



RF Exposure Evaluation Declaration

FCC ID: TK4WSD377

Applicant: Compex Systems Pte Ltd

Product: 2.4GHz/5GHz WiFi + Bluetooth Combination Module

Model No.: WSD377

Serial No.: WSD377-I, WSD377-EVK

Brand Name: COMPEX

FCC Classification: Spread Spectrum Transmitter(DSS)
Digital Transmission System (DTS)
Unlicensed National Information Infrastructure (NII)

FCC Rule Part(s): FCC Part 2.1091

Result: Complies

Test Date: 2018-12-13 ~ 2018-12-29

Reviewed By:

Jame Yuan

Jame Yuan

Approved By:

Robin Wu

Robin Wu



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
2212RSU005-U5	Rev. 01	Initial Report	2023-01-12	Valid

Note: Based on MRT original report No.1812RSU007-U6, this report adds two new antennas which gain are both less than the max gain of previous antennas, and the antenna type is same. So it has no effect on the results.

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1. General Information

1.1. Applicant

Complex Systems Pte Ltd

No:9 Harrison Road, Harrison Industrial Building, #05-01, Singapore 369651

1.2. Manufacturer

Complex Systems Pte Ltd

No:9 Harrison Road, Harrison Industrial Building, #05-01, Singapore 369651

1.3. Testing Facility

☒	Test Site – MRT Suzhou Laboratory Laboratory Location (Suzhou - Wuzhong) D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China Laboratory Location (Suzhou - SIP) 4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China Laboratory Accreditations A2LA: 3628.01 CNAS: L10551 FCC: CN1166 ISED: CN0001 VCCI: ☐ R-20025 ☐ G-20034 ☐ C-20020 ☐ T-20020 ☐ R-20141 ☐ G-20134 ☐ C-20103 ☐ T-20104
☐	Test Site – MRT Shenzhen Laboratory Laboratory Location (Shenzhen) 1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China Laboratory Accreditations A2LA: 3628.02 CNAS: L10551 FCC: CN1284 ISED: CN0105
☐	Test Site – MRT Taiwan Laboratory Laboratory Location (Taiwan) No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) Laboratory Accreditations TAF: L3261-190725 FCC: 291082, TW3261 ISED: TW3261

1.4. Product Information

Product Name	2.4GHz/5GHz WiFi + Bluetooth Combination Module
Model No.	WSD377
Serial No.	WSD377-I, WSD377-EVK
Wi-Fi Specification	802.11a/b/g/n/ac
Bluetooth Specification	v4.2 single mode
Note: 1. The difference between these models is only for different market. 2. The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.	

1.5. Antenna Details

For original antenna

Polarization	Frequency Band (MHz)	TX Paths	Antenna Gain (dBi)
Omni	2400 ~ 2483.5	1*1	5.0
	5150 ~ 5850	1*1	7.0

For new Antenna

Antenna No.	Model No.	Polarization	Frequency Band (MHz)	TX Paths	Antenna Gain (dBi)
1	MA761.B.BICG.003	Omni	2400 ~ 2483.5	1*1	3.7
			5150 ~ 5850	1*1	5.4
2	WS.03.B.305151	Omni	2400 ~ 2483.5	1*1	2.7
			5150 ~ 5850	1*1	3.2

1.6. Device Classification

According to the user manual, the antenna of this device is at least 20cm away from the body of the user, this device is classified as a Mobile Device. So, the RF exposure evaluation requirements of § 2.1091 for mobile device exposure conditions subject to MPE limits.

2. RF Exposure Evaluation

2.1. Test Limits

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)

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)
(A) Limits for Occupational/ Control Exposures				
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/ Uncontrolled Exposures				
300-1500	--	--	f/1500	6
1500-100,000	--	--	1	30

f= Frequency in MHz

Calculation Formula: $P_d = (P_{out} * G) / (4 * \pi * r^2)$

Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

r = distance between observation point and center of the radiator in cm

P_d is the limit of MPE, 1mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

2.2. Test Result

Product	2.4GHz/5GHz WiFi + Bluetooth Combination Module
Test Item	RF Exposure Evaluation

Antenna Gain: Refer to clause 1.5.

Test Mode	Frequency Band (MHz)	Maximum EIRP (dBm)	Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)
Bluetooth	2402~2480MHz	17.08	0.0102	1
Wi-Fi	2412~2462MHz, 5180~5320MHz, 5500~5700MHz, 5745~5825MHz	23.00	0.0397	1

Conducted power refer to user manual TX power tolerance.

CONCULISON:

The Bluetooth, WLAN 2.4GHz Band, and WLAN 5GHz Band can't transmit simultaneously.

The max Power Density at R (20 cm) = 0.0397mW/cm²< 1mW/cm².

Therefore, the Min Safety Distance is 20cm.

Appendix A - EUT Photograph

Refer to “2212RSU005-UE” file.

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