1. RF Exposure Requirements

1.1 General Information

Client Information

Applicant:	Winstars Technology Limited
Address of applicant:	Block 4,Taisong Indusyrial Park, Dalang Street,Longhua Town,Bao'an District,Shenzhen,China
Manufacturer:	Winstars Technology Limited
Address of manufacturer:	Block 4,Taisong Indusyrial Park, Dalang Street,Longhua Town,Bao'an District,Shenzhen,China

General Description of EUT:

Product Name:	AX1800 Dual-Band Mesh WiFi Router Kit
Trade Name:	/
Model No.:	WS-WN552X1
Adding Model(s):	WS-WN552X2, WS-WN552X3, WL-WN552X1, WL-WN552X2, WL-WN552X3, WS-WN552K1, WS-WN552K2, WS-WN552K3, WL-WN552K1, WL-WN552K2, WL-WN552K3, AURA Pro, 9170-00-20
Rated Voltage:	DC12V
Power Adapter Model:	MODEL:P018W1201500HU INPUT:AC100-240V~50/60Hz 0.5A MAX OUTPUT:DC12.0V,1.5A 18.0W
FCC ID:	NZ3-WN0004
Equipment Type:	Mobile device

Technical Characteristics of EUT:

Wi-Fi(2.4GHz)

Support Standards:	802.11b, 802.11g, 802.11n-HT20/40, 802.11ax-HE20, 802.11ax-HE40
Frequency Range:	2412-2462MHz for 802.11b/g/n(HT20)/AX(HE 20) 2422-2452MHz for 802.11n(HT40)/AX(HE 40)
RF Output Power:	Antenna 0: 15.98dBm (Conducted) Antenna 1: 15.76dBm (Conducted)
Type of Modulation:	CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM, 256QAM, 1024QAM
Quantity of Channels:	11 for 802.11b/g/n(HT20)/ax(HE20); 7 for 802.11n(HT40)/ax(HE 40)
Channel Separation:	5MHz
Type of Antenna:	Integral Antenna
Antenna Gain:	2.64dBi

Wi-Fi(5GHz)

Support Standards:	802.11a, 802.11n(HT20) , 802.11n-HT40, 802.11ac-VH20, 802.11ac-VH40, 802.11ac-VH80,

	802.11ax-HE20, 802.11ax-HE40, 802.11ax-HE80
Frequency Range:	5150-5250MHz, 5725-5850MHz
RF Output Power:	Antenna 0: 14.54dBm (Conducted) Antenna 1: 14.78dBm (Conducted)
Type of Modulation:	QPSK, 16QAM, 64QAM, 256QAM, 1024QAM
Type of Antenna:	Integral Antenna
Antenna Gain:	3.33dBi

1.2 RF Exposure Exemption

According to §1.1307(b)(3) and 447498 D04 Interim General RF Exposure Guidance v01, system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

Option A: FCC Rule Part 1.1307 (b)(3)(i)(A):The available maximum time-averaged power is no more than 1mW, regardless of separation distance.

Option B: FCC Rule Part 1.1307 (b)(3)(i)(B): The available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. P_{th} 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: FCC Rule Part 1.1307 (b)(3)(i)(C): 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. R must be at least λ/2π, where λ is the free-space operating wavelength in meters.

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^2f
1,500-100,000	19.2R^2

For Multiple RF sources: FCC Rule Part 1.1307(b)(3)(ii):

(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).

(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.

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

1.3 Calculated Result

Radio Access Technology	Min. Frequency	Max. Output Power	Max. Tune-Up Output Power	Antenna Gain	Duty Cycle	Tune-Up EIRP
	(MHz)	(dBm)	(dBm)	(dBi)	(%)	(dBm)
Wi-Fi (2.4GHz) Antenna 0	2412	15.98	16.0	2.64	100	18.64
Wi-Fi (2.4GHz) Antenna 1	2412	15.76	16.0	2.64	100	18.64
Wi-Fi (5GHz) Antenna 0	5180	14.54	15.0	3.33	100	18.33
Wi-Fi (5GHz) Antenna 0	5180	14.78	15.0	3.33	100	18.33

Frequency	Option	Min. Distance	Tune-Up ERP		Exposure Limit	Ratio	Result
(MHz)		(cm)	(dBm)	(mW)	(mW)		Pass/Fail
2412	C	20.00	16.49	44.57	768.00	0.06	Pass
2412	C	20.00	16.49	44.57	768.00	0.06	Pass
5180	C	20.00	16.18	41.50	768.00	0.05	Pass
5180	C	20.00	16.18	41.50	768.00	0.05	Pass

Note: 1. ERP=EIRP-2.15dB; EIRP= Output Power + Antenna gain

2. Option A, B and C refers as clause 1.2.

3. For option B, Pth(mW) convert to Exposure Limit(mW); For option C, ERP(W) convert to Exposure Limit(mW).

4. Ratio= Tune-Up ERP(mW)/ Exposure Limit (mW)

Mode for Simultaneous Multi-band Transmission:

Radio Access Technology	Ratio 1	Ratio 2	Ratio 3	Ratio 4	Simultaneous Ratio	Limit	Result
							Pass/Fail
Wi-Fi(2.4GHz)+Wi-Fi(5GHz)	0.06	0.06	0.05	0.05	0.22	1.0	Pass

Result: Pass