



Shenzhen Huaxia Testing Technology Co., Ltd

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua District, Shenzhen, China

Telephone: +86-755-26648640

Fax: +86-755-26648637

Website: www.cqa-cert.com

Report Template Version: V04

Report Template Revision Date: 2018-07-06

RF Exposure Evaluation Report

Report No. : CQASZ20191101242E-03

Applicant: Winstars Technology Limited

Address of Applicant: Block 4, Taisong Industrial Park, Dalang Street, Longhua Town, Bao'an District, Shenzhen, China

Equipment Under Test (EUT):

Product: Wi-Fi Router

Model No.: WS-WN531G3, WL-WN531G3, WS-WN531A3, WL-WN531A3, WS-WN531A6, WL-WN531A6, WS-WN530H4, WL-WN530H4, WS-WN530HG4, WL-WN530HG4, WS-WN533A8, WL-WN533A8, WS-WN536A8, WL-WN536A8, QUANTUM D4, QUANTUM D4C, QUANTUM D4G, QUANTUM S4, QUANTUM D6, QUANTUM D6Q, QUANTUM T6, QUANTUM T8, QUANTUM T10, QUANTUM T12, QUANTUM MAX

Test Model No.: WL-WN531G3

Brand Name: N/A

FCC ID: NZ3-WN0002

Standards: 47 CFR Part 1.1307
47 CFR Part 1.1310
KDB447498D01 General RF Exposure Guidance v06

Date of Receipt: 2019-11-29

Date of Test: 2019-11-29 to 2019-12-23

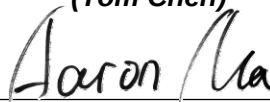
Date of Issue: 2019-12-23

Test Result : **PASS***

*In the configuration tested, the EUT complied with the standards specified above

Tested By: 

(Tom Chen)

Reviewed By: 

(Aaron Ma)

Approved By: 

(Jack Ai)



1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20191101242E-03	Rev.01	Initial report	2019-12-23

2 Contents

	Page
1 VERSION.....	2
2 CONTENTS.....	3
3 GENERAL INFORMATION.....	4
3.1 CLIENT INFORMATION.....	4
3.2 GENERAL DESCRIPTION OF EUT.....	4
3.3 GENERAL DESCRIPTION OF 2.4G WIFI.....	4
3.4 GENERAL DESCRIPTION OF 5G WIFI.....	4
4 RF EXPOSURE EVALUATION.....	6
4.1 RF EXPOSURE COMPLIANCE REQUIREMENT.....	6
4.1.1 Limits.....	6
4.1.2 Test Procedure.....	6
4.2 1.1.3 EUT RF EXPOSURE EVALUATION.....	7

3 General Information

3.1 Client Information

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

3.2 General Description of EUT

Product Name:	Wi-Fi Router
Model No.:	WS-WN531G3, WL-WN531G3, WS-WN531A3, WL-WN531A3, WS-WN531A6, WL-WN531A6, WS-WN530H4, WL-WN530H4, WS-WN530HG4, WL-WN530HG4, WS-WN533A8, WL-WN533A8, WS-WN536A8, WL-WN536A8, QUANTUM D4, QUANTUM D4C, QUANTUM D4G, QUANTUM S4, QUANTUM D6, QUANTUM D6Q, QUANTUM T6, QUANTUM T8, QUANTUM T10, QUANTUM T12, QUANTUM MAX
Test Model No.:	WL-WN531G3
Trade Mark:	N/A
Hardware version:	WS-WN531G3-A-V1.2
Software version:	M31G3.V5030.191123
Sample Type:	☐ Mobile ☐ Portable ☒ Fix Location
Power Supply:	DC5V, by Adapter
Adapter:	Model: P050W2000U Input: AC100-240V 50/60Hz 0.25A Output: DC5V, 2000mA

3.3 General Description of 2.4G WIFI

Operation Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz IEEE 802.11n(HT40): 2422MHz to 2452MHz
Channel Numbers:	IEEE 802.11b/g, IEEE 802.11n HT20: 11 Channels IEEE 802.11n HT40: 7 Channels
Channel Separation:	5MHz
Type of Modulation:	IEEE for 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE for 802.11g : OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE for 802.11n(HT20/40): OFDM (64QAM, 16QAM,QPSK,BPSK)
Test Software of EUT:	MT7603 QA V0.0.0.71 (manufacturer declare)
Antenna Type:	External antenna with ipex connector
Antenna Gain:	ANT1: 5.0dBi ANT2: 5.0dBi

