



# RADIO EXPOSURE TEST REPORT

**FCC ID** : Z3WAIR4985  
**Equipment** : Wi-Fi 6E Smart Mesh System  
**Brand Name** : Airties  
**Model Name** : Air 4985  
**Applicant** : Airties Wireless Networks  
Sehit Mehmet Mikdat Uluunlu Sokagi No:23  
Esentepe, Sisli İstanbul, 34394 Turkey  
**Manufacturer** : Airties Wireless Networks  
Sehit Mehmet Mikdat Uluunlu Sokagi No:23  
Esentepe, Sisli İstanbul, 34394 Turkey  
**Standard** : 47 CFR Part 2.1091

The product was received on Aug. 19, 2022, and testing was started from Aug. 24, 2022 and completed on Oct. 06, 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 variant 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**

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### Photographs of EUT v01



### History of this test report

Report No.	Version	Description	Issued Date
FA281911-03	01	Initial issue of report	Jun. 14, 2023



## Summary of Test Result

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

**Conformity Assessment Condition:**

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacture who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. The measurement uncertainty please refer to each test result in the chapter "Measurement Uncertainty".

**Disclaimer:**

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

**Reviewed by: Sam Chen**

**Report Producer: Viola Huang**



# 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) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
5GHz WLAN	5150-5250 5250-5350 5470-5725 5725-5850	5180-5250 5250-5320 5500-5720 5745-5825	802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
6GHz WLAN	5925-7125	5955-7115	802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)

SW version	4.144.8.0_wltest
HW version	PCB-4985-D01-M01-R03



### 1.2 Antenna Information

Ant.	Port			Brand	Model Name	Antenna Type	Connector	Gain (dBi)
	WLAN 2.4GHz	WLAN 5GHz	WLAN 6GHz					
1	1	-	1	AirTies	ANT A00	PCB	N/A	Note1
2	2	-	2	AirTies	ANT A11	PCB	N/A	
3	-	1	-	AirTies	ANT A0X	PCB	N/A	
4	-	2	-	AirTies	ANT A1X	PCB	N/A	
5	-	3	-	AirTies	ANT A2X	PCB	N/A	
6	-	4	-	AirTies	ANT A3X	PCB	N/A	

Note1:

<Antenna Gain>

Ant.	Port			Antenna Gain (dBi)								
	WLAN 2.4GHz	WLAN 5GHz	WLAN 6GHz	WLAN 2.4GHz	WLAN 5GHz				WLAN 6GHz			
					UNII 1	UNII 2A	UNII 2C	UNII 3	UNII 5	UNII 6	UNII 7	UNII 8
1	1	-	1	4.21	-	-	-	-	1.32	1.46	1.76	2.61
2	2	-	2	4.42	-	-	-	-	1.62	1.98	2.47	2.12
3	-	1	-	-	3.49	3.27	2.85	2.09	-	-	-	-
4	-	2	-	-	3.58	2.61	4.52	2.72	-	-	-	-
5	-	3	-	-	2.41	2.6	3.51	5.47	-	-	-	-
6	-	4	-	-	4.45	4.89	4.53	4.93	-	-	-	-

< Directional Gain>

Directional Gain (dBi)									
Item	WLAN 2.4GHz	WLAN 5GHz				WLAN 6GHz			
		UNII 1	UNII 2A	UNII 2C	UNII 3	UNII 5	UNII 6	UNII 7	UNII 8
2T1S	4.52	-	-	-	-	3.75	3.57	4.12	4.26
4T1S	-	4.57	4.92	5.39	5.58	-	-	-	-

Note 2: The above information (except gain) was declared by manufacturer.

The directional gain is measured which follows the procedure of KDB 662911 D03.

Note 3: The EUT has six antennas.:

**For 2.4GHz function:**

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

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

Port 1 and Port 2 could transmit/receive simultaneously.

**For 5GHz function:**

**For 802.11a/n/ac/ax (4TX/4RX):**

Port 1, Port 2, Port 3 and Port 4 can be used as transmitting/receiving antenna.

Port 1, Port 2, Port 3 and Port 4 could transmit/receive simultaneously.

**For 6GHz function:**

**For 802.11ax (2TX/2RX):**

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

Port 1 and Port 2 could transmit/receive simultaneously.



### 1.3 Accessories

<b>Accessories</b>			
<b>Equipment Name</b>	<b>Brand Name</b>	<b>Model Name</b>	<b>Rating</b>
Adapter 1	MOSO	MS-V2000R120-024H0-US	Input: 100-240V~50/60Hz, 0.7A max. Output: 12.0V, 2.0A
Adapter 2	NetBit	NBS24M120200VU	Input: 100-120V~50/60Hz, 0.6A Output: 12.0V, 2.0A
<b>Others</b>			
RJ-45 cable*1: Non-shielded, 1.5m			

### 1.4 Table for EUT supports functions

<b>Function</b>	<b>Support Band</b>
AP Router	WLAN 2.4GHz, WLAN 5GHz UNII 1~3 and WLAN 6GHz UNII 5~8
Mesh	WLAN 5GHz UNII 1~3 and WLAN 6GHz UNII 5~8

Note : The above information was declared by manufacturer.



