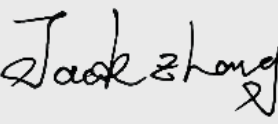




Test report No:
24A0298R-RF-US-P20V01

FCC EXPOSURE TEST REPORT

Product Name	WiFi 7 (802.11be) 2x2 Dual Band Dual Concurrent Wireless Module
Trademark	COMPEX
Model and /or type reference	WLE7002E55, WLTE7002E55, WLTB7002E55
FCC ID	TK4WL7002E55
Applicant's name / address	Compex Systems Pte Ltd No 178 Paya Lebar Road #05-05 Singapore 409030
Test method requested, standard	FCC 47CFR §2.1091
Verdict Summary	IN COMPLIANCE
Documented By (name / position & signature)	Jun Xu/ Project Engineer 
Approved by (name / position & signature)	Jack Zhang/ Manager 
Date of issue	2024-12-27
Report Version	V1.0
Report template No	Template_FCC-MPE-RF-V1.0

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COMPETENCES AND GUARANTEES

DEKRA is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated in the report and it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

DEKRA is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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GENERAL CONDITIONS

Test Location	No. 99, Hongye Road, Suzhou Industrial Park Suzhou, 215006, P.R. China
Date(receive sample)	Aug. 26, 2024
Date (start test)	Aug. 27, 2024
Date (finish test)	Sep. 30, 2024

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or Competent Authorities.
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4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA.

ENVIRONMENTAL CONDITIONS

The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment. The climatic conditions during the tests were within the following limits:

Ambient temperature	15 °C – 35 °C
Relative Humidity air	30% - 60%

If explicitly required in the basic standard or applied product / product family standard the climatic values are recorded and documented separately in this test report.

POSSIBLE TEST CASE VERDICTS

Test case does not apply to test object	N/A
Test object does meet requirement	P (Pass) / PASS
Test object does not meet requirement	F (Fail) / FAIL
Not measured	N/M

ABBREVIATIONS

For the purposes of the present document, the following abbreviations apply:

EUT	: Equipment Under Test
QP	: Quasi-Peak
CAV	: CISPR Average
AV	: Average
CDN	: Coupling Decoupling Network
SAC	: Semi-Anechoic Chamber
OATS	: Open Area Test Site
BW	: Bandwidth
AM	: Amplitude Modulation
PM	: Pulse Modulation
HCP	: Horizontal Coupling Plane
VCP	: Vertical Coupling Plane
U_N	: Nominal voltage
T_x	: Transmitter
R_x	: Receiver
N/A	: Not Applicable
N/M	: Not Measured

DOCUMENT HISTORY

Report No.	Version	Description	Issued Date
24A0298R-RF-US-P20V01	V1.0	Initial issue of report.	2024-12-27

REMARKS AND COMMENTS

1. The equipment under test (EUT) does meet the essential requirements of the stated standard(s)/test(s).
2. These test results on a sample of the device are for the purpose of demonstrating Compliance with FCC 47CFR §2.1091.
3. The measurement result is considered in conformance with the requirement if it is within the prescribed limit, It is not necessary to account the uncertainty associated with the measurement result.
4. The test results relate only to the samples tested.
5. The test report shall not be reproduced without the written approval of DEKRA Testing and Certification (Suzhou) Co., Ltd.
6. This report will not be used for social proof function in China market.
7. DEKRA declines any responsibility with the following test data provided by customer that may affect the validity of result:
 - Chapter 1.1 General Description of the Item(s);
 - Chapter 1.2 Antenna Informaion;

1 GENERAL INFORMATION

1.1 General Description of the Item(s)

Product Name	WiFi 7 (802.11be) 2x2 Dual Band Dual Concurrent Wireless Module
Model No.	WLE7002E55, WLTE7002E55, WLTB7002E55
Trademark.	COMPEX
FCC ID.....	TK4WL7002E55
Hardware Version	V1.0
Software Version	V1.0
Manufacturer.....	Compex Systems Pte Ltd
Manufacturer Address	No 178 Paya Lebar Road #05-05 Singapore 409030
Model difference	Model WLE7002E55, WLTE7002E55 and WLTB7002E55 are identical except for different interfaces.