3.4 General Description of 5G WIFI

Operation Frequency:	IEEE 802.11a/n/ac(20M): 5150MHz ~5250 MHz IEEE802.11n/ac(40M): 5150MHz ~5250 MHz
----------------------	---

	IEEE802.11ac(80M): 5150MHz ~5250 MHz IEEE 802.11a/n/ac(20M): 5725MHz ~5850 MHz IEEE802.11n/ac(40M): 5725MHz ~5850 MHz IEEE802.11ac(80M): 5725MHz ~5850 MHz
Channel Numbers:	IEEE 802.11a/n/ac(20M): 5150MHz ~5250MHz/ 4 channel IEEE 802.11n/ac(40M): 5150MHz ~5250MHz/ 2 channel IEEE 802.11ac(80M): 5150MHz ~5250MHz/ 1 channel IEEE 802.11a/n/ac(20M): 5725MHz ~5850MHz/ 5 channel IEEE 802.11n/ac(40M): 5725MHz ~5850MHz/ 2 channel IEEE 802.11ac(80M): 5725MHz ~5850MHz/ 1 channel
Channel Separation:	IEEE 802.11a/n-HT20/ac-VHT20: 20 MHz IEEE 802.11n-HT40/ac-VHT40: 40 MHz IEEE 802.11ac-VHT80/: 80 MHz
Type of Modulation:	IEEE 802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ac: OFDM(256QAM, 64QAM, 16QAM, QPSK, BPSK)
Test Software of EUT:	MT7662 QA V1.0.3.2 (manufacturer declare)
Antenna Type:	External antenna with ipex connector
Antenna Gain:	ANT1: 5.0dBi
	ANT2: 5.0dBi

Note:

Model No.: WS-WN531G3, WL-WN531G3, WS-WN531A3, WL-WN531A3, WS-WN531A6, WL-WN531A6, WS-WN530H4, WL-WN530H4, WS-WN530HG4, WL-WN530HG4, WS-WN533A8, WL-WN533A8, WS-WN536A8, WL-WN536A8, QUANTUM D4, QUANTUM D4C, QUANTUM D4G, QUANTUM S4, QUANTUM D6, QUANTUM D6Q, QUANTUM T6, QUANTUM T8, QUANTUM T10, QUANTUM T12, QUANTUM MAX

Only the model WL-WN531G3 was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above models, with difference being color of appearance, pack and model name.

4 RF Exposure Evaluation

4.1 RF Exposure Compliance Requirement

4.1.1 Limits

According to FCC Part1.1310: 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 part1.1307(b)

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled 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
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
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
300–1500			f/1500	30
1500–100,000			1.0	30

F= Frequency in MHz

Friis Formula

Friis transmission 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.

4.1.2 Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

4.2 1.1.3 EUT RF Exposure Evaluation

1) For 2.4G WIFI

Antenna Gain: ANT1: 5.0dBi , ANT2: 5.0dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 3.16 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

802.11b mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
Lowest(2412MHz)	Ant1	12.3	12±1.0	13.0	19.953
Lowest(2412MHz)	Ant2	12.53	12±1.0	13.0	19.953
Middle(2437MHz)	Ant1	12.71	12±1.0	13.0	19.953
Middle(2437MHz)	Ant2	12.63	12±1.0	13.0	19.953
Highest(2462MHz)	Ant1	12.56	12±1.0	13.0	19.953
Highest(2462MHz)	Ant2	12.91	12±1.0	13.0	19.953
802.11g mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
Lowest(2412MHz)	Ant1	12.3	12±1.0	13.0	19.953
Lowest(2412MHz)	Ant2	11.51	12±1.0	13.0	19.953
Middle(2437MHz)	Ant1	11.87	12±1.0	13.0	19.953
Middle(2437MHz)	Ant2	11.63	12±1.0	13.0	19.953
Highest(2462MHz)	Ant1	12.89	12±1.0	13.0	19.953
Highest(2462MHz)	Ant2	12.76	12±1.0	13.0	19.953
802.11n(HT20) MIMO mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
Lowest(2412MHz)	Ant1+2	14.99	14.5±1.0	15.5	35.481
Middle(2437MHz)	Ant1+2	15.12	14.5±1.0	15.5	35.481
Highest(2462MHz)	Ant1+2	15.24	14.5±1.0	15.5	35.481
802.11n(HT40) MIMO mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
Lowest(2422MHz)	Ant1+2	14.72	15±1.0	16.0	39.811
Middle(2437MHz)	Ant1+2	15.62	15±1.0	16.0	39.811
Highest(2452MHz)	Ant1+2	15.84	15±1.0	16.0	39.811

