Testing Laboratory
3787

RADIO EXPOSURE TEST REPORT

FCC ID	:	2AHKM-CODA45893A
Equipment	:	DOCSIS 3.1 WiFi Emta
Brand Name	:	Hitron
Model Name	:	CODA-4589, CODA-4582
Applicant	:	Hitron Technologies Inc. No. 1-8, Li-Hsin 1st Rd. Hsinchu Science Park, Hsinchu 30078, Taiwan
Manufacturer	:	Hitron Technologies Inc. No. 1-8, Li-Hsin 1st Rd. Hsinchu Science Park, Hsinchu 30078, Taiwan
Standard	:	47 CFR Part 2.1091

The product was received on Nov. 26, 2021, and testing was started from Mar. 04, 2022 and completed on Apr. 28, 2022. We, Sporton International Inc. Hsinchu Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in 47 CFR Part 2.1091 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. Hsinchu Laboratory, the test report shall not be reproduced except in full.

Approved by: Sam Chen

Sporton International Inc. Hsinchu Laboratory
No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)

Table of Contents

History of this test report

Report No.	Version	Description	Issued Date
FA1N2619	01	Initial issue of report	Jun. 02, 2022

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
2	-	Exposure evaluation	PASS	-

Declaration of Conformity:
1. The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results. 2. The measurement uncertainty please refer to report "Measurement Uncertainty".
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Sam Chen

Report Producer: Viola Huang

1 General Description

1.1 EUT General Information

RF General Information			
Evaluation Mode	**Frequency Range (MHz)**	**Operating Frequency (MHz)**	**Modulation Type**
2.4GHz WLAN	2400-2483.5	2412-2462	802.11b: DSSS (DBPSK, DQPSK, CCK) 802.11g/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) VHT: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
5GHz WLAN	5150-5250 5250-5350 5470-5725 5725-5850	5180-5240 5260-5320 5500-5720 5745-5825	802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)

1.2 Antenna Information

Ant.	2.4GHz	5GHz	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	1	-	Airgain	M2420SLO-T10-B50U	PCB Antenna	I-PEX	Note 1
2	2	-	Airgain	M2410CM-T6-B115UR1	PCB Antenna	I-PEX	
3	3	-	Airgain	M2420SLO-T6-B85U	PCB Antenna	I-PEX	
4	-	1	Airgain	M5X05C-T6-G120UR2	PCB Antenna	I-PEX	
5	-	2	Airgain	M5X05C-T6-G110UR3	PCB Antenna	I-PEX	
6	-	3	Airgain	M5X05C-T6-G40UR2	PCB Antenna	I-PEX	
7	-	4	Airgain	M5X05C-T6-G60UR1	PCB Antenna	I-PEX	

Note 1:

Ant.	Antenna Gain (dBi)						
	WLAN 2.4GHz			WLAN 5GHz			
	2.4GHz	2.45GHz	2.4835GHz	UNII 1	UNII 2A	UNII 2C	UNII 3
1	3.8	4.29	4.5	-	-	-	-
2	3.98	3.94	3.74	-	-	-	-
3	3.68	4.3	4.25	-	-	-	-
4	-	-	-	2.47	3.22	1.61	1.58
5	-	-	-	3.29	3.13	2.57	2.6
6	-	-	-	5.07	5.49	2.82	4.28
7	-	-	-	2.2	3.08	1.2	1.19

Ant.	Directional Gain (dBi)					
	WLAN 2.4GHz					
	2.4GHz		2.45GHz		2.4835GHz	
	3T1S	3T3S	3T1S	3T3S	3T1S	3T3S
1	5.48	1.27	5.67	1.43	5.28	1.52
2						
3						

Ant.	Directional Gain (dBi)											
	WLAN 5GHz											
	UNII 1			UNII 2A			UNII 2C			UNII 3		
	4T1S	4T2S	4T4S	4T1S	4T2S	4T4S	4T1S	4T2S	4T4S	4T1S	4T2S	4T4S
4	6.43	5.07	1.26	6.54	5.49	1.6	5.68	2.82	0.32	5.98	4.28	0
5												
6												
7												

Note 2: The above information was declared by manufacturer.
Note 3: The EUT has seven antennas.
Note 4: The directional gain is measured which follows the procedure of KDB 662911 D03.
The antenna report is provided in the operational description for this application.

For 2.4GHz:
For IEEE 802.11b/g/n/VHT mode (3TX/3RX):
Port 1, Port 2, Port 3 can be used as transmitting/receiving antenna.
Port 1, Port 2, Port 3 could transmit/receive simultaneously.
For 5GHz:
For IEEE 802.11a/n/ac mode (4TX/4RX):
Port 1, Port 2, Port 3, Port 4 can be used as transmitting/receiving antenna.
Port 1, Port 2, Port 3, Port 4 could transmit/receive simultaneously.

1.3 Table for Multiple Listing

The model names in the following table are all refer to the identical product.

Brand Name	Model Name	VOIP Function
Hitron	CODA-4589	V
	CODA-4582	X

Note 1: From the above models, model: CODA-4589 was selected as representative model for the test and its data was recorded in this report.

Note 2: The above information was declared by manufacturer.

1.4 Table of FEM Information

EUT	Source	2.4GHz		5GHz	
		Brand Name	Model Name	Brand Name	Model Name
1	Main	Richwave	RTC66226	Richwave	RTC7635
2	Second	Skyworks	SKY85340-11	Skyworks	SKY85735-11

Note 1: The above information was declared by manufacturer.

Note 2: FEM means Front End Module.

