

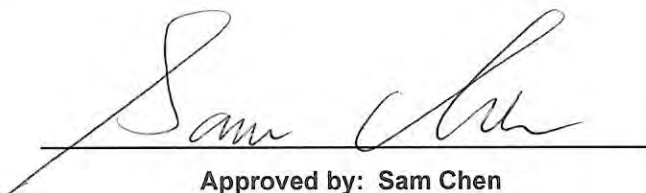


RADIO EXPOSURE TEST REPORT

FCC ID : RAXAIOS65V
Equipment : HEOS 6.5 Platform Module
Brand Name : Arcadyan
Model Name : WN9722NAX22-E7(AIOS6.5 Type-V)
Applicant : Arcadyan Technology Corporation
No.8, Sec.2, Guangfu Rd., Hsinchu, 30071 Taiwan
Manufacturer : Arcadyan Technology Corporation
No.8, Sec.2, Guangfu Rd., Hsinchu, 30071 Taiwan
Standard : 47 CFR Part 2.1091

The product was received on Aug. 24, 2022, and testing was started from Sep. 03, 2022 and completed on Oct. 13, 2022. We, Sporton International Inc. Hsinchu Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in 47 CFR Part 2.1091 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. Hsinchu Laboratory, the test report shall not be reproduced except in full.



Approved by: Sam Chen

Sporton International Inc. Hsinchu Laboratory
No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)



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History of this test report

Report No.	Version	Description	Issued Date
FA282318	01	Initial issue of report	Oct. 31, 2022



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
2	-	Exposure evaluation	PASS	-

Declaration of Conformity:

1. The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results.
2. The measurement uncertainty please refer to report "Measurement Uncertainty".

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: **Sam Chen**

Report Producer: **Penny Kao**



1 General Description

1.1 EUT General Information

RF General Information			
Evaluation Mode	Frequency Range (MHz)	Operating Frequency (MHz)	Modulation Type
2.4GHz WLAN	2400-2483.5	2412-2462	802.11b: DSSS (DBPSK, DQPSK, CCK) 802.11g/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) VHT: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
5GHz WLAN	5150-5250 5250-5350 5470-5725 5725-5850	5180-5240 5260-5320 5500-5720 5745-5825	802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
Bluetooth	2400-2483.5	2402-2480	BR / EDR: FHSS (GFSK / $\pi/4$ -DQPSK / 8DPSK) LE: GFSK



1.2 Antenna Information

Ant.	Port		Brand	Model Name	Type	Connector	Gain(dBi)		Cable Loss (dBi)		Net Gain (dBi)		Cable Length (mm)
	WLAN 2.4GHz /BT	WLAN 5GHz					WLAN 2.4GHz /BT	WLAN 5GHz	WLAN 2.4GHz /BT	WLAN 5GHz	WLAN 2.4GHz /BT	WLAN 5GHz	
1	1/2	-	Airgain	N2420DG3-T2L-PK1-G30U	Dipole	I-PEX	3.1	2.8	0.11	0.15	3	2.65	30
2	-	-	Airgain	N2420DG3-T2L-PK1-G100U	Dipole	I-PEX	3.1	2.8	0.35	0.49	2.75	2.31	100
3	-	-	Airgain	N2420DG3-T2L-PK1-G600U	Dipole	I-PEX	3.1	2.8	2.10	2.94	1	-0.14	600
4	-	-	Airgain	N2420DG3-T2L-PK1-G400U	Dipole	I-PEX	3.1	2.8	1.40	1.96	1.7	0.84	400
5	-	-	Airgain	N2420DG3-T2L-PK1-G300U	Dipole	I-PEX	3.1	2.8	1.05	1.47	2.05	1.33	300
6	-	1/2	Airgain	N2425D-T2L-PK1-G30U	PIFA	I-PEX	1.9	3.5	0.11	0.15	1.8	3.35	30
7	-	-	Airgain	N2425D-T2R-PK1-G150U	PIFA	I-PEX	1.9	3.5	0.53	0.74	1.38	2.77	150
8	-	-	Airgain	N2425D-T2R-PK1-G30U	PIFA	I-PEX	1.9	3.5	0.11	0.15	1.80	3.35	30
9	-	-	Airgain	N2425D-T2R-PK1-G500U	PIFA	I-PEX	1.9	3.5	1.75	2.45	0.15	1.05	500
10	-	-	LITE	120300058800J (503021-0123-0BC) Dual Band Fixed Rod Antenna	Dipole	I-PEX	Fixed Dipole antenna with 450mm cable				2.55	2.35	450
11	-	-	LITE	120300055601J (501301-0019-1BC) +120700034000J (510411-5210-24C) (300mm Gray Cable)	Dipole	I-PEX	Dipole antenna with 300mm cable				2.72	2.97	300
12	-	-	LITE	120300055600J (501301-0019-1BC) +120700034000J (510411-5210-24C) (300mm Gray Cable)	Dipole	I-PEX	Dipole antenna with 300mm cable				2.72	2.97	300
13	-	-	LITE	120300055601J (501301-0019-1BC) +120700042100J (510411-5300-23C) (500mm Gray Cable)	Dipole	I-PEX	Dipole antenna with 500mm cable				1.85	2.09	500
14	-	-	LITE	120300055600J (501301-0019-1BC) +120700042100J (510411-5300-23C) (500mm Gray Cable)	Dipole	I-PEX	Dipole antenna with 500mm cable				1.85	2.09	500
15	-	1/2	LITE	503021-0003-0BC (AIOS5 only) Dual Band Fixed Rod Antenna	Dipole	I-PEX	Fixed Dipole antenna with 200mm cable				2.52	3.04	200
16	-	-	LITE	503021-0013-0BC Dual Band Fixed Rod Antenna	Dipole	I-PEX	Fixed Dipole antenna with 500mm cable				1.74	1.68	500
17	-	-	LITE	120300055601J (501301-0019-1BC) +510411-5310-23C (200mm Gray Cable)	Dipole	I-PEX	Dipole antenna with 200mm cable				2.64	2.86	200
18	-	-	LITE	503021-0113-0BC (AIOS4 only) Dual Band Fixed Rod Antenna	Dipole	I-PEX	Fixed Dipole antenna with 300mm cable				2.35	2.44	300
19	-	-	Airgain	N2420DG3-T2L-PK1-G200U	Dipole	I-PEX	3.1	2.8	0.62	0.98	2.48	1.82	200
20	-	-	Airgain	N2420DG3-T2L-PK1-G520U	Dipole	I-PEX	3.1	2.8	1.61	2.55	1.49	0.25	520