Wireless specification	WIFI 5G						
Transmit modes	☒	802.11a	☒	802.11n(20MHz)	☒	802.11n(40MHz)	
	☒	802.11ac(20MHz)	☒	802.11ac(40MHz)	☒	802.11ac(80MHz)	
	☒	802.11ac(160MHz)	☒	802.11ax(20MHz)	☒	802.11ax(40MHz)	
	☒	802.11ax(80MHz)	☒	802.11ax(160MHz)	☒	802.11be(20MHz)	
	☒	802.11be(40MHz)	☒	802.11be(80MHz)	☒	802.11be(160MHz)	
Frequency Range	☒	802.11a/n/ac/ax/be(20MHz):5180MHz~5240Mz 802.11n/ac/ax/be(40MHz):5190MHz~5230Mz 802.11ac/ax/be(80MHz):5210Mz					
		☒	Indoor access point				
		☒	Client devices				
		☐	Outdoor access point				
		☐	Fxed point-to-point access points				
	☒	802.11a/n/ac/ax/be(20MHz):5260MHz~5320Mz 802.11n/ac/ax/be(40MHz):5270MHz~5310Mz 802.11ac/ax/be(80MHz):5290Mz 802.11ac/ax/be(160MHz):5250Mz					
	☒	802.11a/n/ac/ax/be(20MHz):5500MHz~5700MHz 802.11n/ac/ax/be(40MHz):5510MHz~5670Mz 802.11ac/ax/be(80MHz):5530~5610Mz 802.11ac/ax/be(160MHz):5570Mz					
	☒	802.11a/n/ac/ax/be(20MHz):5745MHz~5825MHz 802.11n/ac/ax/be(40MHz):5755MHz~5805Mz 802.11ac/ax/be(80MHz):5775Mz					
Number of channels.....	802.11a/n/ac/ax/be(20MHz): 24 802.11n/ac/ax/be(40MHz): 11 802.11ac/ax/be(80MHz): 5 802.11ac/ax/be(160MHz): 2						

Rated power supply	Voltage and Frequency	
	☐	AC: 220 - 240 V, 50/60 Hz
	☐	AC: 100 - 240 V, 50/60 Hz
	☒	DC: 3.3 V
	☐	Poe:
	☐	Adapter:
Mounting position.....	☐	Tabletop equipment
	☐	Wall/Ceiling mounted equipment
	☐	Floor standing equipment
	☐	Hand-held/Portable equipment
	☒	Other: RF Module

1.2 Antenna Informaion

Antenna Set1:

Antenna model / type number.....:	ANT256Q6A-NM					
Antenna Delivery	☒	1TX + 1RX				
	☒	2TX + 2RX				
	☐	Others:				
Antenna technology	☒	SISO				
	☒	MIMO	☒	CDD		
			☒	Beam-forming		
Antenna Type	☒	External	☒	Dipole		
	☐		Sectorized			
	☐	Internal	☐	Ceramic Chip		
			☐	PIFA		
			☐	Others.....		
Antenna Gain	Frequency Range		5150 - 5850 MHz			
	SISO:		Antenna 1	6.0dBi	Antenna 2	6.0dBi
	CDD:		For Power: 6.0dBi		For PSD:9.01 dBi	
	Beam-forming:		For Power: 9.01dBi		For PSD:12.02 dBi	

Antenna Set2:

Antenna model / type number.....:	RFDPA161504IMLB902 RFDPA161517IMLB902					
Antenna Delivery	☒	1TX + 1RX				
	☒	2TX + 2RX				
	☐	Others:				
Antenna technology	☒	SISO				
	☒	MIMO	☒	CDD		
			☒	Beam-forming		
Antenna Type	☒	External	☒	Dipole		
	☐		Sectorized			
	☐	Internal	☐	Ceramic Chip		
			☐	PIFA		
			☐	Others.....		
Antenna Gain	Frequency Range		5150 - 5850 MHz			
	SISO:		Antenna 1	3.98 dBi	Antenna 2	3.98 dBi
	CDD:		For Power: 3.98 dBi		For PSD: 6.99 dBi	
	Beam-forming:		For Power: 6.99 dBi		For PSD: 10.00 dBi	
Antenna difference.....:	The antenna bodies are the same, the only difference is the Cable length.					

