RF Exposure Report

Report No.:	SA130927E08O
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.
Address:	10 Science Park Road, #02-07/08, The Alpha (Science Park II), Singapore 117684
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 R.O.C.
Test Location (1):	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
Test Location (2):	No. 49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan R.O.C.

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Release Control Record

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

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

Approved by : _____ , **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^2)	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

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

where

Pd = power density in mW/cm^2

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	Connecter 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	Connecter 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	Connecter 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^2)	Limit (mW/cm^2)
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] = 8.59dBi.

STBC Mode

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
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^2)	Limit (mW/cm^2)
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] = 7.87dBi
5GHz (5500-5720MHz): Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20})^2$ / 2] = 7.95dBi

2TX STBC Mode

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
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^2)	Limit (mW/cm^2)
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] = 9.46dBi

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

3TX STBC Mode

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
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^2)	Limit (mW/cm^2)
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:

$CPD_1 / LPD_1 + CPD_2 / LPD_2 + \ldots\ldots$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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