Ant.	Port		Brand	Model Name	Type	Connector	Gain(dBi)		Cable Loss (dBi)		Net Gain (dBi)		Cable Length (mm)
	WLAN 2.4GHz /BT	WLAN 5GHz					WLAN 2.4GHz /BT	WLAN 5GHz	WLAN 2.4GHz /BT	WLAN 5GHz	WLAN 2.4GHz /BT	WLAN 5GHz	
21	1/2	-	KWANG HYUN AIRTECH	KH-WFDI-AN001	PIFA	I-PEX	4	2.8	0.6	1.2	3.4	1.6	160
22	-	-	KWANG HYUN AIRTECH	KH-WFDI-AN002	PIFA	I-PEX	4	2.8	0.7	1.3	3.3	1.5	210
23	-	-	KWANG HYUN AIRTECH	KH-WFDI-AN004	PIFA	I-PEX	3.6	2.1	1.5	2.7	2.1	-0.6	470
24	-	-	KWANG HYUN AIRTECH	KH-WFDI-AN005	PIFA	I-PEX	3.5	2.1	1.2	1.9	2.3	0.2	400
25	-	-	KWANG HYUN AIRTECH	KH-WFDI-AN006	PIFA	I-PEX	3.5	2.1	2.3	4	1.2	-1.9	810
26	-	-	KWANG HYUN AIRTECH	KH-WFDI-AN007	PIFA	I-PEX	2.6	2.1	1.2	1.9	1.4	0.2	384
27	-	-	KWANG HYUN AIRTECH	KH-WFDI-AN008	PIFA	I-PEX	3.5	2.1	1.2	1.9	2.3	0.2	400

Note1: Directional gain information

Maximum Output Power	Power Spectral Density
Directional gain = Max.gain + array gain. For power measurements on IEEE 802.11 devices Array Gain = 0 dB (i.e., no array gain) for N ANT ≤ 4	$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$

Ex.

Directional Gain (NSS1) formula :

$$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

NSS1(g1,1) = 10^{G1/20} ; NSS1(g1,2)= 10^{G2/20}.

g_{j,k}=(Nss1(g1,1) + Nss1(g1,2))²

DG = 10 log[(Nss1(g1,1) + Nss1(g1,2))² / N_{ANT}] => 10 log[(10^{G1/20} + 10^{G2/20})² / N_{ANT}]

Where ;

2.4G G1 = 3.40 dBi; G2 = 3.40 dBi; DG = 6.41 dBi

5G G1 = 3.35 dBi; G2 = 3.35 dBi; DG = 6.36 dBi

Note2: The above information was declared by manufacturer.

Note3 : The EUT has two type antennas.

Dipole Antenna collocate with 16 antennas selling.

PIFA Antenna collocate with 11 antennas selling.

The highest gain: "Ant.21" for WLAN 2.4GHz/BT & "Ant.6" for WLAN 5GHz were selected to perform the test.



