



RF Exposure Evaluation Declaration

FCC ID: SFK-WF610
APPLICANT: CIG Shanghai Co., Ltd.

Application Type: Certification
Product: WF-610 2x2 dual band 802.11ac Outdoor AP
Model No.: WF-610
FCC Classification: Digital Transmission System (DTS)
Unlicensed National Information Infrastructure (UNII)

Reviewed By : Robin Wu
(Robin Wu)
Approved By : Marlinchen
(Marlin Chen)



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
1506RSU01304	Rev. 01	Initial report	08-19-2015

1. PRODUCT INFORMATION

1.1. Equipment Description

Product Name	WF-610 2x2 dual band 802.11ac Outdoor AP
Model No.	WF-610
Frequency Range	<p><u>For 2.4GHz Band:</u> 802.11b/g/n: 2412 ~ 2462 MHz</p> <p><u>For 5GHz Band:</u> For 802.11a/n-HT20/ac-VHT20: 5180~5240MHz, 5745~5825MHz For 802.11n-HT40/ac-VHT40: 5190~5230MHz, 5755~5795MHz For 802.11ac-VHT80: 5210MHz, 5775MHz</p>
Type of Modulation	802.11b: DSSS 802.11g/a/n/ac: OFDM
Maximum Average Output Power	<p><u>For 2.4GHz:</u> 802.11b: 27.92dBm 802.11g: 27.67dBm 802.11n-HT20: 27.67dBm 802.11n-HT40: 27.56dBm</p> <p><u>For 5GHz:</u> 802.11a: 29.46dBm 802.11n-HT20: 29.37dBm 802.11n-HT40: 27.62dBm 802.11ac-VHT20: 29.34dBm 802.11ac-VHT40: 27.61dBm 802.11ac-VHT80: 15.78dBm</p>

1.2. Antenna Description

Antenna Type	Frequency Band (GHz)	Tx Paths	Max Peak Gain (dBi)	Beam Forming Directional Gain (dBi)	CDD Directional Gain (dBi)	
					For Power	For PSD
PCB Antenna	2.4	2	8	11	8	11
	5	2	18	21	18	21

- The EUT supports Cyclic Delay Diversity (CDD) mode, and CDD signals are correlated. For CDD transmissions, directional gain is calculated as follows, $N_{ANT} = 2$, $N_{SS} = 1$.
 - 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 = 3.01;
 - For power measurements on IEEE 802.11 devices, Array Gain = 0 dB for $N_{ANT} \leq 4$;
- The EUT supports Beam Forming technology for 802.11n/ac mode, and exclude 802.11a mode. Correlated signals include, but are not limited to, signals transmitted in any of the following modes:

Any transmit Beam Forming mode, whether fixed or adaptive (e.g., phased array modes, closed loop MIMO modes, Transmitter Adaptive Antenna modes, Maximum Ratio Transmission (MRT) modes, and Statistical Eigen Beam Forming (EBF) modes).

 - Unequal Antenna gains, with equal transmit powers. For Antenna gains given by G_1, G_2, \dots, G_N dBi transmit signals are correlated, then
 - Directional gain = $10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{ANT}]$ dBi [Note the “20”s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

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, 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.

2.2. Test Result of RF Exposure Evaluation

Product	WF-610 2x2 dual band 802.11ac Outdoor AP
Test Item	RF Exposure Evaluation

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 11dBi for 2.4GHz, 21dBi for 5.2GHz, and 21dBi for 5.8GHz in logarithm scale.

For 2.4GHz ISM Band:

Test Mode	Frequency Band (MHz)	Maximum Average Output Power (dBm)	Limit of Power Density S(mW/cm ²)	Safety Distance (cm)
802.11b	2412 ~ 2462	27.92	1	24.91
802.11g	2412 ~ 2462	27.67	1	24.20
802.11n-HT20	2412 ~ 2462	27.67	1	24.20
802.11n-HT40	2422 ~ 2452	27.56	1	23.90

For 5GHz UNII Band:

Test Mode	Frequency Band (MHz)	Maximum Average Output Power (dBm)	Limit of Power Density S(mW/cm ²)	Safety Distance (cm)
802.11a/n-HT20/ ac-VHT20	5180 ~ 5240	29.46	1	94.06
	5745 ~ 5825	27.45	1	74.63
802.11n-HT40/ ac-VHT40	5190 ~ 5230	27.62	1	76.10
	5755 ~ 5795	26.27	1	65.15
802.11ac-VHT80	5210	15.78	1	19.47
	5775	9.85	1	9.84

CONCLUSION:

Both of the WLAN 2.4GHz Band and WLAN 5GHz Band can transmit simultaneously. The Safety Distance of the **WF-610 2x2 dual band 802.11ac Outdoor AP FCC ID: SFK-WF610** was 118.97 cm.

So the EUT complies with the requirement.

The End