

RF Exposure Evaluation Declaration

FCC ID : 2AXJ4AIRR5
Applicant : TP-Link Corporation Limited
Application Type : Certification
Product : AX3000 Wi-Fi 6 Air Router
Model No. : Archer Air R5
Brand Name : tp-link
FCC : Digital Transmission System (DTS)
Classification : Unlicensed National Information Infrastructure (NII)
Received Date : February 24, 2023

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Approved By : *Chenz Ker*
(Chenz Ker)



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standards through the calibration of the equipment and evaluated measurement uncertainty herein.

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Revision History

Report No.	Version	Description	Issue Date	Note
2302TW0116-U5	1.0	Original Report	2023-10-18	Valid

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General Information

Applicant	TP-Link Corporation Limited
Applicant Address	Room 901, 9/F., New East Ocean Centre, 9 Science Museum Road, Tsim Sha Tsui, Kowloon, Hongkong
Manufacturer	TP-Link Corporation Limited
Manufacturer Address	Room 901, 9/F., New East Ocean Centre, 9 Science Museum Road, Tsim Sha Tsui, Kowloon, Hongkong
Test Site	MRT Technology (Taiwan) Co., Ltd
Test Site Address	No. 38, Fuxing Second Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C)
MRT FCC Registration No.	291082

Test Facility / Accreditations

1. MRT facility is a FCC registered (Reg. No. 291082) test facility with the site description report on file and is designated by the FCC as an Accredited Test Firm.
2. MRT facility is an IC registered (MRT Reg. No. 21723) test laboratory with the site description on file at Industry Canada.
3. MRT Lab is accredited to ISO 17025 by the Taiwan Accreditation Foundation (TAF Cert. No. 3261) in EMC, Telecommunications and Radio testing for FCC (Designation Number: TW3261), Industry Canada, EU and TELEC Rules.

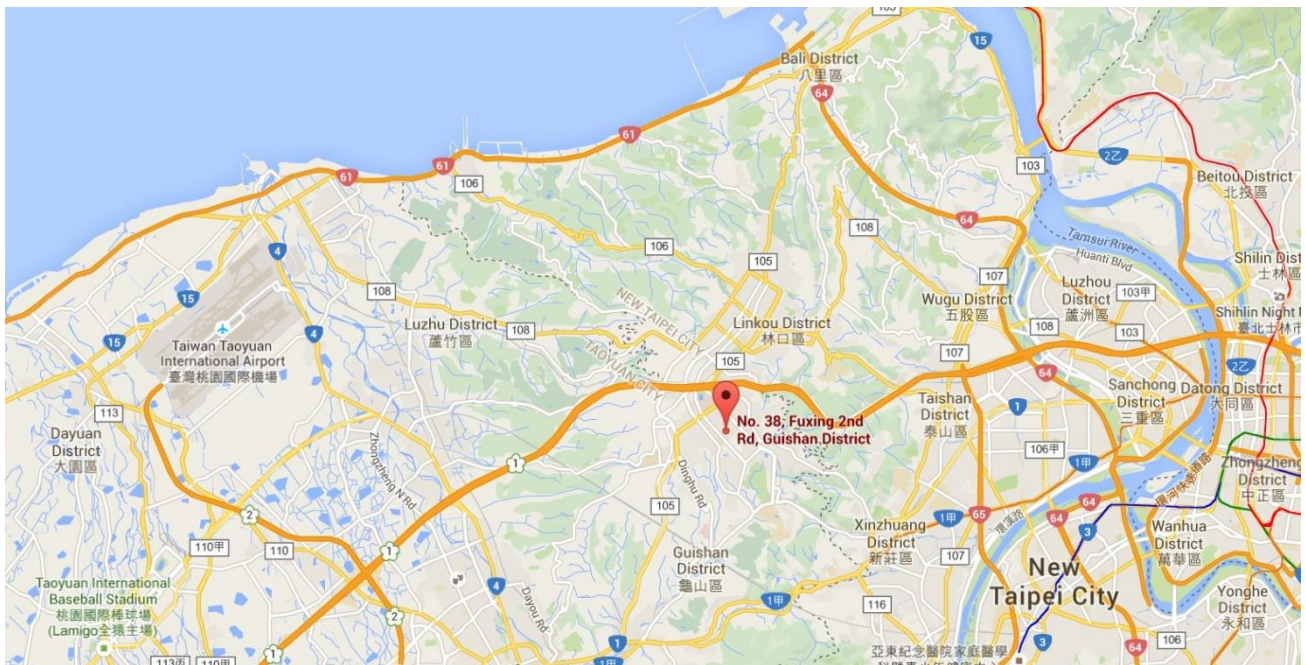
1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada and Certification and Engineering Bureau.

1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taoyuan City. These measurement tests were conducted at the MRT Technology (Taiwan) Co., Ltd. Facility located at No.38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 33377, Taiwan (R.O.C).



