

EN 62311 Report

Report No.: SE170816E06G

Test Model: WLT674

Received Date: Jan. 07, 2015

Test Date: Mar. 05, 2015

Issued Date: Oct. 04, 2018

Applicant: Compex 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
SE170816E06G	Original release.	Oct. 04, 2018

1 Certificate of Conformity

Product: Wireless M.2 Type A/E with BLE Module
Brand: Compex
Test Model: WLT674
Sample Status: ENGINEERING SAMPLE
Applicant: Compex Systems Pte. Ltd.
Test Date: Mar. 05, 2015
Standards: EN 62311:2008

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:** Oct. 04, 2018
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Approved by :  , **Date:** Oct. 04, 2018
May Chen / Manager

2 General Information

2.1 General Description of EUT

Product	Wireless M.2 Type A/E with BLE Module
Brand	Compex
Test Model	WLT674
Status of EUT	ENGINEERING SAMPLE
Nominal Voltage	3.3Vdc form host equipment
Voltage Operation Range	Vnom= 230Vac Vmin= 207Vac Vmax= 253Vac
Temperature Operating Range	-10°C ~ 70°C
Modulation Type	For WLAN: CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode and VHT (20/40) mode in 2.4GHz
	For Bluetooth: GFSK, $\pi/4$ -DQPSK, 8DPSK for FHSS 16QAM, QPSK, BPSK for OFDM GFSK for DTS
Modulation Technology	For WLAN: DSSS, OFDM
	For Bluetooth: FHSS, OFDM, DTS
Transfer Rate	For WLAN: 802.11b: up to 11Mbps 802.11a/g: up to 54Mbps 802.11n : up to 300Mbps 802.11ac: up to 866.7Mbps
	For Bluetooth: BT-EDR: Up to 3Mbps BT-HS: Up to 24Mbps BT-LE: Up to 1Mbps
Operating Frequency	For WLAN: 2.4GHz: 2412 ~ 2472MHz 5GHz: 5180MHz ~ 5240MHz, 5260MHz ~ 5320MHz, 5500MHz ~ 5700MHz
	For Bluetooth: BT-EDR, BT-LE: 2402MHz ~ 2480MHz BT-HS: 2412MHz ~ 2472MHz

Number of Channel	For WLAN: 2.4GHz 802.11b/g, 802.11n (HT20), VHT20: 13 802.11n (HT40), VHT40: 9 5GHz 802.11a, 802.11n (HT20), 802.11ac (VHT20): 19 802.11n (HT40), 802.11ac (VHT40): 9 802.11ac (VHT80): 4
	For Bluetooth: BT-EDR: 79 BT-HS: 11 BT-LE: 40
EIRP Power (Measured Max. Average)	For WLAN: 2.4GHz:19.89dBm 5GHz:22.90dBm
	For Bluetooth: BT-EDR: 9.84dBm BT-LE: 8.15dBm
Antenna Type	See item 2.2
Antenna Connector	See item 2.2
Accessory Device	NA
Data Cable Supplied	NA

Note:

1. There are Bluetooth technology and WLAN technology used for the EUT.
2. The EUT incorporates a 2T2R function.

2.4GHz Band			
MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
802.11b	1 ~ 11Mbps	2TX	2RX
802.11g	6 ~ 54Mbps	2TX	2RX
802.11n (HT20) (2.4GHz)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
802.11n (HT40) (2.4GHz)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
VHT20 (2.4GHz)	MCS 0~8, Nss=1	2TX	2RX
	MCS 0~8, Nss=2	2TX	2RX
VHT40 (2.4GHz)	MCS 0~9, Nss=1	2TX	2RX
	MCS 0~9, Nss=2	2TX	2RX
5GHz Band			
MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
802.11a	6 ~ 54Mbps	2TX	2RX
802.11n (HT20) (5GHz)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
802.11n (HT40) (5GHz)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
802.11ac (VHT20) (5GHz)	MCS 0~8, Nss=1	2TX	2RX
	MCS 0~8, Nss=2	2TX	2RX
802.11ac (VHT40) (5GHz)	MCS 0~9, Nss=1	2TX	2RX
	MCS 0~9, Nss=2	2TX	2RX
802.11ac (VHT80) (5GHz)	MCS 0~9, Nss=1	2TX	2RX
	MCS 0~9, Nss=2	2TX	2RX

Note: The modulation and bandwidth are similar for 802.11n mode for 20MHz (40MHz) and 802.11ac mode for 20MHz (40MHz), therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.5)

3. WLAN/BT coexistence mode:

◆ 2x2 WLAN + BT:

- 5GHz 802.11a/an (or 11ac) transmit concurrent with BT.
- 2.4GHz: timely shared coexistence.

4. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

2.2 Description of Antenna

The antenna gain was declared by client; please refer to the following table:

Transmitter Circuit	Brand	Model	Ant. Type	2.4GHz Gain with cable loss (dBi)	5GHz Gain with cable loss (dBi)	2.4GHz Cable Loss (dBi)	5G Cable Loss (dBi)	Connector Type	Cable Length (mm)
Chain (0)	WNC	81-EBJ15.005	PIFA	3.00	Band 1&2: 2.56	1.15	Band 1&2: 1.70	IPEX	300
					Band 3: 4.76		Band 3: 1.74		
					Band 4: 4.76		Band 4: 1.79		
Chain (1)	WNC	81-EBJ15.005	PIFA	3.62	Band 1&2: 3.08	1.15	Band 1&2: 1.70	IPEX	300
					Band 3: 3.31		Band 3: 1.74		
					Band 4: 2.42		Band 4: 1.79		

Note: 1. Above antenna gains of antenna are Total (H+V).

3 RF Exposure Measurement

3.1 Introduction

This International Standard applies to electronic and electrical equipment for which no dedicated product- or product family standard regarding human exposure to electromagnetic fields applies.

The frequency range covered is 0 Hz to 300 GHz.

The object of this generic standard is to provide assessment methods and criteria to evaluate such equipment against basic restrictions or reference levels on exposure of the general public related to electric, magnetic and electromagnetic fields and induced and contact current.

3.2 Limit

According to EN 62311:2008, the criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified 1999/519/EC.

Frequency Range	E-Field Strength (V/m)	H-Field Strength (A/M)	B-Field (μ T)	Equivalent Plane Wave Power Density S_{eq} (W/M ²)
0-1 Hz	—	$3,2 \times 10^4$	4×10^4	—
1-8 Hz	10 000	$3,2 \times 10^4/f^2$	$4 \times 10^4/f^2$	—
8-25 Hz	10 000	$4\,000/f$	$5\,000/f$	—
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	0.073	0.092	2
400-2 000 MHz	$1.375 f^{1/2}$	$0.0037 f^{1/2}$	$0.0046 f^{1/2}$	$f/200$
2 ~ 300 GHz	61	0.16	0.20	10

3.3 Normative Reference Classification of The Assessment Methods

The antenna of the product, under normal use condition is at least 20 cm away from the body of the user. Warning statement to the user for keeping at least 20cm separation distance and the prohibition of operating to a person has been printed on the user's manual. So, this product under normal use is located on electromagnetic far field between the human body.

$$E = \eta_0 H = \frac{\sqrt{30PG(\theta, \phi)}}{r}$$

Far Field Calculation Formula

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
 η_0 = Characteristic impedance of free space

3.4 Test Results

Calculation for maximum EIRP

For WLAN:

2.4GHz

Output Power EIRP (dBm)	Output Power EIRP (mW)	E-Field Strength (V/m)	E-Field Strength Limit (V/m)	Pass / Fail
19.89	97.499	8.551	61	Pass

5GHz

Output Power EIRP (dBm)	Output Power EIRP (mW)	E-Field Strength (V/m)	E-Field Strength Limit (V/m)	Pass / Fail
22.90	194.984	12.093	61	Pass

For BT-EDR:

Output Power EIRP (dBm)	Output Power EIRP (mW)	E-Field Strength (V/m)	E-Field Strength Limit (V/m)	Pass / Fail
9.84	9.638	2.689	61	Pass

For BT-LE:

Output Power EIRP (dBm)	Output Power EIRP (mW)	E-Field Strength (V/m)	E-Field Strength Limit (V/m)	Pass / Fail
8.15	6.531	2.213	61	Pass

Conclusion:

Both of the WLAN (5GHz) and Bluetooth can transmit simultaneously, the formula of calculated the exposure is:

$$(CEF1 / LEF1)^2 + (CEF2 / LEF2)^2 + \dots \text{etc.} < 1$$

CEF = Calculation E-Field Strength

LEF = Limit of E-Field Strength

Therefore, the calculation of this situation is $(12.093 / 61)^2 + (2.689 / 61)^2 = 0.041$, which is less than the "1" limit.

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