

## RF Exposure Report

**Report No.:** SA130927E080

**FCC ID:** Z3M-FG1100

**Test Model:** FiOS-G1100

**Received Date:** Mar. 29, 2016

**Test Date:** Apr. 18, 2016

**Issued Date:** Apr. 28, 2016

**Applicant:** Greenwave Systems Pte. Ltd.

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**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch  
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### Release Control Record

Issue No.	Description	Date Issued
SA130927E08O	Original release.	Apr. 28, 2016



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## 1 Certificate of Conformity

**Product:** FiOS Gateway

**Brand:** Frontier

**Test Model:** FiOS-G1100

**Sample Status:** ENGINEERING SAMPLE

**Applicant:** Greenwave Systems Pte. Ltd.

**Test Date:** Apr. 18, 2016

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

KDB 447498 D01 General RF Exposure Guidance v06

IEEE C95.1-1992

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 :** C L, **Date:** Apr. 28, 2016  
Claire Kuan / Specialist

**Approved by :** M, **Date:** Apr. 28, 2016  
May Chen / 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				
300-1500	...	...	F/1500	30
1500-100,000	...	...	1.0	30

F = Frequency in MHz

### 2.2 MPE Calculation Formula

$$Pd = (Pout \cdot G) / (4 \cdot \pi \cdot r^2)$$

where

Pd = power density in mW/cm<sup>2</sup>

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

### 2.3 Classification

The antenna of this product, under normal use condition, is at least 28cm away from the body of the user. So, this device is classified as **Mobile Device**.

## 2.4 Antenna Gain

WLAN Antenna Spec.					
2.4GHz					
Transmitter Circuit	Gain (dBi) (Include cable loss)	Antenna Type	Connector Type	Frequency range (GHz to GHz)	
Chain (0)	3.97	Dipole(Metal)	NA	2.4~2.4835	
Chain (1)	4.1	Dipole(Metal)	NA	2.4~2.4835	
Chain (2)	3.36	PIFA(Metal)	NA	2.4~2.4835	
5GHz					
Transmitter Circuit	Gain (dBi) (Include cable loss)	Antenna Type	Connector Type	Frequency range (GHz to GHz)	
Chain (0)	3.56	Dipole(Metal)	NA	5.15~5.25	
	3.86			5.25~5.35	
	4.05			5.47~5.725	
	4.05			5.725~5.85	
Chain (1)	5.3	Dipole(Metal)	NA	5.15~5.25	
	5.75			5.25~5.35	
	5.75			5.47~5.725	
	5.71			5.725~5.85	
Chain (2)	4.6	Dipole(Metal)	NA	5.15~5.25	
	4.35			5.25~5.35	
	4.35			5.47~5.725	
	4.21			5.725~5.85	
Z-Wave Antenna Spec.					
Gain (dBi) (Include cable loss)	Antenna Type	Connector Type		Frequency range (MHz to MHz)	
1.73	PIFA (Metal)	NA		902~928	
Note: 1. For 1Tx mode will fix transmission on Chain (0). 2. For 2Tx mode will fix transmission on Chain (0) and Chain (1)					

### 3 Calculation Result of Maximum Conducted Power

#### For WLAN 2.4GHz:

##### CDD Mode

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
2412-2462	535.959	8.59	28	0.39319	1

NOTE: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + 10^{G3/20})^2 / 3] = 8.59 \text{ dBi}$ .

##### STBC Mode

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
2412-2462	919.616	4.1	28	0.23992	1

#### For WLAN 5GHz:

##### 2TX CDD / Beamforming Mode

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
5260-5320	47.709	7.87	28	0.02965	1
5500-5720	93.702	7.95	28	0.05932	1

NOTE:

5GHz (5260-5320MHz): Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 7.87 \text{ dBi}$

5GHz (5500-5720MHz): Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 7.95 \text{ dBi}$

##### 2TX STBC Mode

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
5260-5320	69.627	5.75	28	0.02656	1
5500-5720	93.702	5.75	28	0.03575	1

**For WLAN 5GHz:**
**3TX CDD / Beamforming Mode**

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
5260-5320	39.38	9.46	28	0.03530	1
5500-5720	67.047	9.52	28	0.06093	1

**NOTE:**

5GHz (5260-5320MHz): Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + 10^{G3/20})^2 / 3] = 9.46 \text{dBi}$   
 5GHz (5500-5720MHz): Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + 10^{G3/20})^2 / 3] = 9.52 \text{dBi}$

**3TX STBC Mode**

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
5260-5320	39.38	5.75	28	0.01502	1
5500-5720	83.069	5.75	28	0.03169	1

**For Zwave:**

Frequency BAND (MHz)	Field Strength of Fundamental@3m (dBuV/m)	Pout EIRP (dBm)	Pout EIRP (mW)	Distance (cm)	Power Density (mW/ cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
908.4-916.0	100.9	5.67	3.691	28	0.00037	0.61

**Conclusion:**

All of the Z-Wave and WLAN (2.4GHz & 5GHz) can transmit simultaneously, the formula of calculated the MPE is:

$$\text{CPD}_1 / \text{LPD}_1 + \text{CPD}_2 / \text{LPD}_2 + \dots \text{etc.} < 1$$

**CPD = Calculation power density**

**LPD = Limit of power density**

Therefore, the worst-case situation is  $0.39319 / 1 + 0.06093 / 1 + 0.00037 / 0.61 = 0.45473$ , which is less than "1". This confirmed that the device comply with FCC 1.1310 MPE limit.

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