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Report No.: TMWK2405001448KS

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Page 1 / 14
Rev.: 00

RF Exposure Evaluation Report

FCC 47 CFR § 2.1091

for
802.11b/g/n + BT 5.4 Module

Model: WM-CW-26

Prepared for:

Universal Global Scientific Industrial Co., Ltd.

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Prepared by

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Report No.: TMWK2405001448KS

Page 2 / 14
Rev.: 00

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	June 17, 2024	Initial Issue	ALL	Peggy Tsai



Report No.: TMWK2405001448KS

Page 3 / 14
Rev.: 00

Table of Contents

1	ATTESTATION OF TEST RESULTS	4
2	TEST SPECIFICATION, METHODS AND PROCEDURES	5
3	DEVICE UNDER TEST (DUT) INFORMATION	6
3.1	DUT DESCRIPTION	6
3.2	WIRELESS TECHNOLOGIES	7
4	MAXIMUM PERMISSIBLE EXPOSURE	8
4.1	LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)	8
4.2	MPE CALCULATION METHOD	9
4.3	MPE EXEMPTION	10
4.4	MULTIPLE RF SOURCES	11
5	MPE EXEMPTION OPTION B	12
6	SIMULTANEOUS TRANSMISSION ANALYSIS	13
6.1	SUM OF THE WIFI 2.4GHZ + BLUETOOTH	13
7	FACILITIES	14



Report No.: TMWK2405001448KS

Page 4 / 14
Rev.: 00

1 Attestation of Test Results

Applicant	Universal Global Scientific Industrial Co., Ltd. No. 141, Lane 351, Sec.1, Taiping Road, Tsaotuen, Nantou County, 542007, Taiwan
Manufacturer	Universal Global Scientific Industrial Co., Ltd. No. 141, Lane 351, Sec.1, Taiping Road, Tsaotuen, Nantou County, 542007, Taiwan
Model Name	WM-CW-26
Applicable Standards	FCC 47 CFR § 2.1091 FCC 47 CFR § 1.1307 FCC 47 CFR § 1.1310 Published RF exposure KDB procedures
Receive EUT Date:	May 3, 2024
Compliance Certification Services Inc. , tested the above equipment in accordance with the requirements set forth in the above standards. Determination of compliance is based on the results of the compliance measurement,not taking into account measurement instrumentation uncertainty.All indications of Pass/Fail in this report are opinions expressed by Compliance Certification Services Inc, based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.	
Approved & Released By: 	
Sky Zhou Asst. Section Manager	



Report No.: TMWK2405001448KS

Page 5 / 14

Rev.: 00

2 Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1091, the following FCC Published RF exposure [KDB](#) procedures:

- 447498 D04 Interim General RF Exposure Guidance v01
- 865664 D02 RF Exposure Reporting v01r02



Report No.: TMWK2405001448KS

Page 6 / 14
Rev.: 00

3 Device Under Test (DUT) Information

3.1 DUT Description

Product	802.11b/g/n + BT 5.4 Module
Trade Name	USI
Model No.	WM-CW-26
Model Discrepancy	N/A
EUT Serial #	85016008120124030700001032
Software Version	v7.95.55
Hardware Version	v1.0
Sample Stage	Identical prototype

3.2 Wireless Technologies

Frequency bands	☒ Bluetooth: 2402MHz-2480MHz ☒ 802.11b/g/n HT20: 2412MHz ~ 2462 MHz ☐ 802.11n HT40/ac VHT40/ax HE40: 2422MHz ~ 2452MHz ☐ 802.11a/n HT20: 5180MHz ~ 5240MHz / 5260MHz ~ 5320MHz / 5500MHz ~ 5700MHz / 5745MHz ~ 5825MHz ☐ 802.11ac VHT20: 5180MHz ~ 5240MHz / 5260MHz ~ 5320MHz / 5500MHz ~ 5700MHz / 5745MHz ~ 5825MHz ☐ 802.11ax HE20: 5180MHz ~ 5240MHz / 5260MHz ~ 5320MHz / 5500MHz ~ 5700MHz / 5745MHz ~ 5825MHz ☐ 802.11n HT40: 5190MHz ~ 5230MHz / 5270MHz ~ 5310MHz / 5510MHz ~ 5670MHz / 5755MHz ~ 5795MHz ☐ 802.11ac VHT40: 5190MHz ~ 5230MHz / 5270MHz ~ 5310MHz / 5510MHz ~ 5670MHz / 5755MHz ~ 5795MHz ☐ 802.11ax HE40: 5190MHz ~ 5230MHz / 5270MHz ~ 5310MHz / 5510MHz ~ 5670MHz / 5755MHz ~ 5795MHz ☐ 802.11ac VHT80: 5210MHz / 5290MHz / 5530MHz ~ 5610MHz / 5775MHz ☐ 802.11ax HE80: 5210MHz / 5290MHz / 5530MHz ~ 5610MHz / 5775MHz ☐ Others																	
Exposure classification	☐ Occupational/Controlled exposure ☒ General Population/Uncontrolled exposure																	
Antenna Specification	Type: Ceramic Chip Antenna Yageo / ANT3216LL11R2400A BT: Gain: 3.68 dBi WIFI 2.4G: Gain: 3.68 dBi <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">BT:</td> <td style="width: 30%;">Antenna Gain :</td> <td style="width: 20%;">3.68 dBi</td> <td style="width: 20%;">(Numeric gain: 2.33)</td> <td style="width: 10%;">Worst</td> </tr> <tr> <td>2.4GHz:</td> <td>Antenna Gain:</td> <td>3.68 dBi</td> <td>(Numeric gain: 2.33)</td> <td>Worst</td> </tr> </table>			BT:	Antenna Gain :	3.68 dBi	(Numeric gain: 2.33)	Worst	2.4GHz:	Antenna Gain:	3.68 dBi	(Numeric gain: 2.33)	Worst					
BT:	Antenna Gain :	3.68 dBi	(Numeric gain: 2.33)	Worst														
2.4GHz:	Antenna Gain:	3.68 dBi	(Numeric gain: 2.33)	Worst														
Maximum Tune up power	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%;">BT</td> <td style="width: 20%;">9.50 dBm</td> <td style="width: 40%;">(8.913 mW)</td> </tr> <tr> <td>BLE</td> <td>8.50 dBm</td> <td>(7.08 mW)</td> </tr> </table> 2.4GHz <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%;">IEEE 802.11b</td> <td style="width: 20%;">21.50 dBm</td> <td style="width: 40%;">(141.254 mW)</td> </tr> <tr> <td>IEEE 802.11g</td> <td>19.00 dBm</td> <td>(79.433 mW)</td> </tr> <tr> <td>IEEE 802.11n HT 20</td> <td>19.00 dBm</td> <td>(79.43 mW)</td> </tr> </table>			BT	9.50 dBm	(8.913 mW)	BLE	8.50 dBm	(7.08 mW)	IEEE 802.11b	21.50 dBm	(141.254 mW)	IEEE 802.11g	19.00 dBm	(79.433 mW)	IEEE 802.11n HT 20	19.00 dBm	(79.43 mW)
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Notes:

- For more details, please refer to the User's manual of the EUT.
- Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.
- The power referred the Tune up power of the test report TMWK2405001446KR, TMWK2405001447KR and TMWK2405001737KR for RF Exposure assessment purpose.

4 Maximum Permissible Exposure

4.1 Limits for Maximum Permissible Exposure (MPE)

Table 1 - Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	* 100	6
3.0-30	1842/f	4.89/f	* 900/f ²	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	* 100	30
1.34-30	824/f	2.19/f	* 180/f ²	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
<u>1,500-100,000</u>			1.0	30

4.2 MPE Calculation Method

Calculation

Given $E = \frac{\sqrt{30 \times P \times G}}{d}$ & $S = \frac{E^2}{377}$

Where E = Field strength in Volts / meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{377 d^2}$$

Changing to units of mW and cm, using:

$$P \text{ (mW)} = P \text{ (W)} / 1000 \text{ and}$$

$$d \text{ (cm)} = d \text{ (m)} / 100$$

Yields

$$S = \frac{30 \times (P/1000) \times G}{377 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2} \text{ Equation 1}$$

Where d = Distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power density in mW / cm²

If, Substituting the MPE safe distance using d = 20 cm into Equation 1:

$$S = 0.000199 \times P \times G$$

4.3 MPE EXEMPTION

- (A) The available maximum time-averaged power is no more than 1 mW
- (B) The available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by:

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

Where

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

and

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

d = the separation distance (cm);

- (C) Using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP 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 (1.64 linear value).

Single RF Sources Subject to Routine Environmental Evaluation	
RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$.
1.34-30	$3,450 R^2/f^2$.
30-300	$3.83 R^2$.
300-1,500	$0.0128 R^2 f$.
1,500-100,000	$19.2 R^2$.
Note: R is in meters, f is in MHz.	

4.4 Multiple RF sources

In the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation),

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



Report No.: TMWK2405001448KS

Page 12 / 14

Rev.: 00

5 MPE Exemption Option B

Bluetooth

Mode	Frequency (MHz)	R(m)	Max Tune-up power (dBm)	G(dBi)	Max Tune-up EIRP (dBm)	Max Tune-up ERP (dBm)	Max Tune-up ERP (mW)	ERP Threshold (mW)	MPE Exemption
BT	2480	0.2	9.5	3.68	13.18	11.03	12.677	3060	Complies
BLE	2480	0.2	8.5	3.68	12.18	10.03	10.069	3060	Complies

WIFI 2.4GHz (DTS)

Mode	Frequency (MHz)	R(m)	Max Tune-up power (dBm)	G(dBi)	Max Tune-up EIRP (dBm)	Max Tune-up ERP (dBm)	Max Tune-up ERP (mW)	ERP Threshold (mW)	MPE Exemption
IEEE 802.11b	2447	0.2	21.5	3.68	25.18	23.03	200.909	3060	Complies
IEEE 802.11g	2442	0.2	19.0	3.68	22.68	20.53	112.980	3060	Complies
IEEE 802.11n HT 20	2442	0.2	19.0	3.68	22.68	20.53	112.980	3060	Complies

6 Simultaneous Transmission Analysis

In the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation),

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

Simultaneous Transmission Condition

RF Exposure Condition	Item	Capable Transmit Configurations	
	1	DTS	+ BT

6.1 Sum of the WIFI 2.4GHz + Bluetooth

WiFi 2.4GHz + Bluetooth

Mode	Frequency (MHz)	Max Tune-up ERP(mW)	ERP Threshold(mW)	simultaneous Transmission	simultaneous Transmission Limit
WiFi 2.4GHz	2447	200.909	3060	0.07	≤1
Bluetooth	2480	12.677	3060		



Report No.: TMWK2405001448KS

Page 14 / 14

Rev.: 00

7 Facilities

All measurement facilities used to collect the measurement data are located at

☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan.

☐ No. 12, Ln. 116, Wugong 3rd Rd., Wugu Dist., New Taipei City, Taiwan.

--End of Test Report--