



RADIO EXPOSURE TEST REPORT

FCC ID : RAXCR1000B
Equipment : Verizon Router
Brand Name : Verizon
Model Name : CR1000B
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 Dec. 14, 2021, and testing was started from Dec. 14, 2021 and completed on Jun. 07, 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

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History of this test report

TEL : 886-3-656-9065
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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) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
5GHz WLAN	5150-5250 5250-5350 5470-5725 5725-5850	5180-5250 5250-5320 5500-5700 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	5955-7095	802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)

1.2 Antenna Information

Ant.	Port				Brand	P/N	Antenna Type	Connector	Gain (dBi)
	WLAN 2.4GHz	WLAN 5GHz		WLAN 6GHz					
		UNII1~3	DFS UNII2A~2C						
1	1	4	-	-	Arcadyan	120800098100J	PCB Antenna	I-PEX	Note1
2	2	3	-	-	Arcadyan	120800098200J	PCB Antenna	I-PEX	
3	3	2	-	-	Arcadyan	120800098300J	PCB Antenna	I-PEX	
4	4	1	-	-	Arcadyan	120800098400J	PCB Antenna	I-PEX	
5	-	-	-	1	Arcadyan	120800098700J	PCB Antenna	I-PEX	
6	-	-	-	2	Arcadyan	120800098800J	PCB Antenna	I-PEX	
7	-	-	-	3	Arcadyan	120800098500J	PCB Antenna	I-PEX	
8	-	-	-	4	Arcadyan	120800098600J	PCB Antenna	I-PEX	
9	-	-	1	-	Arcadyan	120800104000J	PCB Antenna	I-PEX	

Note1:

<Antenna Gain>

Ant.	Port				Gain (dBi)							
	WLAN 2.4GHz	WLAN 5GHz		WLAN 6GHz	WLAN 2.4GHz	WLAN 5GHz		WLAN 6GHz				
		UNII1~3	DFS UNII2A~2C			UNII1~3	DFS UNII2A~2C	UNII 5	UNII 6	UNII 7	UNII 8	
1	1	4	-	-	1.8	2.6	-	-	-	-	-	
2	2	3	-	-	3.2	2.3	-	-	-	-	-	
3	3	2	-	-	2.8	3.5	-	-	-	-	-	
4	4	1	-	-	3.8	2.5	-	-	-	-	-	
5	-	-	-	1	-	-	-	4.18	3.86	2.19	3.24	
6	-	-	-	2	-	-	-	4.96	4.19	3.17	3.19	
7	-	-	-	3	-	-	-	3.47	3.24	3.40	3.06	
8	-	-	-	4	-	-	-	4.13	3.66	2.47	2.73	
9	-	-	1	-	-	-	3.8	-	-	-	-	

<For WLAN 6GHz Directional Gain>

Directional Gain (dBi)				
Item	WLAN 6GHz UNII 5	WLAN 6GHz UNII 6	WLAN 6GHz UNII 7	WLAN 6GHz UNII 8
4T1S	5.46	5.09	5.36	4.97

Note2: The above information (excepting WLAN 6GHz antenna gain) was declared by manufacturer.

Note3: WLAN 6GHz directional gain is measured which follows the procedure of KDB 662911 D03.

The antenna report is provided in the operational description for this application.

Note4: The antenna 9 which has the receiving function only is used for zero wait or interference detection.

Note5: The EUT has nine antennas.

<WLAN 2.4GHz function>

For IEEE 802.11b/g/n/ax (4TX/4RX):

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

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

<WLAN 5GHz function>

UNII1~3

For IEEE 802.11a/n/ac/ax mode (4TX/4RX)

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

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

UNII 2A~2C DFS Band

Only Port 1 can receive

<WLAN 6GHz function>
For IEEE 802.11ax mode (4TX/4RX)

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

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

Note6:

<For WLAN 2.4GHz and WLAN 5GHz Directional Gain>

Type	Maximum Output Power	Power Spectral Density
Non-BF	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	$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{ANT}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$
BF	$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{ANT}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$	$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{ANT}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$

Ex.

Directional Gain (NSS1) formula :

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

$$NSS1(g1,1) = 10^{G1/20} ; NSS1(g1,2) = 10^{G2/20} ; NSS1(g1,3) = 10^{G3/20} ; NSS1(g1,4) = 10^{G4/20}$$

$$g_{j,k} = (NSS1(g1,1) + NSS1(g1,2) + NSS1(g1,3) + NSS1(g1,4))^2$$

$$DG = 10 \log[(NSS1(g1,1) + NSS1(g1,2) + NSS1(g1,3) + NSS1(g1,4))^2 / N_{ANT}] \Rightarrow 10$$

$$\log[(10^{G1/20} + 10^{G2/20} + 10^{G3/20} + 10^{G4/20})^2 / N_{ANT}]$$

Where ;

G1 = Ant 1 Gain ; G2 = Ant 2 Gain ; G3 = Ant 3 Gain ; G4 = Ant 4 Gain ;

2.4GHz DG = 8.95 dBi

5 GHz U-NII-1 DG = 8.76 dBi

5 GHz U-NII-2A DG = 8.76 dBi

5 GHz U-NII-2C DG = 8.76 dBi

5 GHz U-NII-3 DG = 8.76 dBi



1.3 Accessories

Accessories				
No.	Equipment Name	Brand Name	Model Name	Rating
1	Adapter	LUCENT TRANS	1A98-1250-02	INPUT: 100-120V~1.6A, 50-60Hz OUTPUT: 12.0V, 5.0A, 60.0W
Others				
RJ-45 cable*1: Non-shielded, 2m				

1.4 Table for EUT Information

External Type of EUT	Color of tick	Position of tick	Remark
1	Gray	In the middle of the case	The internal of the EUT is identical.
2	Red	The lower right of the case	

Note: The above information was declared by manufacturer.

1.5 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

1.6 Testing Location

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



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 52 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

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

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	$19.2 R^2$.
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	8.95	27.02	35.97	0.02	35.99	3.97192	52	0.11689	1.00000
5.2G;D1D	8.76	27.06	35.82	0.17	35.99	3.97192	52	0.11689	1.00000
5.3G;D1D	8.76	21.19	29.95	0.04	29.99	0.99770	52	0.02936	1.00000
5.6G;D1D	8.76	21.18	29.94	0.05	29.99	0.99770	52	0.02936	1.00000
5.8G;D1D	8.76	27.18	35.94	0.05	35.99	3.97192	52	0.11689	1.00000
6.2G;D1D	5.46	20.52	25.98	0.50	26.48	0.44463	52	0.01309	1.00000
6.4G;D1D	4.19	17.47	21.66	0.50	22.16	0.16444	52	0.00484	1.00000
6.7G;D1D	5.36	20.94	26.30	0.50	26.80	0.47863	52	0.01409	1.00000
7.0G;D1D	4.97	20.44	25.41	0.50	25.91	0.38994	52	0.01148	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	0.52	36.00	33.85	2.427	5.192	Complies
5785	0.0082		35.96	33.81	2.404	5.192	Complies
6665	0.0072		26.35	24.20	0.263	5.192	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	0.52	36.00	33.85	2.427	5.192	0.98	<= 1
5785		35.96	33.81	2.404	5.192		
6345		26.35	24.20	0.263	5.192		