong, China 518129
Manufacturer:	Shenzhen Kean Digital Co., Ltd.
Address of Manufacturer:	Room 1001, Rujun Building, No. 105, Zhongxing Road, Ma'antang Community, Bantian Street, Longgang District, Shenzhen, Guangdong, China 518129
Factory:	Shenzhen Kean Digital Co., Ltd.
Address of Factory:	Room 1001, Rujun Building, No. 105, Zhongxing Road, Ma'antang Community, Bantian Street, Longgang District, Shenzhen, Guangdong, China 518129

3.2 General Description of EUT

Product Name:	Wireless Home Base
Model No.:	N54WHF, N54WHP, N54WHQ, N54WHR, N54WHS, N58WHP, N58WHQ, N58WHR, N58WHS, N94WHF, N94WHP, N94WHQ, N94WHR, N94WHS, N98WHF, N98WHP, N98WHQ, N98WHS
Test Model No.:	N54WHF
Trade Mark:	N/A
Software Version:	V1.0
Hardware Version:	V1.0
EUT Power Supply:	Adapter: Model:CS-0501000 Input:100-240V~0.5A Max.50/60Hz Output:5V $\overline{\text{~}}$ 1.0A

3.3 General Description of 2.4G WIFI Classic

RF Model:	SWT6652
Operation Frequency:	2412MHz~2462MHz
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)
Number of Channel:	IEEE 802.11b/g, IEEE 802.11n HT20: 11 Channels IEEE 802.11n HT40: 7 Channels
Channel Separation:	5MHz
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
Sample Type:	☒ Mobile ☐ Portable
Antenna Type:	PCB antenna
Antenna Gain:	Ant1:4.57dBi Ant2:4.57dBi Ant1+Ant2:7.58dBi

3.4 General Description of 2.4G WIFI Classic

RF Model:	AIC8800D40L
Operation Frequency:	2412MHz~2462MHz
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)
Number of Channel:	IEEE 802.11b/g, IEEE 802.11n HT20: 11 Channels IEEE 802.11n HT40: 7 Channels
Channel Separation:	5MHz
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
Sample Type:	☒ Mobile ☐ Portable
Antenna Type:	PCB antenna
Antenna Gain:	4.57dBi

3.5 General Description of 5G WIFI Classic

RF Model:	SWT6652
Operation Frequency:	IEEE 802.11a/n/ac/ax(20M): 5150MHz ~5250 MHz IEEE802.11n/ac/ax(40M): 5150MHz ~5250 MHz IEEE802.11ac/ax(80M): 5150MHz ~5250 MHz IEEE 802.11a/n/ac/ax(20M): 5725MHz ~5850 MHz IEEE802.11n/ac/ax(40M): 5725MHz ~5850 MHz IEEE802.11ac/ax(80M): 5725MHz ~5850 MHz
Channel Numbers:	IEEE 802.11a/n/ac/ax(20M): 5150MHz ~5250MHz/ 4 channel IEEE 802.11n/ac/ax(40M): 5150MHz ~5250MHz/ 2 channel IEEE 802.11ac/ax(80M): 5150MHz ~5250MHz/ 1 channel IEEE 802.11a/n/ac/ax(20M): 5725MHz ~5850MHz/ 5 channel IEEE 802.11n/ac/ax(40M): 5725MHz ~5850MHz/ 2 channel IEEE 802.11ac/ax(80M): 5725MHz ~5850MHz/ 1 channel
Type of Modulation:	IEEE 802.11n/ac:OFDM IEEE 802.11ax:OFDMA
Sample Type:	☒ Mobile ☐ Portable
Test Software of EUT:	CMD
Antenna Type:	PCB antenna
Antenna gain:	Ant1: 2.43dBi@5GHz: Wi-Fi: U-NII-1 3.11dBi@5GHz: Wi-Fi: U-NII-3 Ant2: 2.43dBi@5GHz: Wi-Fi: U-NII-1 3.11dBi@5GHz: Wi-Fi: U-NII-3 Ant1+Ant2: 5.44dBi@5GHz: Wi-Fi: U-NII-1 6.12dBi@5GHz: Wi-Fi: U-NII-3
Cable loss:	1.0 dB