Antenna Set3:

Antenna model / type number.....:	CKP-32505-006200-100-RS					
Antenna Delivery	☒	1TX + 1RX				
	☒	2TX + 2RX				
	☐	Others:				
Antenna technology	☒	SISO				
	☒	MIMO	☒	CDD		
			☒	Beam-forming		
Antenna Type	☒	External	☒	Dipole		
			☐	Sectorized		
	☐	Internal	☐	Ceramic Chip		
			☐	PIFA		
			☐	Others.....		
Antenna Gain	Frequency Range		5150 - 5850 MHz			
	SISO:		Antenna 1	4.29 dBi	Antenna 2	4.29 dBi
	CDD:		For Power: 4.29 dBi		For PSD: 7.30 dBi	
	Beam-forming:		For Power: 7.30 dBi		For PSD: 10.31 dBi	

Antenna Set4:

Antenna model / type number.....:	ARY121-0277-005-00 ARY121-0277-006-00					
Antenna Delivery	☒	1TX + 1RX				
	☒	2TX + 2RX				
	☐	Others:				
Antenna technology	☒	SISO				
	☒	MIMO	☒	CDD		
			☒	Beam-forming		
Antenna Type	☒	External	☒	Dipole		
			☐	Sectorized		
	☐	Internal	☐	Ceramic Chip		
			☐	PIFA		
			☐	Others.....		
Antenna Gain	Frequency Range		5150 - 5850 MHz			
	SISO:		Antenna 1	3.68 dBi	Antenna 2	3.68 dBi
	CDD:		For Power: 3.68 dBi		For PSD: 6.69 dBi	
	Beam-forming:		For Power: 6.69 dBi		For PSD: 9.70 dBi	
Antenna difference.....:	The antenna bodies are the same, the only difference is the Cable length.					

Antenna Set5:

Antenna model / type number.....:	ARY121-0277-007-00 ARY121-0277-008-00				
Antenna Delivery	☒	1TX + 1RX			
	☒	2TX + 2RX			
	☐	Others:			
Antenna technology	☒	SISO			
	☒	MIMO	☒	CDD	
			☒	Beam-forming	
Antenna Type	☒	External	☒	Dipole	
			☐	Sectorized	
	☐		Ceramic Chip		
	☐	Internal	☐	PIFA	
			☐	Others.....	
Antenna Gain	Frequency Range		5150 - 5850 MHz		
	SISO:	Antenna 1	3.51 dBi	Antenna 2	3.51dBi
	CDD:	For Power: 3.51 dBi		For PSD: 6.52 dBi	
	Beam-forming:	For Power: 6.52 dBi		For PSD: 9.53 dBi	
Antenna difference.....:	The antenna bodies are the same, the only difference is the Cable length.				

Antenna Set6:

Antenna model / type number.....:	RFDPA161527IM5B901 RFDPA161530IM5B901 RFDPA161507IM5B901 RFDPA161518IM5B901				
Antenna Delivery	☒	1TX + 1RX			
	☒	2TX + 2RX			
	☐	Others:			
Antenna technology	☒	SISO			
	☒	MIMO	☒	CDD	
			☒	Beam-forming	
Antenna Type	☒	External	☒	Dipole	
			☐	Sectorized	
	☐		Ceramic Chip		
	☐	Internal	☐	PIFA	
			☐	Others.....	
Antenna Gain	Frequency Range		5150 - 5850 MHz		
	SISO:	Antenna 1	3.49 dBi	Antenna 2	3.49dBi
	CDD:	For Power: 3.49 dBi		For PSD: 6.50 dBi	
	Beam-forming:	For Power: 6.50 dBi		For PSD: 9.51 dBi	
Antenna difference.....:	The antenna bodies are the same, the only difference is the Cable length.				

Note: The data shown in report was based on ANT256Q6A-NM Antenna which gain is higher.

2. RF Exposure Evaluation

2.1. Limits: KDB 447498 D04

B.2 Blanket 1 mW Blanket Exemption

The 1 mW Blanket Exemption of § 1.1307(b)(3)(i)(A) applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power of no more than 1 mW, regardless of separation distance.

The 1 mW blanket exemption applies at separation distances less than 0.5 cm, including where there is no separation. This exemption shall not be used in conjunction with other exemption criteria other than those for multiple RF sources in paragraph § 1.1307(b)(3)(ii)(A).

