RF Exposure Evaluation Declaration

Product Name	:	Wireless Router Motherboard
Model No.	:	DR344-NAS27
FCC ID	:	2AG7VDR344-NAS27

Applicant	:	Wallys Communications Technologies Co.,Ltd
Address	:	Room 2723, Le Jia building,Jia Rui Xiang No.8,Suzhou Industrial Park, Suzhou, P.R China

Date of Receipt	:	Jan. 26, 2016
Issued Date	:	Mar. 21, 2016
Report No.	:	1612091R-RF-US-P20V01
Report Version	:	V1.2

Test Report Certification

Issued Date : Mar. 21, 2016
Report No. : 1612091R-RF-US-P20V01

Product Name	:	Wireless Router Motherboard
Applicant	:	Wallys Communications Technologies Co.,Ltd
Address	:	Room 2723, Le Jia building,Jia Rui Xiang No.8,Suzhou Industrial Park, Suzhou, P.R China
Manufacturer	:	Wallys Communications Technologies Co.,Ltd
Address	:	Room 2723, Le Jia building,Jia Rui Xiang No.8,Suzhou Industrial Park, Suzhou, P.R China
Model No.	:	DR344-NAS27
FCC ID	:	2AG7VDR344-NAS27
EUT Voltage	:	48V
Brand Name	:	wallys
Applicable Standard	:	KDB 447498D01V06 FCC Part1.1310(b)
Test Result	:	Complied
Performed Location	:	Quietek Corporation - Suzhou EMC Laboratory No.99 Hongye Rd., Suzhou Industrial Park, Suzhou,215006, Jiangsu, China TEL: +86-512-6251-5088 / FAX: +86-512-6251-5098 FCC Registration Number: 800392

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Approved By : Harry Zhao

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Laboratory Information

We, **QuieTek Corporation**, are an independent EMC and safety consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted(audited or listed) by the following related bodies in compliance with ISO 17025, EN 45001 and specified testing scope:

Taiwan R.O.C.	**:**	**BSMI, NCC, TAF**
USA	**:**	**FCC**
Japan	**:**	**VCCI**
China	**:**	**CNAS**

The related certificate for our laboratories about the test site and management system can be downloaded from QuieTek Corporation's Web Site : http://www.quietek.com/english/about/certificates.aspx?bval=5
The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site : http://www.quietek.com/index_en.aspx
If you have any comments, Please don't hesitate to contact us. Our contact information is as below:

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TEL : +86-512-6251-5088 / FAX : 86-512-6251-5098 E-Mail : service@quietek.com

History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
1612091R-RF-US-P20V01	V1.0	Initial Issued Report	Mar. 07, 2016
1612091R-RF-US-P20V01	V1.1	Updata frequency on Page7, 8.	Mar. 11, 2016
1612091R-RF-US-P20V01	V1.2	Modified data and description on Page 7, 8.	Mar. 18, 2016
1612091R-RF-US-P20V01	V1.3	Modified the max antenna gain	Mar. 21, 2016

1. RF Exposure Evaluation

1.1. 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/cm2)	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

Friis Formula

Friis transmission formula: Pd = (Pout*G)/(4*pi*r2)

Where

Pd = power density in mW/cm2

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in cm

Pd id 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.

1.2. Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.
The temperature and related humidity: 18℃and 78％ RH.

1.3. Test Result of RF Exposure Evaluation

Product	:	Wireless Router Motherboard
Test Item	:	RF Exposure Evaluation
Test Site	:	AC-6

- Antenna Gain:

Antenna No.	Peak Gain	Directional Gain
Antenna 0	8.56dBi for 5GHz	11.57dBi for 5GHz
Antenna 1	8.56dBi for 5GHz	

Note: Directional gain = GANT + 10 log(NANT) dBi
Note: 1: The EUT only has two WIFI antennas, and each port has same gain, they transmit signals are correlated with each other.
(1) 5G WIFI Directional gain for Calculation is:
Directional gain = G_{ANT} + Array Gain≈11.57dBi

Note: The EUT don't with antennas shipment. The maximum antenna gain for each chain is 9.05dBi and 9.08dBi For SISO and the maximum direction gain for CDD mode is 13.41dBi a ccording to the conducted power. So the maximum gain for each antenna should be 9.05dBi and 9.08dBi.

Antenna No.	Peak Gain	Directional Gain
Antenna 0	9.05dBi for 5GHz	12.08dBi for 5GHz
Antenna 1	9.08dBi for 5GHz	

- Output Power into Antenna & RF Exposure Evaluation Distance:

Standlone modes

5GHz:

Ant0

Test Mode	Frequency Band (MHz)	Maximum Output Power to Antenna (dBm)	Antenna Gain (dBi)	Power Density at R = 22 cm (mW/cm2)
802.11a/n(20MHz)	5180MHz~5240MHz 5745MHz~5825MHz	26.95	9.05	0.654553
802.11n(40MHz)	5190MHz~5230MHz 5755MHz~5795MHz	26.33	9.05	0.567473

Ant1

Test Mode	Frequency Band (MHz)	Maximum Output Power to Antenna (dBm)	Antenna Gain (dBi)	Power Density at R = 22 cm (mW/cm2)
802.11a/n(20MHz)	5180MHz~5240MHz 5745MHz~5825MHz	26.92	9.08	0.654553
802.11n(40MHz)	5190MHz~5230MHz 5755MHz~5795MHz	26.67	9.08	0.617938

Ant0+1

Test Mode	Frequency Band (MHz)	Maximum Output Power to Antenna (dBm)	Directional Gain (dBi)	Power Density at R = 22 cm (mW/cm2)
802.11a/n(20MHz)	5180MHz~5240MHz 5745MHz~5825MHz	25.59	12.08	0.961491
802.11n(40MHz)	5190MHz~5230MHz 5755MHz~5795MHz	25.45	12.08	0.930990

So according to transmission formula: Pd = (Pout*G)/(4*pi*r^2) and the power density limit according to KDB 447498D01V06 and FCC Part1.1310(b), the limit is 1mW/cm^2

Safety Distance Calculation Formula:

The power flux:

$$S = \frac{P*G_{(\theta,\phi)}}{4*\pi*r^2}$$

So safety distance as following:

$$r = \sqrt{\frac{P*G}{4*\pi*S}}$$

P = input power of the antenna

G = antenna gain relative to an isotropic antenna

θ, Φ = elevation and azimuth angles.

r = distance from the antenna to the point of investigation

Test Mode	Frequency Range (MHz)	Maximum EIRP (dBm)	Limit of Power Density S(mW/cm^2)	Safety Distance r(cm)
802.11a/n(20MHz)	5180MHz~5240MHz 5745MHz~5825MHz	37.67	1	21.57
802.11n(40MHz)	5190MHz~5230MHz 5755MHz~5795MHz	37.53	1	

Note: The safety distance is 22cm for the router without any other radio equipment.

The End