<WLAN 2.4GHz function>

For IEEE 802.11b/g/n/VHT/ax (2TX/2RX):

Port 1, Port 2 can be used as transmitting/receiving antenna.

Port 1, Port 2 could transmit/receive simultaneously.

<WLAN 5GHz function>

For IEEE 802.11a/n/ac/ax mode (2TX/2RX)

Port 1, Port 2 can be used as transmitting/receiving antenna.

Port 1, Port 2 could transmit/receive simultaneously.

<Bluetooth function> (1TX/1RX):

Port 1 can be used as transmitting/receiving antenna.

Port 1 could transmit/receive simultaneously.

1.3 Accessories

N/A

1.4 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ 47 CFR Part 2.1091
- ♦ KDB 447498 D04 Interim General RF Exposure Guidance v01

The following reference test guidance is not within the scope of accreditation of TAF.

- ♦ 47 CFR Part 1.1307
- ♦ 47 CFR Part 1.1310

1.5 Testing Location

Testing Location Information	
Test Lab. : Sporton International Inc. Hsinchu Laboratory	
Hsinchu	ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)
(TAF: 3787)	TEL: 886-3-656-9065 FAX: 886-3-656-9085
	Test site Designation No. TW3787 with FCC.
	Conformity Assessment Body Identifier (CABID) TW3787 with ISED.



2 Maximum Permissible Exposure

2.1 Limit of Maximum Permissible Exposure

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
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

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
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

Note: f = frequency in MHz ; *Plane-wave equivalent power density

2.2 MPE Calculation Method

The MPE was calculated at 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d}$$

$$\text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric field (V/m)

P = RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$



2.3 MPE Exemption

Option (A): 1.1307(b)(3)(i)(A): Available maximum time-averaged power is < 1 mW

Option (B): 1.1307(b)(3)(i)(B): Device operates between 300 MHz and 6 GHz and the maximum time-averaged power or effective radiated power (ERP), whichever is greater, <= Pth.

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

Option (C): 1.1307(b)(3)(i)(C): ERP is below a threshold calculated based on the distance R between the person and the antenna / radiating structure, where $R > \lambda / 2 \pi$.

Single RF Sources Subject to Routine Environmental Evaluation	
RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	1,920 R ² .
1.34-30	3,450 R ² /f ² .
30-300	3.83 R ² .
300-1,500	0.0128 R ² f.
1,500-100,000	19.2R ² .
Note: R is in meters, f is in MHz.	



2.4 Calculated Result and Limit

Exposure Environment: General Population / Uncontrolled Exposure

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm ²)	S Limit (mW/cm ²)
2.4G;D1D	3.40	22.52	25.92	0.50	26.42	0.43853	20	0.08724	1.00000
5.2G;D1D	3.35	20.25	23.60	0.50	24.10	0.25704	20	0.05114	1.00000
5.3G;D1D	3.35	19.54	22.89	0.50	23.39	0.21827	20	0.04342	1.00000
5.6G;D1D	3.35	22.98	26.33	0.50	26.83	0.48195	20	0.09588	1.00000
5.8G;D1D	3.35	23.83	27.18	0.50	27.68	0.58614	20	0.11661	1.00000
2.4G;BT-EDR	3.40	6.55	9.95	0.50	10.45	0.01109	20	0.00221	1.00000
2.4G;BT-LE	3.40	6.32	9.72	0.50	10.22	0.01052	20	0.00209	1.00000

MPE Exemption Option B						
Frequency (MHz)	R (m)	Tune-up EIRP (dBm)	Tune-up ERP (dBm)	Tune-up ERP (W)	ERP Threshold (W)	MPE Exemption
2437	0.2	26.42	24.27	0.267	3.060	Complies
5755		27.68	25.53	0.357	3.060	Complies
2480		10.45	8.30	0.007	3.060	Complies

Simultaneous Transmission Analysis Mode: WLAN 2.4GHz+Bluetooth

Simultaneous Transmissions Option B							
Frequency (MHz)	R (m)	Tune-up EIRP (dBm)	Tune-up ERP (dBm)	Tune-up ERP (W)	ERP Threshold (W)	Simultaneous Transmissions	Simultaneous Transmissions Limit
2437	0.2	26.42	24.27	0.267	3.060	0.09	<= 1
2480		10.45	8.30	0.007	3.060		

Simultaneous Transmission Analysis Mode: WLAN 5GHz+Bluetooth

Simultaneous Transmissions Option B							
Frequency (MHz)	R (m)	Tune-up EIRP (dBm)	Tune-up ERP (dBm)	Tune-up ERP (W)	ERP Threshold (W)	Simultaneous Transmissions	Simultaneous Transmissions Limit
5755	0.2	27.68	25.53	0.357	3.060	0.09	<= 1
2480		10.45	8.30	0.007	3.060		