

RF Exposure Evaluation Declaration

FCC ID: 2AXJ4X50POE
Applicant: TP-Link Corporation Limited
Product: AX3000 Whole Home Mesh Wi-Fi 6 AP with PoE
Model No.: HX510-PoE
Brand Name: tp-link
FCC Classification: Digital Transmission System (DTS)
Unlicensed National Information Infrastructure (NII)
FCC Rule Part(s): FCC Part 2.1091
Result: Complies
Evaluation Date: 2023-09-16

Reviewed By:

Kevin Guo

Approved By:

Robin Wu



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.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
2308RSU061-U3	V01	Initial Report	2023-10-09	Invalid
2308RSU061-U3	V02	Correct a typo and add Wi-Fi 2.4G Antenna information	2023-10-10	Valid

Note: This report is prepared for FCC Class II permissive change supplement based on the FCC ID: 2AXJ4X50POE, original grant date: 11/14/2022 to open the NII-2a/-2c bands and Beamforming function at Wi-Fi 5GHz Bands via the software.

CONTENTS

Description	Page
1. General Information	4
1.1. Applicant.....	4
1.2. Manufacturer	4
1.3. Testing Facility.....	4
1.4. Product Information	5
1.5. Antenna Details.....	5
1.6. Device Classification	6
2. RF Exposure Evaluation.....	7
2.1. Limits	7
2.2. Calculated Result	8

1.4. Product Information

Product Name	AX3000 Whole Home Mesh Wi-Fi 6 AP with PoE
Model No.	HX510-PoE
Wi-Fi Specification	802.11a/b/g/n/ac/ax
Antenna Information	Refer to section 1.5
Power Supply	By Adapter
Accessory	
Adapter	Model: T120150-2B1 Input: 100-240V ~ 50/60Hz 0.6A Output: 12V 1.5A
Note: The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.	

1.5. Antenna Details

Antenna Type	Frequency Band (MHz)	Tx Paths	Antenna Gain (dBi)	Beamforming Directional Gain (dBi)	CDD Directional Gain (dBi)	
					For Power	For PSD
Dipole Antenna	2412 ~ 2462	2	1.97	--	1.97	4.98
	5150 ~ 5850	2	0.97	3.98	0.97	3.98

Remark:

- The EUT supports Cyclic Delay Diversity (CDD) mode, and CDD signals are correlated.
 If all antennas have the same gain, G_{ANT} , Directional gain = $G_{ANT} + \text{Array Gain}$, where Array Gain is as follows.
 - For power spectral density (PSD) measurements on all devices,
 Array Gain = $10 \log (N_{ANT} / N_{SS})$ dB;
 - For power measurements on IEEE 802.11 devices,
 Array Gain = 0 dB for $N_{ANT} \leq 4$;
- 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 = $G_{ANT} + 10 \log (N_{ANT})$.
- The information as above is from the antenna specifications.

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

802.11n/ac/ax (NII)	2	√	√
Note: "√" means "Support", "X" means "Not support".			

1.6. Device Classification

According to the user manual, this device is classified as a Mobile Device. So, the RF exposure evaluation requirements of § 2.1091 for mobile device exposure conditions subject to MPE limits.

2. RF Exposure Evaluation

2.1. 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, 1 mW/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.

2.2. Calculated Result

Product	AX3000 Whole Home Mesh Wi-Fi 6 AP with PoE
Test Item	RF Exposure

Test Mode	Frequency Band (MHz)	Tune-up Conducted Power (dBm)	Directional Gain (dBi)	Tune-up EIRP (dBm)
802.11b/g/n/ax	2412 ~ 2462	28.84	1.97	30.81
802.11a/n/ac/ax	5180 ~ 5825	26.93	3.98	30.91

Note:

1. Tune-up power was from the original grant.
2. Tune-up EIRP = Tune-up Conducted Power + Directional Gain.

For single RF source, Option B

Test Mode	R (m)	Tune-up Conducted Power (mW)	Tune-up ERP (mW)	Threshold ERP (mW)
Wi-Fi (DTS)	0.2	765.60	734.5	3060.00
Wi-Fi (NII)	0.2	493.17	751.6	3060.00

Note 1: R is from user manual.

Note 2: $ERP (mW) = 10^{[(Tune-up\ EIRP(dBm)-2.15)/10]}$

For multiple RF sources

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

So the Max Simultaneous Transmission = $765.6/3060$ (DTS) + $751.6/3060$ (NII) = $0.4958 < 1$

Therefore, the device qualifies for RF exposure test exemption.

_____ The End _____