

RF Exposure Evaluation Declaration

Applicant: Compex Systems Pte Ltd

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Singapore 369651

Product: 4x4 Wave-2 802.11BGN Mini PCIe WiFi Module

Model No.: WLE1216V2-20, WLE1216V2-20-I

Brand Name: COMPEX

Standards: EN 62311: 2008

Reviewed By : _____
(Jame Yuan)

Approved By : _____
(Marlin Chen)



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standards through the calibration of the equipment and evaluated measurement uncertainty herein.

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Revision History

Report No.	Version	Description	Issue Date	Note
1801RSU037-E2	Rev. 01	Draft report	04-18-2018	

1. PRODUCT INFORMATION

1.1. Equipment Description

Product Name:	4x4 Wave-2 802.11BGN Mini PCIe WiFi Module
Model No.:	WLE1216V2-20, WLE1216V2-20-I
Wi-Fi Specification:	802.11b/g/n

1.2. Antenna Description

Antenna Type	Frequency Band (GHz)	TX Paths	Max Peak Gain (dBi)
Dipole Antenna	2.4	4	5
Panel Antenna	2.4	4	11

Note 1: The device didn't support beam-forming technology and Cyclic Delay Diversity (CDD) technology, and the transmit signals are uncorrected.


Note 2: We selected the max peak gain antenna to perform all RF conducted test and both of them for radiated test.

1.3. Description of Support Units

The EUT has been tested with associated equipment below:

Description	Manufacturer	Model No.
PCB Board	Compex Systems Pte Ltd	WPQ864HV

1.4. Description of Antenna RF Port

Antenna RF Port				
--	2.4GHz RF Port			
Software Control Port	Ant 0	Ant 1	Ant 2	Ant 3
				

2. RF Exposure Measurement

The scope of this standard is limited to apparatus which is intended for use by the general public as defined in the Council Recommendation 1999/519/EC of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz) (Official Journal L 199 of 30 July 1999).

This generic standard applies to electronic and electrical apparatus for which no dedicated product or product family standard regarding human exposure to electromagnetic fields applies.

This generic standard does not cover equipment, which fulfils the requirements given in EN 50371 or is medical equipment as defined in the Council Directive 93/42/EEC of 14 June 1993 concerning medical devices.

The frequency range covered is 0 Hz to 300 GHz.

The object of this standard is to demonstrate the compliance of such apparatus with the basic restrictions or reference levels on exposure of the general public related to electric, magnetic, electromagnetic fields and induced and contact current.

2.1. Limits

The electronic and electro-technical apparatus shall comply with the basic restriction as specified in Annex II of Council Recommendation 1999/519/EC.

The reference levels in the Council Recommendation 1999/519/EC on public exposure to electromagnetic fields are derived from the basic restrictions using worst-case assumptions about exposure.

According to EN50385, the reference level listed in the following table 2 shall be used to evaluate the environment impact of human exposure human exposure to electromagnetic fields (0 Hz - 300 GHz) as specified in 1999/519/EC.

Council Recommendation 1999/519/EC of 12 July 1999

Table 2

Reference levels for electric, magnetic and electromagnetic fields
(0 Hz to 300 GHz, unperturbed rms values)

Frequency Range	E-field Strength (V/m)	H-field Strength (A/m)	B-field (μ T)	Equivalent plane wave power density Seq (W/m ²)
0-1 Hz	–	3.2×10^4	4×10^4	–
1-8 Hz	10000	$3.2 \times 10^4/f^2$	$4 \times 10^4/f^2$	–
8-25 Hz	10000	4000/f	5000/f	–
0.025-0.8 kHz	250/f	4/f	5/f	–
0.8-3 kHz	250/f	5	6.25	–
3-150 kHz	87	5	6.25	–
0.15-1 MHz	87	0.73/f	0.92/f	–
1-10 MHz	$87/f^{1/2}$	0.73/f	0.92/f	–
10-400 MHz	28	0.73	0.092	2
400-2000 MHz	$1.375 f^{1/2}$	$0.0037 f^{1/2}$	$0.0046 f^{1/2}$	f/200
2-300G Hz	61	0.16	0.20	10

Notes:

1. f as indicated in the frequency range column.
2. For frequencies between 100 kHz and 10 GHz, Seq, E2, H2, and B2 are to be averaged over any six-minute period.
3. For frequencies exceeding 10 GHz, Seq, E2, H2, and B2 are to be averaged over any $68/f^{1.05}$ -minute period (f in GHz).
4. No E-field value is provided for frequencies < 1 Hz, which are effectively static electric fields. For most people the annoying perception of surface electric charges will not occur at field strengths less than 25 kV/m. Spark discharges causing stress or annoyance should be avoided.

2.2. Assessment methods

Under normal use of condition, this device has a separation distance of at least 20cm between the antenna and the body of the user. A radiation exposure statement" this equipment should be installed and operated with minimum distance between the antenna and your body" is shown on the user manual, so human exposure to the electromagnetic field of this product is at far-field region under normal use.

Far-field region Calculation Formula:

P watts are radiated, from a point, uniformly over the surface of sphere of radius r.

In free space

$$E = \eta_0 H = [30 \cdot P \cdot G(\theta, \phi)]^{0.5} / r$$

Where

G = antenna gain relative to an isotropic antenna

θ, ϕ = elevation and azimuth angles to point of investigation

r = distance from observation point to the antenna (m)

η = characteristic impedance of free space

Safety Distance Calculation Formula:

The power flux:

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

So safety distance as following:

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

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

2.3. Test Result of RF Exposure Evaluation

Product	4x4 Wave-2 802.11BGN Mini PCIe WiFi Module
Test Item	RF Exposure Evaluation

Operation Mode	Frequency Range (MHz)	Maximum EIRP (dBm)	Power Density Limit (mW/cm ²)	Safety Distance (cm)
802.11b/g/n	2412 ~ 2472	19.68	1	2.72

CONCLUSION:

The safety distance is 2.72cm for **4x4 Wave-2 802.11BGN Mini PCIe WiFi Module** installed without any other radio equipment.

_____ The End _____