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RF Exposure Evaluation Report

Report No.: CQASZ20220200210E-04
Applicant: Shenzhen Chuangkeyou Technology Co., Ltd.
Address of Applicant: Room 408, Block A, Zhantao Commercial Plaza, Tenglong Road, Dalang Street, Longhua District, Shenzhen, Guangdong
Equipment Under Test (EUT):
EUT Name: All in one PC
Model No.: NX3, NX3T, NX1, NX1PRO, NX5, NX5PRO, NX7, NX7PRO, NX9, NX9PRO, Z1, Z2, Z3, Z5, Z6, Z7, Z8, Z9
Test Model No.: NX3
Brand Name: N/A
FCC ID: 2A4MD-NX3
Standards: 47 CFR Part 1.1307
47 CFR Part 1.1310
KDB447498D01 General RF Exposure Guidance v06
Date of Receipt: 2022-2-18
Date of Test: 2022-2-18 to 2022-2-24
Date of Issue: 2022-3-1
Test Result: PASS*

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

Tested By: Lewis Zhou

(Lewis Zhou)

Reviewed By: Rock Huang

(Rock Huang)

Approved By: Jack Ai

(Jack Ai)



1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20220200210E-04	Rev.01	Initial report	2022-3-1

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3 General Information

3.1 Client Information

Applicant:	Shenzhen Chuangkeyou Technology Co., Ltd.
Address of Applicant:	Room 408, Block A, Zhantao Commercial Plaza, Tenglong Road, Dalang Street, Longhua District, Shenzhen, Guangdong
Manufacturer:	Shenzhen Chuangkeyou Technology Co., Ltd.
Address of Manufacturer:	Room 408, Block A, Zhantao Commercial Plaza, Tenglong Road, Dalang Street, Longhua District, Shenzhen, Guangdong
Factory:	Shenzhen CYX Technology Co.,Ltd
Address of Factory:	5/F, One buildings, Xiazao Industrial Zone, Zaohe Road, Longhua District, Shenzhen, Guangdong, China

3.2 General Description of EUT

Product Name:	All in one PC
Model No.:	NX3, NX3T, NX1, NX1PRO, NX5, NX5PRO, NX7, NX7PRO, NX9, NX9PRO, Z1, Z2, Z3, Z5, Z6, Z7, Z8, Z9
Test Model No.:	NX3
Trade Mark:	N/A
Software Version:	WINDOWS 11
Hardware Version:	PA_HM87_V1.1
EUT Power Supply:	MODEL:ZF120A-1206500 INPUT:100-240V~ 50/60Hz 2.5A OUTPUT:12V= 6.5A

3.3 General Description of BT Classic

Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	Bluetooth Spec 4.0
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
Antenna Type:	FPC Antenna
Antenna Gain:	-1.5dBi

3.4 General Description of 2.4G WIFI Classic

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 ☒ Fix Location
Antenna Type:	FPC Antenna
Antenna Gain:	-1.5dBi

3.5 General Description of 5G WIFI Classic

Operation Frequency:	5150MHz ~5250 MHz
Type of Modulation:	OFDM
Number of Channel:	IEEE 802.11a/n/ac(20M): 5150MHz ~5250MHz/ 4 channel IEEE 802.11n/ac(40M): 5150MHz ~5250MHz/ 2 channel IEEE 802.11ac(80M): 5150MHz ~5250MHz/ 1 channel
Channel Separation:	5MHz
Operation Frequency:	IEEE 802.11a/n/ac(20M): 5150MHz ~5250 MHz IEEE802.11n/ac(40M): 5150MHz ~5250 MHz IEEE802.11ac(80M): 5150MHz ~5250 MHz
Sample Type:	☐ Mobile ☐ Portable ☒ Fix Location
Antenna Type:	FPC Antenna
Antenna Gain:	-1.5dBi

Note:

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

4 MPE 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

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: -1.5dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 0.708 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)	-3.86	-4±1	-3	0.501
Middle(2441MHz)	-2.13	-2±1	-1	0.794
Highest(2480MHz)	-0.75	-1±1	0	1
π/4DQPSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	-3.98	-4±1	-3	0.501
Middle(2441MHz)	-2.3	-2±1	-1	0.794
Highest(2480MHz)	-0.96	-1±1	0	1
8DPSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	-3.96	-4±1	-3	0.501
Middle(2441MHz)	-2.41	-2±1	-1	0.794
Highest(2480MHz)	-1.01	-1±1	0	1

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
1	-1.5	0.00014	1.0	PASS

Note: 1) Refer to report No. CQASZ20220200210E-01 for EUT test Max Conducted Peak Output Power value.

2) $P_d = (P_{out} * G) / (4 * \pi * R^2) = (1 * 0.708) / (4 * 3.1416 * 20^2) = 0.00014$

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

2) For 2.4G WIFI Classic

Antenna Gain: -1.5dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 0.708 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

11B mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	9.03	9±1	10	10
Middle(2437MHz)	10.29	10±1	11	12.589
Highest(2462MHz)	9.60	9±1	10	10
11G mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	13.57	13±1	14	25.119
Middle(2437MHz)	12.76	12±1	13	19.953
Highest(2462MHz)	15.74	15±1	16	39.811
11N20 mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	8.75	8±1	9	7.943
Middle(2437MHz)	9.76	9±1	10	10
Highest(2462MHz)	9.38	9±1	10	10
11N40 mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2422MHz)	10.82	10±1	11	12.589
Middle(2437MHz)	12.23	12±1	13	19.953
Highest(2452MHz)	12.11	12±1	13	19.953

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
39.811	-1.5	0.00562	1.0	PASS

Note: 1) Refer to report No. CQASZ20220200210E-02 for EUT test Max Conducted Peak Output Power value.

2) $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2) = (39.811 \cdot 0.708) / (4 \cdot 3.1416 \cdot 20^2) = 0.00562$

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

3) For 5G WIFI Classic

Antenna Gain: -1.5dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 0.708 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

11A mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(5180MHz)	12.94	13±1	14	25.119
Middle(5200MHz)	12.56	13±1	14	25.119
Highest(5240MHz)	12.95	13±1	14	25.119
11N20 mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(5180MHz)	12.85	13±1	14	25.119
Middle(5200MHz)	12.42	13±1	14	25.119
Highest(5240MHz)	12.89	13±1	14	25.119
11N40 mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(5190MHz)	13.96	13±1	14	25.119
Highest(5230MHz)	13.92	13±1	14	25.119
11AC20 mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(5180MHz)	13.22	13±1	14	25.119
Middle(5200MHz)	11.69	11±1	12	15.849
Highest(5240MHz)	12.15	12±1	13	19.953
11AC40 mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(5190MHz)	13.36	13±1	14	25.119
Highest(5230MHz)	12.84	12±1	13	19.953

11AC80 mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Middle(5210MHz)	15.21	15±1	16	39.811

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm²)	Limit	Result
39.811	-1.5	0.00562	1.0	PASS

Note: 1) Refer to report No. CQASZ20220200210E-03 for EUT test Max Conducted Peak Output Power value.

2) $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2) = (39.811 \cdot 0.708) / (4 \cdot 3.1416 \cdot 20^2) = 0.00562$

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

Result:

Since BT and 2.4G WiFi share the same antenna, the worst mode is that 2.4G WiFi and 5G WiFi transmit at the same time.

2.4G WiFi + 5G WiFi = 0.00562 + 0.00562 = 0.01124

*** END OF REPORT ***