The 1 mW exemption is independent of service type and covers the full range of 100 kHz to 100 GHz, but it shall not be used in conjunction with other exemption criteria or in devices with higher-power transmitters operating in the same time-averaging period. Exposure from such higher-power transmitters would invalidate the underlying assumption that exposure from the lower-power transmitter is the only contributor to SAR in the relevant volume of tissue.

B.3 MPE-based Exemption

General frequency and separation-distance dependent MPE-based effective radiated power (ERP) thresholds are in Table B.1 [Table 1 of § 1.1307(b)(1)(i)(C)] to support an exemption from further evaluation from 300 kHz through 100 GHz.

**TABLE B.1—THRESHOLDS FOR SINGLE RF SOURCES
SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION**

RF Source Frequency			Minimum Distance			Threshold ERP
f_L MHz		f_H MHz	$\lambda_L / 2\pi$		$\lambda_H / 2\pi$	W
0.3	—	1.34	159 m	—	35.6 m	1,920 R ²
1.34	—	30	35.6 m	—	1.6 m	3,450 R ² /f ²
30	—	300	1.6 m	—	159 mm	3.83 R ²
300	—	1,500	159 mm	—	31.8 mm	0.0128 R ² f
1,500	—	100,000	31.8 mm	—	0.5 mm	19.2R ²
Subscripts L and H are low and high; λ is wavelength. From § 1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns.						

The table applies to any RF source (i.e., single fixed, mobile, and portable transmitters) and specifies power and distance criteria for each of the five frequency ranges used for the MPE limits. These criteria apply at separation distances from any part of the radiating structure of at

least $\lambda/2\pi$. The thresholds are based on the general population MPE limits with a single perfect reflection, outside of the reactive near-field, and in the main beam of the radiator.

For mobile devices that are not exempt per Table B.1 [Table 1 of § 1.1307(b)(1)(i)(C)] at distances from 20 cm to 40 cm and in 0.3 GHz to 6 GHz, evaluation of compliance with the exposure limits in § 1.1310 is necessary if the ERP of the device is greater than ERP_{20cm} in Formula (B.1) [repeated from § 2.1091(c)(1) and § 1.1307(b)(1)(i)(B)].

$$P_{th} \text{ (mW)} = ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases} \quad (\text{B.1})$$

If the ERP is not easily obtained, then the available maximum time-averaged power may be used (i.e., without consideration of ERP only if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole.

SAR-based exemptions are constant at separation distances between 20 cm and 40 cm to avoid discontinuities in the threshold when transitioning between SAR-based and MPE-based exemption criteria at 40 cm, considering the importance of reflections.

B.4 SAR-based Exemption

SAR-based thresholds are derived based on frequency, power, and separation distance of the RF source. The formula defines the thresholds in general for either available maximum time-averaged power or maximum time-averaged ERP, whichever is greater.

If the ERP of a device is not easily determined, such as for a portable device with a small form factor, the applicant may use the available maximum time-averaged power exclusively if the device antenna or radiating structure does not exceed an electrical length of $\lambda/4$.

As for devices with antennas of length greater than $\lambda/4$ where the gain is not well defined, but always less than that of a half-wave dipole (length $\lambda/2$), the available maximum time-averaged power generated by the device may be used in place of the maximum time-averaged ERP, where that value is not known.

The separation distance is the smallest distance from any part of the antenna or radiating structure for all persons, during operation at the applicable ERP. In the case of mobile or portable devices, the separation distance is from the outer housing of the device where it is closest to the antenna.

The SAR-based exemption formula of § 1.1307(b)(3)(i)(B), repeated here as Formula (B.2), applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power or effective radiated power (ERP), whichever is greater, of less than or equal to the threshold P_{th} (mW).

This method shall only be used at separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by Formula (B.2).

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right)$$

and f is in GHz, d is the separation distance (cm), and $ERP_{20\text{cm}}$ is per Formula (B.1).

The example values shown in Table B.2 are for illustration only.