### 1.5 Table for Permissive Change

This product is an extension of original one reported under Sporton project number: FA281911. Below is the table for the change of the product with respect to the original one.

Modifications	Performance Checking
<ol style="list-style-type: none"> <li>1. Adding one adapter model name: NBS24M120200VU</li> <li>2. PCB layout and P/N changed from PCB-4985-D01-M01-R02 to PCB-4985-D01-M01-R03 PCB layout and P/N changed from PCB-4985-D01-M01-R02 to PCB-4985-D01-M01-R03.</li> <li>3. Layout change for adding capacitors new brand: Richtek, model NO. RT6278BHGQUF, and change power inductor, old brand: TAI-TECH, model No : TMPF0402LR-1R2MN-ABD, new brand: MAGLAYERS, model NO: MNR-8040-2R0N-CP.</li> <li>4. Layout changed for 3.3V DC switcher.</li> <li>5. Layout change for new DC switcher design , power inductor changed, old brand: Chilisin, model NO. BMMA000606301R2MX1, new brand : MAGLAYERS, model No. MNR-8040-1R4M-BL.</li> <li>6. Layout change for new 5V DC switcher design</li> <li>7. The RJ45 connector changed, The old Part Number: SK01-G110060NL ,brand: CSAK, and the new part number is SK01-G110067NL, brand: CSAK.</li> <li>8. MLCCs have been added to CPU Core regulator output and Radio IC Core regulator output according to Broadcom suggestion.( C1091, C1092,C1094). Brand : Taiyo Yuden , model No: JMK107BC6106MA-T.</li> <li>9. Reserved MLCCs have been added according to 1.8V power rail measurements, brand :Yageo , model NO. : CC0402KRX5R6BB104.</li> <li>10. JTAG_SEL function of the Radio IC has been cancelled, and the component at position R178 has been removed.</li> <li>11. 6 GHZ Co-existence filters have been removed (by passed) from 5G RX Chains (FL1, FL4, FL7, FL10).</li> <li>12. Co-existence filters have been removed(by passed) from 2.4G RX Chains (U17, U19).</li> <li>13. MLCC capacitor packages have been removed for 6G &amp; 5G FEM supply circuitry, the placement is C412, C384, C356, C328.</li> </ol>	<p>Do not have to retest assessed.</p>

Note: RF Exposure Evaluation of 2.4GHz, 5GHz and 6GHz Band are based on original test report.





## 1.6 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

## 1.7 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 <sup>2</sup> )	Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes)
0.3-3.0	614	1.63	*(100)	<6
3.0-30	1842/f	4.89/f	*(900/f <sup>2</sup> )	<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 <sup>2</sup> )	Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes)
0.3-1.34	614	1.63	*(100)	<30
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	<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 45 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \qquad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

**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 <sup>2</sup> .
1.34-30	3,450 R <sup>2</sup> /f <sup>2</sup> .
30-300	3.83 R <sup>2</sup> .
300-1,500	0.0128 R <sup>2</sup> f.
1,500-100,000	19.2R <sup>2</sup> .

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 <sup>2</sup> )	S Limit (mW/cm <sup>2</sup> )
2.4G;G1D	4.42	27.45	31.87	0.50	32.37	1.72584	45	0.06782	1.00000
5.2G;D1D	4.57	29.91	34.48	0.50	34.98	3.14775	45	0.12370	1.00000
5.3G;D1D	4.92	23.95	28.87	0.50	29.37	0.86497	45	0.03399	1.00000
5.6G;D1D	5.39	23.94	29.33	0.50	29.83	0.96161	45	0.03779	1.00000
5.8G;D1D	5.58	29.97	35.55	0.44	35.99	3.97192	45	0.15608	1.00000
6.2G;D1D	3.75	-	26.97	0.50	27.47	0.55847	45	0.02195	1.00000
6.4G;D1D	3.57	-	25.89	0.50	26.39	0.43551	45	0.01711	1.00000
6.7G;D1D	4.12	-	26.97	0.50	27.47	0.55847	45	0.02195	1.00000
7.0G;D1D	4.26	-	25.76	0.50	26.26	0.42267	45	0.01661	1.00000

MPE Exemption Option C							
Frequency (MHz)	$\lambda/2\pi$ (m)	R (m)	Tune-up EIRP (dBm)	Tune-up ERP (dBm)	Tune-up ERP (W)	ERP Threshold (W)	MPE Exemption
2437	0.0196	0.45	32.37	30.22	1.052	3.888	Complies
5755	0.0083		35.99	33.84	2.421	3.888	Complies
6185	0.0077		27.47	25.32	0.340	3.888	Complies

Simultaneous Transmission Analysis Mode: WLAN 2.4GHz + WLAN 5GHz + WLAN 6GHz

Simultaneous Transmissions Option C							
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	0.45	32.37	30.22	1.052	3.888	0.98	<= 1
5755		35.99	33.84	2.421	3.888		
6185		27.47	25.32	0.340	3.888		

—THE END—