

## RF Exposure Report

**Report No.:** SA160901E04A

**FCC ID:** Z3M-E2100

**Test Model:** E2100

**Received Date:** Sep. 01, 2016

**Test Date:** Oct. 25 to Nov. 11, 2016

**Issued Date:** Mar. 06, 2017

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

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

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### Release Control Record

Issue No.	Description	Date Issued
SA160901E04A	Original release.	Mar. 06, 2017

## 1 Certificate of Conformity

**Product:** Wi-Fi Extender

**Brand:** NA

**Test Model:** E2100

**Sample Status:** MASS-PRODUCTION

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

**Test Date:** Oct. 25 to Nov. 11, 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:**

Mar. 06, 2017

Midoli Peng / Specialist

**Approved by :**



**Date:**

Mar. 06, 2017

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

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

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 32cm 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:

No.	PCB Chain No	Brand	Antenna Gain(dBi) Including cable loss	Frequency range (GHz~GHz)	Antenna Type	Connector type	Cable Length (mm)
2G-1	Chain 2	WNC	4.62	2.4~2.4835	Dipole	i-pex(MHF)	75
2G-2	Chain 1	WNC	3.33	2.4~2.4835	Dipole	i-pex(MHF)	52
2G-3	Chain 0	WNC	3.63	2.4~2.4835	Dipole	i-pex(MHF)	187
5G-5	Chain 3	WNC	3.24	5.15~5.25	Dipole	i-pex(MHF)	171
			3.24	5.25~5.35			
5G-6	Chain 2	WNC	4.39	5.15~5.25	Dipole	i-pex(MHF)	187
			4.58	5.25~5.35			
5G-8	Chain 1	WNC	4.63	5.15~5.25	Dipole	i-pex(MHF)	237
			4.07	5.25~5.35			
5G-7	Chain 0	WNC	3.68	5.15~5.25	Dipole	i-pex(MHF)	228
			3.62	5.25~5.35			
5G-1	Chain 3	WNC	3.45	5.47~5.725	Dipole	i-pex(MHF)	43
			3.45	5.725~5.85			
5G-2	Chain 2	WNC	4.28	5.47~5.725	Dipole	i-pex(MHF)	37
			4.47	5.725~5.85			
5G-4	Chain 1	WNC	2.71	5.47~5.725	Dipole	i-pex(MHF)	90
			2.95	5.725~5.85			
5G-3	Chain 0	WNC	4.01	5.47~5.725	Dipole	i-pex(MHF)	73
			3.54	5.725~5.85			

The Directional gain table:

Frequency (MHz)	Max Gain (dBi)
UNII-1 band	3.97
UNII-2A band	4.29
UNII-2C band	5.21
UNII-3 band	4.88

Note:

1. Non-TxBF mode & TxBF mode antenna gain refer to KDB 662911 F 2) f) (ii)

$$DirectionalGain = 10 \cdot \log \left[ \frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

where

Each antenna is driven by no more than one spatial stream;

$N_{SS}$  = the number of independent spatial streams of data;

$N_{ANT}$  = the total number of antennas

$g_{j,k} = 10^{G_k/20}$  if the  $k$ th antenna is being fed by spatial stream  $j$ , or zero if it is not;  
 $G_k$  is the gain in dBi of the  $k$ th antenna.

## 2.5 Calculation Result of Maximum Conducted Power

For 15.247 data was copied from the original test report (Report No.: SA160901E04)

Frequency (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
2412-2462	896.52	8.65	32	0.51056	1
5180-5240	767.196	3.97	32	0.14873	1
5260-5320	249.65	4.29	32	0.05210	1
5500-5720	231.867	5.21	32	0.05980	1
5745-5825	897.877	4.88	32	0.21464	1

NOTE:

2.4GHz: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + 10^{G3/20})^2 / 3] = 8.65\text{dBi}$

5 GHz: Directional gain = 3.97dBi(UN-II-1), 4.29dBi(UN-II-2A), 5.21dBi(UN-II-2C), 4.88dBi(UN-II-3)

### Conclusion:

The formula of calculated the MPE is:

CPD1 / LPD1 + CPD2 / LPD2 + .....etc. < 1

CPD = Calculation power density

LPD = Limit of power density

Simultaneously transmission condition.

Technology		
WLAN (2.4GHz)	WLAN (5GHz <U-NII-1 & U-NII-2A>)	WLAN (5GHz <U-NII-2C & U-NII-3>)

$0.51056/1 + 0.14873/1 + 0.21464/1 = 0.87393$

Therefore the maximum calculations of above situations are less than the "1" limit.

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