RF Exposure Evaluation Declaration

FCC ID:	2BBYQPCWL-0510
Applicant:	PicoCELA Inc
Product:	WiFi 6 (802.11ax) 4×4 MU-MIMO Tri Band Access point
Model No.:	PCWL-0510
Brand Name:	PicoCELA
FCC Classification:	Digital Transmission System (DTS) Unlicensed National Information Infrastructure (NII)
FCC Rule Part(s):	FCC Part 2.1091
Test Procedure(s):	KDB 447498 D04v01

Reviewed By: Jame Yuan

Approved By: Robin Wu

Revision History

Report No.	Version	Description	Issue Date	Note
2305RSU028-U4	V01	Initial Report	2023-07-25	Valid

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1. General Information

1.1. Applicant

PicoCELA Inc

2-34-5 Nihonbashi Ningyo-cho Chuo-ku Tokyo 103-0013 JAPAN

1.2. Manufacturer

PicoCELA Inc

2-34-5 Nihonbashi Ningyo-cho Chuo-ku Tokyo 103-0013 JAPAN

1.3. Testing Facility

☒	**Test Site – MRT Suzhou Laboratory**
	Laboratory Location (Suzhou - Wuzhong) D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China **Laboratory Location (Suzhou - SIP)** 4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China
	Laboratory Accreditations
	A2LA: 3628.01 CNAS: L10551 FCC: CN1166 ISED: CN0001 VCCI: ☐R-20025 ☐G-20034 ☐C-20020 ☐T-20020 ☐R-20141 ☐G-20134 ☐C-20103 ☐T-20104
☐	**Test Site – MRT Shenzhen Laboratory**
	Laboratory Location (Shenzhen) 1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China
	Laboratory Accreditations
	A2LA: 3628.02 CNAS: L10551 FCC: CN1284 ISED: CN0105
☐	**Test Site – MRT Taiwan Laboratory**
	Laboratory Location (Taiwan) No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)
	Laboratory Accreditations
	TAF: L3261-190725 FCC: 291082, TW3261 ISED: TW3261

1.4. Product Information

Product Name	WiFi 6 (802.11ax) 4×4 MU-MIMO Tri Band Access point
Model No.	PCWL-0510
Wi-Fi Specification	802.11a/b/g/n/ac/ax
Antenna Information	Refer to Section 1.5
Power Supply	AC/DC Adapter or PoE Adapter
Accessories	
AC/DC Adapter	Model: PSAC60W-120 Input: 100-240V, 1.6A Output: 12V, 5A
Note 1: The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer. Note 2: AC/DC Adapter was not sold with the product.	

1.5. Antenna Details

Antenna Type	Frequency Band (MHz)	T_X Paths	Max Antenna Gain (dBi)	Directional Gain (dBi)		Beamforming Directional Gain (dBi)
				For Power	For PSD	
Wi-Fi Antenna 1# (Model No.: PIC04-220080(AP))						
Omni-Directional	2400 ~ 2500	4	4.50	4.50	10.52	10.52
Omni-Directional	5150 ~ 5875	4	7.00	7.00	13.02	13.02
Wi-Fi Antenna 2# (Model No.: SAA04-222060)						
Directional Panel	2400 ~ 2500	4	13.50	13.50	19.52	19.52
Directional Panel	5150 ~ 5875	4	15.50	15.50	21.52	21.52

2. RF Exposure Evaluation

2.1. Test Limits

According to §1.1310: 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 §1.1307(b)

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time (Minutes)
(A) Limits for Occupational/ Control 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
300-1,500	--	--	f/300	<6
1,500-100,000	--	--	5	<6
(B) Limits for General Population/ Uncontrolled Exposures				
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
300-1,500	--	--	f/1500	<30
1,500-100,000	--	--	1.0	<30

f= frequency in MHz. * = Plane-wave equivalent power density.