Table B.2—Example Power Thresholds (mW)

Frequency (MHz)	Distance (mm)										
		5	10	15	20	25	30	35	40	45	50
	300	39	65	88	110	129	148	166	184	201	217
	450	22	44	67	89	112	135	158	180	203	226
	835	9	25	44	66	90	116	145	175	207	240
	1900	3	12	26	44	66	92	122	157	195	236
	2450	3	10	22	38	59	83	111	143	179	219
	3600	2	8	18	32	49	71	96	125	158	195
	5800	1	6	14	25	40	58	80	106	136	169

Simultaneous Transmission SAR Test Exemption with Respect to Multiple Exemption Criteria

Either SAR-based or MPE-based exemption may be considered for test exemption for fixed, mobile, or portable device exposure conditions; therefore, the contributions from each exemption in conjunction with the measured SAR (Evaluated_k term) shall be used to determine exemption for simultaneous transmission according to Formula (C.1) [repeated from § 1.1307(b)(3)(ii)(B)].

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1 \quad (C.1)$$

- a. number of fixed, mobile, or portable RF sources claiming exemption using the § 1.1307(b)(3)(i)(B) formula for P_{th} , including existing exempt transmitters and those being added.
- b. number of fixed, mobile, or portable RF sources claiming exemption using the applicable § 1.1307(b)(3)(i)(C) Table 1 formula for Threshold ERP, including existing exempt transmitters and those being added.
- c. number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance.

P_i = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source i at a distance between 0.5 cm and 40 cm (inclusive).

$P_{th, i}$ the exemption threshold power (P_{th}) according to the § 1.1307(b)(3)(i)(B) formula for fixed, mobile, or portable RF source i .

ERP_j the available maximum time-averaged power or the ERP, whichever is greater, of fixed, mobile, or portable RF source j .

$ERP_{th, j}$ exemption threshold ERP for fixed, mobile, or portable RF source j , at a distance of at least $\lambda/2\pi$, according to the applicable § 1.1307(b)(3)(i)(C) Table 1 formula at the location in question.

$Evaluated_k$ the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation.

Exposure

$Limit_k$ either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable sources, as applicable

The sum of the ratios of the applicable terms for SAR-based, MPE-based and measured SAR or MPE shall be less than 1, to determine simultaneous transmission exposure compliance.

2.2. Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

The temperature and related humidity: 18°C and 78% RH.

2.3. Test Result of RF Exposure Evaluation

Product	:	WiFi 7 (802.11be) 2x2 Dual Band Dual Concurrent Wireless Module
Test Item	:	RF Exposure Evaluation
Test Site	:	AC-6

B.2 Blanket 1 mW Blanket Exemption

Test Mode	Frequency Band (MHz)	Maximum conducted Power (dBm)	Maximum ERP Power (dBm)	Maximum Power (mW)	Limit (mW)	Result
5.1-5.3G WIFI	5180 ~ 5320	19.72	23.57	227.5	1	Not applicable
5.5-5.8G WIFI	5500~ 5825	20.28	24.13	258.8	1	Not applicable

Note: 5G WIFI does not comply with B.2 Blanket 1 mW Blanket Exemption, we use B.3 MPE-based Exemption for evaluation.

B.3 MPE-based Exemption

Test Mode	Frequency Band (MHz)	Maximum conducted Power (dBm)	Maximum ERP Power (dBm)	Maximum Power (mW)	R (cm)	Limit (mW)	Result
5.1-5.3G WIFI	5180 ~ 5320	19.72	23.57	227.5	20	768	Pass
5.5-5.8G WIFI	5500~ 5825	20.28	24.13	258.8	20	768	Pass

Power Density:**Standalone modes:**

Test Mode	Frequency Band (MHz)	Maximum conducted Power (dBm)	Maximum ERP Power (dBm)	Power Density at R = 20 cm (W/m ²)	Power Density Limit (W/m ²)	Result
5.1-5.3G WIFI	5180 ~ 5320	19.72	23.57	0.453	10	Pass
5.5-5.8G WIFI	5500~ 5825	20.28	24.13	0.515	10	Pass

Simultaneous transmission:5.1~5.3G WIFI + 5.5~5.8G WIFI

Wireless Configure	Frequency Range (MHz)	Maximum conducted Power (dBm)	Maximum ERP Power (dBm)	Limit of Power Density S(W/cm ²)	Power Density S at R = 20cm (W/m ²)	Rate	Limit	Result
5.1-5.3G WIFI	5180 ~ 5320	19.72	23.57	10	0.045	0.097	1	Pass
5.5-5.8G WIFI	5500~ 5825	20.28	24.13	10	0.052			

Note: So the safe use distance of the EUT is 20cm, without any other radio equipment.

_____ The End _____