3.6 General Description of 5G WIFI Classic

RF Model:	AIC8800D40L
Operation Frequency:	IEEE 802.11a/n/ac/ax(20M): 5150MHz ~5250 MHz IEEE802.11n/ac/ax(40M): 5150MHz ~5250 MHz IEEE802.11ac/ax(80M): 5150MHz ~5250 MHz IEEE 802.11a/n/ac/ax(20M): 5250MHz ~5350 MHz IEEE802.11n/ac/ax(40M): 5250MHz ~5350 MHz IEEE802.11ac/ax(80M): 5250MHz ~5350 MHz IEEE 802.11a/n/ac/ax(20M): 5470MHz ~5725 MHz IEEE802.11n/ac/ax(40M): 5470MHz ~5725 MHz IEEE802.11ac/ax(80M): 5470MHz ~5725 MHz IEEE 802.11a/n/ac/ax(20M): 5725MHz ~5850 MHz IEEE802.11n/ac/ax(40M): 5725MHz ~5850 MHz IEEE802.11ac/ax(80M): 5725MHz ~5850 MHz
Channel Numbers:	IEEE 802.11a/n/ac/ax(20M): 5150MHz ~5250MHz/ 4 channel IEEE 802.11n/ac/ax(40M): 5150MHz ~5250MHz/ 2 channel IEEE 802.11ac/ax(80M): 5150MHz ~5250MHz/ 1 channel IEEE 802.11a/n/ac/ax(20M): 5250MHz ~5350MHz/ 4 channel IEEE 802.11n/ac/ax(40M): 5250MHz ~5350MHz/ 2 channel IEEE 802.11ac/ax(80M): 5250MHz ~5350MHz/ 1 channel IEEE 802.11a/n/ac/ax(20M): 5470MHz ~5725MHz/ 9 channel IEEE 802.11n/ac/ax(40M): 5470MHz ~5725MHz/ 4 channel IEEE 802.11ac/ax(80M): 5470MHz ~5725MHz/ 2 channel IEEE 802.11a/n/ac/ax(20M): 5725MHz ~5850MHz/ 5 channel IEEE 802.11n/ac/ax(40M): 5725MHz ~5850MHz/ 2 channel IEEE 802.11ac/ax(80M): 5725MHz ~5850MHz/ 1 channel
Type of Modulation:	IEEE 802.11n/ac:OFDM IEEE 802.11ax:OFDMA
Sample Type:	☒ Mobile ☐ Portable
Test Software of EUT:	CMD
Antenna Type:	PCB antenna
Antenna gain:	2.43dBi@5GHz: Wi-Fi: U-NII-1 3.35dBi@5GHz: Wi-Fi: U-NII-2A 2.9dBi@5GHz: Wi-Fi: U-NII-2C 3.11dBi@5GHz: Wi-Fi: U-NII-3
Cable loss:	1.0 dB

Note:

The above parameters will directly affect the test results. The information is provided by the applicant.

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 2.4G WIFI

RF Model: SWT6652

Antenna Gain: 6.12dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 4.09 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Ant 1 + Ant 2:

Measurement Data

11N20MIMO mode				
Test channel	AV Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	22.65	23±1	24	251.189
Middle(2437MHz)	21.72	22±1	23	199.526
Highest(2462MHz)	23.33	23.5±1	24.5	281.838

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm²)	Limit	Result
281.838	6.12	0.2294716979	1.0	PASS

Note: 1) Refer to report No. CQASZ20240901965E-01 for EUT test Max Conducted AV Output Power value.

2) $P_d = (P_{out} * G) / (4 * \pi * R^2) = (281.838 * 4.09) / (4 * 3.1416 * 20^2) = 0.2294716979$

2) For 5G WIFI Classic

RF Moudel:SWT6652

Antenna Gain: 5.44dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 3.5 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Ant 1 + Ant 2:

Measurement Data

11N20MIMO mode				
Test channel	AV Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(5180MHz)	14.38	14.5±1	15.5	35.481
Middle(5200MHz)	14.24	14.5±1	15.5	35.481
Highest(5240MHz)	14.40	14.5±1	15.5	35.481

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
35.481	5.44	0.0247018300	1.0	PASS

Note: 1) Refer to report No. CQASZ20250501057E-03 for EUT test Max Conducted AV Output Power value.

2) $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2) = (35.481 \cdot 3.5) / (4 \cdot 3.1416 \cdot 20^2) = 0.0247018300$

3) For 2.4G WIFI

RF Moudel:AIC8800D40L

Antenna Gain: 4.57dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.86 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

11N20SISO mode				
Test channel	AV Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	19.57	19.5±1	20.5	112.202
Middle(2437MHz)	18.60	18.5±1	19.5	89.125
Highest(2462MHz)	20.10	20±1	21	125.893

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
125.893	4.57	0.0717346740	1.0	PASS

Note: 1) Refer to report No. CQASZ20250501057E-02 for EUT test Max Conducted AV Output Power value.

2) $P_d = (P_{out} * G) / (4 * \pi * R^2) = (125.893 * 2.86) / (4 * 3.1416 * 20^2) = 0.0717346740$

4)For 5G WIFI Classic

RF Moudel:AIC8800D40L

Antenna Gain: 3.35dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.16 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

11AX20SISO mode				
Test channel	AV Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(5260MHz)	10.16	10.5±1	11.5	14.125
Middle(5280MHz)	6.55	6.5±1	7.5	5.623
Highest(5320MHz)	10.46	10.5±1	11.5	14.125

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
14.125	3.35	0.006077558	1.0	PASS

Note: 1) Refer to report No. CQASZ20240901965E-04 for EUT test Max Conducted AV Output Power value.

$$2) Pd = (P_{out} * G) / (4 * \pi * R^2) = (14.125 * 2.16) / (4 * 3.1416 * 20^2) = 0.006077558$$

Simultaneous transmission:

MPE ratios(2.4G WIFI)(SWT6652)+MPE ratios(2.4G WIFI)(AIC8800D40L)

$$= 0.2294716979 / 1 + 0.0717346740 / 1$$

$$= 0.3012063719 \leq 1$$

*** END OF REPORT ***