2.2. Test Exemptions

For single RF sources (i.e., any single fixed RF source, mobile device, or portable device, as defined in paragraph §1.1307(b)(2) of this section): A single RF source is exempt if:

(Option A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph §1.1307(b)(3)(ii)(A) of this section.
Medical implant devices may only use this exemption and that in paragraph §1.1307(b)(3)(ii)(A);

(Option B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P is given by:

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

Where

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

and

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

d = the separation distance (cm);

(Option C) Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least λ/2π, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of λ/4 or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

Table 1 to §1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source Frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1920R^2$
1.34-30	$3450R^2/f^2$
30-300	$3.83R^2$
300-1,500	$0.0128R^2/f$
1,500-100,000	$19.2R^2$

For multiple RF sources: Multiple RF sources are exempt if:

(A) The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required). This exemption may not be used in conjunction with other exemption criteria other than those is paragraph §1.1307(b)(3)(i)(A) of this section. Medical implant devices may only use this exemption and that in paragraph §1.1307(b)(3)(i)(A).

(B) in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^{a} \frac{P_i}{P_{th,i}} + \sum_{j=1}^{b} \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^{c} \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

Where:

a = number of fixed, mobile, or portable RF sources claiming exemption using paragraph §1.1307(b)(3)(i)(B) of this section for P_{th}, including existing exempt transmitters and those being added.

b = number of fixed, mobile, or portable RF sources claiming exemption using paragraph §1.1307(b)(3)(i)(C) of this section for Threshold ERP, including existing exempt transmitters and those being added.

c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.

$\boldsymbol{P_i}$ = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source *i* at a distance between 0.5 cm and 40 cm (inclusive).

$\boldsymbol{P_{th,i}}$ = the exemption threshold power (P_{th}) according to paragraph §1.1307(b)(3)(i)(B) of this section for fixed, mobile, or portable RF source *i*.

ERP$_j$ = the ERP of fixed, mobile, or portable RF source *j*.

ERP$_{th,j}$ = exemption threshold ERP for fixed, mobile, or portable RF source *j*, at a distance of at least λ/2π according to the applicable formula of paragraph §1.1307(b)(3)(i)(C) of this section.

Evaluated$_k$ = the maximum reported SAR or MPE of fixed, mobile, or portable RF source *k* either in the device or at the transmitter site from an existing evaluation at the location of exposure.

Exposure Limit$_k$ = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source *k*, as applicable from §1.1310 of this chapter.

2.3. Test Result

Product	WiFi 6 (802.11ax) 4×4 MU-MIMO Tri Band Access point
Test Item	RF Exposure Evaluation

Test Mode	Frequency Band (MHz)	Max. Conducted Power (dBm)	Antenna Gain (dBi)	Max EIRP (dBm)	Max ERP (dBm)	Max. Tune-up ERP (dBm)
Antenna 1#						
802.11b/g/n/ax	2412 ~ 2462	29.02	4.50	33.52	31.37	32
802.11a/n/ac/ax	5180 ~ 5825	27.76	7.00	34.76	32.61	33
Antenna 2#						
802.11b/g/n/ax	2412 ~ 2462	22.37	13.50	35.87	33.72	34
802.11a/n/ac/ax	5180 ~ 5825	20.35	15.50	35.85	33.70	34

Note:

1. The level of max power was from RF report 2305RSU028-U1 and 2305RSU028-U2.
2. Tune-up power declared by manufacturer.
3. The ERP of beamforming mode is lower than CDD mode, so only CDD mode showed in this report.

***For multiple RF sources*，Option C**

Frequency (MHz)	Max ERP (Watts)	λ / 2 π (cm)	R (cm)	Threshold ERP (Watts)
2412 ~ 2462	2.512	1.98	55	5.808
5180 ~ 5825	2.512	0.92	55	5.808

Note: R is from user manual.

For multiple RF sources

The EUT supports Wi-Fi 2.4GHz + Wi-Fi 5GHz simultaneous transmissions.

So the Max Simultaneous Transmission =2.512 / 5.808 + 2.512 / 5.808 = 0.865 < 1

CONCLUSION:

Therefore, the device qualifies for RF exposure test exemption.

The End