1.5 Accessories

Accessories
Power cable*1: Non-shielded, 1.2m
RJ-45 cable*1: Non-shielded, 1.5m

1.6 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR Part 2.1091
- KDB 447498 D04 Interim General RF Exposure Guidance v01

The following reference test guidance is not within the scope of accreditation of TAF.

- 47 CFR Part 1.1307
- 47 CFR Part 1.1310

1.7 Testing Location

Testing Location Information		
Test Lab.：Sporton International Inc. Hsinchu Laboratory		
Hsinchu	ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)	
(TAF: 3787)	TEL: 886-3-656-9065	FAX: 886-3-656-9085
	Test site Designation No. TW3787 with FCC.	
	Conformity Assessment Body Identifier (CABID) TW3787 with ISED.	

2 Maximum Permissible Exposure

2.1 Limit of Maximum Permissible Exposure

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm²)	Averaging Time |E|²,|H|² or S (minutes)
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
300-1500	-	-	f/300	<6
1500-100,000	-	-	5	<6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm²)	Averaging Time |E|²,|H|² or S (minutes)
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
300-1500	-	-	f/1500	<30
1500-100,000	-	-	1.0	<30

Note: f = frequency in MHz ; *Plane-wave equivalent power density

2.2 MPE Calculation Method

The MPE was calculated at 47 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

E (V/m) = $\frac{\sqrt{30 \times P \times G}}{d}$ Power Density: *Pd* (W/m²) = $\frac{E^2}{377}$

E = Electric field (V/m)

P = RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

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

2.3 MPE Exemption

Option (A): 1.1307(b)(3)(i)(A): Available maximum time-averaged power is < 1 mW

Option (B): 1.1307(b)(3)(i)(B): Device operates between 300 MHz and 6 GHz and the maximum time-averaged power or effective radiated power (ERP), whichever is greater, <= Pth.

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

Where

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

and

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

d = the separation distance (cm);

Option (C): 1.1307(b)(3)(i)(C): ERP is below a threshold calculated based on the distance R between the person and the antenna / radiating structure, where R > λ / 2 π.

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^2f.
1,500-100,000	19.2R^2.
Note: R is in meters, f is in MHz.	

2.4 Calculated Result and Limit

Exposure Environment: General Population / Uncontrolled Exposure

For EUT 1

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm^2)	S Limit (mW/cm^2)
2.4G;D1D	5.67	28.05	33.72	0.50	34.22	2.64241	47	0.09519	1.00000
5.2G;D1D	6.43	29.55	35.98	0.01	35.99	3.97192	47	0.14308	1.00000
5.3G;D1D	6.54	23.19	29.73	0.26	29.99	0.99770	47	0.03594	1.00000
5.6G;D1D	5.68	23.96	29.64	0.35	29.99	0.99770	47	0.03594	1.00000
5.8G;D1D	5.98	29.55	35.53	0.46	35.99	3.97192	47	0.14308	1.00000

For EUT 2

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm^2)	S Limit (mW/cm^2)
2.4G;D1D	5.67	28.77	34.44	0.50	34.94	3.11889	47	0.11235	1.00000
5.2G;D1D	6.43	28.83	35.26	0.50	35.76	3.76704	47	0.13570	1.00000
5.3G;D1D	6.54	23.19	29.73	0.26	29.99	0.99770	47	0.03594	1.00000
5.6G;D1D	5.68	23.96	29.64	0.35	29.99	0.99770	47	0.03594	1.00000
5.8G;D1D	5.98	29.20	35.18	0.50	35.68	3.69828	47	0.13322	1.00000

For EUT 1

MPE Exemption Option C							
Frequency (MHz)	λ/2π (m)	R (m)	Tune-up EIRP (dBm)	Tune-up ERP (dBm)	Tune-up ERP (W)	ERP Threshold (W)	MPE Exemption
2437	0.0196	0.47	34.22	32.07	1.611	4.241	Complies
5230	0.0091		35.99	33.84	2.421	4.241	Complies
5270	0.0091		29.99	27.84	0.608	4.241	Complies
5550	0.0086		29.99	27.84	0.608	4.241	Complies
5785	0.0082		35.99	33.84	2.421	4.241	Complies

For EUT 2

MPE Exemption Option C							
Frequency (MHz)	λ/2π (m)	R (m)	Tune-up EIRP (dBm)	Tune-up ERP (dBm)	Tune-up ERP (W)	ERP Threshold (W)	MPE Exemption
2437	0.0196	0.47	34.94	32.79	1.901	4.241	Complies
5240	0.0091		35.76	33.61	2.296	4.241	Complies
5270	0.0091		29.99	27.84	0.608	4.241	Complies
5710	0.0084		29.99	27.84	0.608	4.241	Complies
5825	0.0082		35.68	33.53	2.254	4.241	Complies

Simultaneous Transmission Analysis Mode:

EUT 1 - WLAN 2.4GHz + WLAN 5GHz

Simultaneous Transmissions Option C							
Frequency (MHz)	R (m)	Tune-up EIRP (dBm)	Tune-up ERP (dBm)	Tune-up ERP (W)	ERP Threshold (W)	Simultaneous Transmissions	Simultaneous Transmissions Limit
2437	0.47	34.22	32.07	1.611	4.241	0.95	<= 1
5230		35.99	33.84	2.421	4.241		

EUT 2 - WLAN 2.4GHz + WLAN 5GHz

Simultaneous Transmissions Option C							
Frequency (MHz)	R (m)	Tune-up EIRP (dBm)	Tune-up ERP (dBm)	Tune-up ERP (W)	ERP Threshold (W)	Simultaneous Transmissions	Simultaneous Transmissions Limit
2437	0.47	34.94	32.79	1.901	4.241	0.99	<= 1
5240		35.76	33.61	2.296	4.241		

THE END