2. PRODUCT INFORMATION

2.1. Feature of Equipment under Test

Product Name:	AX3000 Wi-Fi 6 Air Router
Model No.:	Archer Air R5
Brand Name:	tp-link
Wi-Fi Specification:	802.11a/b/g/n/ac/ax
Accessory	
Adapter	MODEL: T120200-2B7 INPUT: 100 - 240V ~ 50/60Hz 0.8A. OUTPUT: DC 12.0V 2.0A DC 5.0 2.0A

2.2. Description of Available Antennas

Antenna Type	Frequency Band (MHz)	Tx Paths	Max Antenna Gain (dBi)	Beamforming Directional Gain (dBi)	CDD Directional Gain (dBi)	
					For Power	For PSD
Wi-Fi 2.4G						
Dipole	2412 ~ 2462	2	2.00	5.01	2.00	5.01
Wi-Fi 5G (Horizontal Antenna)						
Dipole	5150 ~ 5250	2	1.27	4.28	1.27	4.28
	5250 ~ 5350	2	1.66	4.67	1.66	4.67
	5470 ~ 5850	2	2.50	5.51	2.50	5.51
Wi-Fi 5G (Vertical Antenna)						
Dipole	5150 ~ 5250	2	2.05	5.06	2.05	5.06
	5250 ~ 5350	2	1.56	4.57	1.56	4.57
	5470 ~ 5850	2	2.50	5.51	2.50	5.51

Notes:

1. The EUT supports Cyclic Delay Diversity (CDD) mode, and CDD signals are correlated.

If all antennas have the same gain, G_{ANT} , Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows.

- For power spectral density (PSD) measurements on all devices,

$$\text{Array Gain} = 10 \log (N_{ANT} / N_{SS}) \text{ dB};$$

- For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB for $N_{ANT} \leq 4$;

2. The EUT also supports Beam Forming mode, and the Beam Forming support 802.11ac/ax, not include 802.11a/b/g/n. BF Directional gain = $G_{ANT} + 10 \log(N_{ANT})$.
3. Horizontal antenna and Vertical antenna do not support simultaneous transmissions.
4. The Messages as above is from the antenna specifications.

Test Mode	T _x Paths	CDD Mode	Beamforming Mode
802.11b/g/n (DTS)	2	√	X
802.11ax (DTS)	2	√	√
802.11a/n (NII)	2	√	X
802.11ac/ax (NII)	2	√	√

Note: "√" means "Support", "X" means "Not support".

3. RF Exposure Evaluation

3.1. Limits

According to FCC 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				
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/ Uncontrolled Exposures				
300-1500	--	--	f/1500	6
1500-100,000	--	--	1	30

f= Frequency in MHz

Calculation Formula: $P_d = (P_{out} * G) / (4 * \pi * r^2)$

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, 1mW/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.

3.2. Test Result of RF Exposure Evaluation

Product	AX3000 Wi-Fi 6 Air Router
Test Item	RF Exposure Evaluation

Antenna Gain: Refer to clause 2.2.

Test Mode	Frequency Band (MHz)	Conducted Power (dBm)	Tune-up Power (dBm)	Directional Gain (dBi)	Tune-up EIRP (dBm)
Wi-Fi (DTS)	2412 ~ 2462	29.74	30.00	5.01	35.01
Wi-Fi (NII)-H Ant	5180 ~ 5850	27.66	28.16	5.51	33.67
Wi-Fi (NII)-V Ant	5180 ~ 5850	28.11	28.61	5.51	34.12

Note 1: Tune-up power was declared by manufacturer.

Note 2: Tune-up EIRP (dBm) = Tune-up Power (dBm) + Directional Gain (dBi)

For single RF source, Option C

Test Mode	$\lambda / 2 \pi$ (m)	R (m)	Tune-up Power (mW)	Tune-up ERP (mW)	Threshold ERP (mW)
Wi-Fi (DTS)	0.0198	0.43	1000.00	1932.0	3550.08
Wi-Fi (NII)-H Ant	0.0092	0.43	654.64	1419.1	3550.08
Wi-Fi (NII)-V Ant	0.0092	0.43	726.11	1574.0	3550.08

Note 1: R is from user manual.

Note 2: Tune-up Power (mW) = $10^{[\text{Tune-up Power (dBm)}/10]}$

Note 3: ERP (mW) = $10^{[(\text{Tune-up EIRP(dBm)}-2.15)/10]}$

For multiple RF sources

The EUT supports Wi-Fi 2.4GHz + Wi-Fi 5GHz (Horizontal Ant) or Wi-Fi 2.4GHz + Wi-Fi 5GHz (Vertical Ant) simultaneous transmissions.

So the Max Simultaneous Transmission = $1932.0/3550.08$ (DTS) + $1574.0/3550.08$ (NII) = 0.9876 < 1

Therefore, the device qualifies for RF exposure test exemption.

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