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
39.811	5	0.025	1.0	PASS

Note: 1) Refer to report No. CQASZ20191101242E-01 for EUT test Max Conducted average Output Power value.

2) $P_d = (P_{out} * G) / (4 * \pi * R^2) = (39.811 * 3.16) / (4 * 3.1416 * 20^2) = 0.025$

2) For 5G WIFI

Antenna Gain: ANT1: 5.0dBi , ANT2: 5.0dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 3.16 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

802.11a mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
5180	Ant1	12.98	12±1.0	13.0	19.953
5180	Ant2	12.61	12±1.0	13.0	19.953
5200	Ant1	12.22	12±1.0	13.0	19.953
5200	Ant2	12.48	12±1.0	13.0	19.953
5240	Ant1	11.63	12±1.0	13.0	19.953
5240	Ant2	12.26	12±1.0	13.0	19.953
5745	Ant1	12.67	12±1.0	13.0	19.953
5745	Ant2	12.5	12±1.0	13.0	19.953
5785	Ant1	12.44	12±1.0	13.0	19.953
5785	Ant2	11.98	12±1.0	13.0	19.953
5825	Ant1	12.56	12±1.0	13.0	19.953
5825	Ant2	12.36	12±1.0	13.0	19.953
802.11n(HT20) MIMO mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
5180	Ant1+2	15.44	14.5±1.0	15.5	35.481
5200	Ant1+2	15.12	14.5±1.0	15.5	35.481
5240	Ant1+2	15.28	14.5±1.0	15.5	35.481
5745	Ant1+2	15.05	14.5±1.0	15.5	35.481
5785	Ant1+2	15.19	14.5±1.0	15.5	35.481
5825	Ant1+2	15.33	14.5±1.0	15.5	35.481
802.11n(HT40) MIMO mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
5190	Ant1+2	15.37	15±1.0	16.0	39.811
5230	Ant1+2	15.27	15±1.0	16.0	39.811
5755	Ant1+2	15.58	15±1.0	16.0	39.811
5795	Ant1+2	15.39	15±1.0	16.0	39.811

802.11ac(VHT20) MIMO mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
5180	Ant1+2	15.42	14.5±1.0	15.5	35.481
5200	Ant1+2	15.18	14.5±1.0	15.5	35.481
5240	Ant1+2	15.07	14.5±1.0	15.5	35.481
5745	Ant1+2	15.11	14.5±1.0	15.5	35.481
5785	Ant1+2	15.33	14.5±1.0	15.5	35.481
5825	Ant1+2	15.18	14.5±1.0	15.5	35.481
802.11ac(VHT40) MIMO mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
5190	Ant1+2	15.29	14.5±1.0	15.5	35.481
5230	Ant1+2	15.33	14.5±1.0	15.5	35.481
5755	Ant1+2	15.41	14.5±1.0	15.5	35.481
5795	Ant1+2	14.9	14.5±1.0	15.5	35.481
802.11acV(HT80) MIMO mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
5210	Ant1+2	15.62	15±1.0	16.0	39.811
5775	Ant1+2	15.2	15±1.0	16.0	39.811

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
39.811	5	0.025	1.0	PASS

Note: 1) Refer to report No. CQASZ20191101242E-02 for EUT test Max Conducted average Output Power value.

$$2) P_d = (P_{out} * G) / (4 * \pi * R^2) = (39.811 * 3.16) / (4 * 3.1416 * 20^2) = 0.025$$