

## RF Exposure Report

**Report No.:** SA191111E03

**FCC ID:** RRC4000XG

**Test Model:** C4000XG

**Received Date:** Nov. 11, 2019

**Test Date:** Nov. 23, 2019

**Issued Date:** Dec. 13, 2019

**Applicant:** Alpha Networks Inc.

**Address:** No.8 Li-shing 7th Rd., Science-based Industrial Park, Hsinchu, Taiwan,  
R.O.C.

**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch  
Hsin Chu Laboratory

**Lab Address:** E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,  
Taiwan

**Test Location:** E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,  
Taiwan

**FCC Registration /  
Designation Number:** 723255 / TW2022

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### Release Control Record

Issue No.	Description	Date Issued
SA191111E03	Original release.	Dec. 13, 2019

## 1 Certificate of Conformity

**Product:** Wireless Gateway

**Brand:** CenturyLink

**Test Model:** C4000XG

**Sample Status:** ENGINEERING SAMPLE

**Applicant:** Alpha Networks Inc.

**Test Date:** Nov. 23, 2019

**Standards:** FCC Part 2 (Section 2.1091)

KDB 447498 D01 General RF Exposure Guidance v06

IEEE C95.3-2002

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**Prepared by :**



**Date:**

Dec. 13, 2019

Joyce Kuo / Specialist

**Approved by :**



**Date:**

Dec. 13, 2019

Clark Lin / Technical Manager

## 2 RF Exposure

### 2.1 Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Average Time (minutes)
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 <sup>2</sup> )*	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 ; \*Plane-wave equivalent power density

### 2.2 MPE Calculation Formula

$$P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot r^2)$$

where

$P_d$  = power density in mW/cm<sup>2</sup>

$P_{out}$  = 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

### 2.3 Classification

The antenna of this product, under normal use condition, is at least 34cm away from the body of the user.

So, this device is classified as **Mobile Device**.

## 2.4 Antenna Gain

The antennas provided to the EUT, please refer to the following table:

1<sup>st</sup> source

Antenna NO.	Brand	Model	Antenna Type	Connector Type	Cable Length(mm)
2.4G-1	Hongbo	290-20433	PCB	i-pex(MHF)	295
2.4G-2	Hongbo	290-20434	PCB	i-pex(MHF)	340
2.4G-3	Hongbo	290-20435	PCB	i-pex(MHF)	220
2.4G-4	Hongbo	290-20436	PCB	i-pex(MHF)	240
5G-1	Hongbo	290-20437	PCB	i-pex(MHF)	125
5G-2	Hongbo	290-20438	PCB	i-pex(MHF)	220
5G-3	Hongbo	290-20439	PCB	i-pex(MHF)	240
5G-4	Hongbo	290-20440	PCB	i-pex(MHF)	175
*5G-5	Hongbo	290-20441	PCB	i-pex(MHF)	350

\*Reserved for future permissive change. (Not evaluation for 5G-5 antenna)

2<sup>nd</sup> source

Antenna NO.	Brand	Model	Antenna Type	Connector Type	Cable Length(mm)
2.4G-1	Walsin	RFPCA351129IMAB401	PCB	i-pex(MHF)	295
2.4G-2	Walsin	RFPCA351134IMAB401	PCB	i-pex(MHF)	340
2.4G-3	Walsin	RFPCA351122IMAB401	PCB	i-pex(MHF)	220
2.4G-4	Walsin	RFPCA351124IMAB401	PCB	i-pex(MHF)	240
5G-1	Walsin	RFPCA201112IM5B401	PCB	i-pex(MHF)	125
5G-2	Walsin	RFPCA201122IM5B401	PCB	i-pex(MHF)	220
5G-3	Walsin	RFPCA201124IM5B401	PCB	i-pex(MHF)	240
5G-4	Walsin	RFPCA201117IM5B401	PCB	i-pex(MHF)	175
*5G-5	Walsin	RFPCA201135IM5B401	PCB	i-pex(MHF)	350

\*Reserved for future permissive change. (Not evaluation for 5G-5 antenna)

From the above brand, brand: **Hongbo** was selected as representative model for the test and its data was recorded in this report.

The directional antenna gain, please refer to the following table:

Frequency Range (GHz)	Directional Antenna Gain (dBi)	Antenna Type	Antenna Connector
2.4 ~ 2.5	7.4	PCB	i-pex(MHF)
5.15 ~ 5.25	9.1		
5.25 ~ 5.35	8.4		
5.47 ~ 5.725	8.3		
5.725 ~ 5.85	8.1		

Note: More detailed information, please refer to antenna specification.

## 2.5 Calculation Result of Maximum Conducted Power

Operation Mode	Evaluation Frequency (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
WLAN 2.4GHz	2437	965.166	7.4	34	0.36512	1
WLAN 5GHz U-NII-1	5230	928.785	9.1	34	0.51969	1
WLAN 5GHz U-NII-3	5785	959.035	8.1	34	0.42625	1

NOTE:

2.4GHz: The directional gain =  $10 \log [(10^{\text{Chain0/20}} + 10^{\text{Chain1/20}} + 10^{\text{Chain2/20}} + 10^{\text{Chain3/20}})^2 / 4] = 7.4\text{dBi}$

5GHz:

U-NII-1: The directional gain =  $10 \log [(10^{\text{Chain0/20}} + 10^{\text{Chain1/20}} + 10^{\text{Chain2/20}} + 10^{\text{Chain3/20}})^2 / 4] = 9.1\text{dBi}$

U-NII-3: The directional gain =  $10 \log [(10^{\text{Chain0/20}} + 10^{\text{Chain1/20}} + 10^{\text{Chain2/20}} + 10^{\text{Chain3/20}})^2 / 4] = 8.1\text{dBi}$

### Conclusion:

The formula of calculated the MPE is:

$\text{CPD1} / \text{LPD1} + \text{CPD2} / \text{LPD2} + \dots \text{etc.} < 1$

CPD = Calculation power density

LPD = Limit of power density

$\text{WLAN 2.4GHz} + \text{WLAN 5GHz} = 0.36512 / 1 + 0.51969 / 1 = 0.88481$

**Therefore the maximum calculations of above situations are less than the “1” limit.**

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