MPE Report

Applicant	:	Emplus Technologies, Inc
Product Type	:	Dual Radio Concurrent AP
Trade Name	:	emplus
Model Number	:	WAP655-C
Test Specification	:	ANSI / IEEE Std.C95.1-1992 / IEEE Std. 1528-2013 47 CFR § 2.1091 47 CFR § 1.1310
Received Date	:	Apr. 02, 2019
Test Period	:	May 03, 2019
Issue Date	:	Aug. 06, 2019
Test Firm MRA designation number	:	TW0010

Issue by

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Taiwan Accreditation Foundation accreditation number: 1330

Note:

1.The test results are valid only for samples provided by customers and under the test conditions described in this report.
2.This report shall not be reproduced except in full, without the written approval of A Test Lab Technology Corporation.
3.The relevant information is provided by customers in this test report. According to the correctness, appropriateness

Revision History

Rev.	Issue Date	Revisions	Revised By
00	Jul. 22, 2019	Initial Issue	Jennifer Liu
01	Aug. 06, 2019	Page 5 Revised Antenna Information. Page 9 Revised Test Results Frequency.	Jennifer Liu

Contents

1. Reference Testing Standards

Standard	Description	Version
ANSI/IEEE C95.1	American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 300 KHz to 100 GHz, New York.	2005

2. Description of Equipment under Test (EUT)

Applicant	Emplus Technologies, Inc Bld B, 10F, No.209 Nangang Rd., Taipei City, Taiwan					
Manufacturer	Emplus Technologies, Inc Bld B, 10F, No.209 Nangang Rd., Taipei City, Taiwan					
Product Type	Dual Radio Concurrent AP					
Trade Name	emplus					
Model Number	WAP655-C					
FCC ID	2AL6XWAP655					
Frequency Range	Operate Band				Frequency Range (MHz)	
	IEEE 802.11b / 802.11g IEEE 802.11n 2.4 GHz 20 MHz (64QAM/256QAM)				2412 - 2462	
	IEEE 802.11n 2.4 GHz 40 MHz (64QAM/256QAM)				2422 - 2452	
	IEEE 802.11a U-NII Band I				5180 - 5240	
	IEEE 802.11a U-NII Band III				5745 - 5825	
	IEEE 802.11n 5 GHz / 802.11ac 20 MHz U-NII Band I				5180 - 5240	
	IEEE 802.11n 5 GHz / 802.11ac 20 MHz U-NII Band III				5745 - 5825	
	IEEE 802.11n 5 GHz / 802.11ac 40 MHz U-NII Band I				5190 - 5230	
	IEEE 802.11n 5 GHz / 802.11ac 40 MHz U-NII Band III				5755 - 5795	
	IEEE 802.11ac 80 MHz U-NII Band I				5210	
	IEEE 802.11ac 80 MHz U-NII Band III				5775	
Antenna Information	Band	Antenna	Model	Type	Frequency (MHz)	Max. Gain (dBi)
	2.4 GHz	ANT-0	5718A0382300	Metal PIFA Antenna	2412-2462	3.54
		ANT-1	5718A0382300	Metal PIFA Antenna	2412-2462	3.55
		G_{ANT}				3.55
		Directional Gain				6.56
	5 GHz	ANT-0	5718A0382300	Metal PIFA Antenna	5150-5250	5.28
					5725-5850	4.85
		ANT-1	5718A0382300	Metal PIFA Antenna	5150-5250	5.70
					5725-5850	4.46
		G_{ANT}			5150-5250	5.50
					5725-5850	4.66
		Directional Gain			5150-5250	8.50
					5725-5850	7.67
Antenna Delivery	IEEE 802.11b / IEEE 802.11g: 2TX (CDD) IEEE 802.11n 2.4GHz 20 MHz / 40 MHz: 2TX (STBC/Beamforming on) IEEE 802.11a: 2TX (CDD) IEEE 802.11ac 20 MHz / 40 MHz / 80 MHz: 2TX (STBC /Beamforming on)					
RF Evaluation	0.315 mW/cm^2					
Temperature Range	-20 ~ +65°C					

The above equipment was tested by A Test Lab Techno Corp. For compliance with the requirements set forth in 47 CFR § 2.1091 / 47 CFR § 1.1310. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties

3. Human Exposure Assessment

Due to the design and installation of this product, it is not possible to conduct SAR evaluation. This is because client either manufactures or supplies the antenna(s) that will be used in the installation of this product. Therefore, this product will be evaluated as a mobile device per 47 CFR § 1.1310 titled “Radiofrequency radiation exposure limits”, generally referred to as MPE limits.

In 47 CFR § 2.1091, paragraph (b) defines a mobile device as “a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 cm is normally maintained between the transmitter’s radiating structure(s) and the body of the user or nearby persons. ” This product is intended to be installed into a vehicle such that the unit is physically secured at one location. In the installation guide supplied with the product,

Client has made the following statement: “IMPORTANT: To meet the FCC’s RF Exposure Guidelines, the antenna should be installed so there is at least 20 cm of separation between the body of the user and nearby persons and the antenna”. Based on the installation of the transceiver and the antenna, the transmitters radiating structure is more than 20 cm from the user. Thus, this product is a “mobile device” as defined in section § 2.1091 paragraph (b).

Exposure evaluation
$$S = \frac{PG}{4\pi R^2}$$ Where   S: power density   P: power input to the antenna   G: power gain of the antenna in the direction of interest relative to an isotropic radiator.   R: distance to the center of radiation of the antenna.

4. RF Output Power

The conducted power turn-up tolerance reference manufacturer specification.

Band	Date Rate (Mbps)	Frequency (MHz)	Average Conducted power (dBm)		
			ANT-0	ANT-1	ANT-0+1
IEEE 802.11b	1M	2412.0	21.40	21.17	**24.30**
		2437.0	19.85	19.55	22.71
		2462.0	21.12	20.88	24.01
IEEE 802.11g	6M	2412.0	17.19	17.31	20.26
		2437.0	21.71	21.75	**24.74**
		2462.0	17.36	17.41	20.40
IEEE 802.11n 2.4 GHz 20 MHz (64QAM/256QAM)	13M	2412.0	16.31	16.41	19.37
		2437.0	20.89	20.92	**23.92**
		2462.0	16.44	16.52	19.49
IEEE 802.11n 2.4 GHz 40 MHz (64QAM/256QAM)	27M	2422.0	14.67	14.58	17.64
		2437.0	16.40	16.57	**19.50**
		2452.0	14.81	14.61	17.72
IEEE 802.11a	6M	5180.0	12.32	12.06	15.20
		5200.0	12.41	12.08	15.26
		5220.0	12.44	12.11	15.29
		5240.0	12.46	12.24	**15.36**
		5745.0	20.74	21.08	23.92
		5765.0	20.71	21.12	**23.93**
		5785.0	20.74	21.09	23.93
		5805.0	20.76	21.05	23.92
		5825.0	20.73	21.11	23.93
IEEE 802.11ac 20 MHz	13M	5180.0	12.52	12.18	15.36
		5200.0	12.42	12.07	15.26
		5220.0	12.45	12.21	15.34
		5240.0	12.42	12.31	**15.38**
		5745.0	20.71	21.15	23.95
		5765.0	20.74	21.14	23.95
		5785.0	20.73	21.19	23.98
		5805.0	20.81	21.21	**24.02**
		5825.0	20.76	21.12	23.95
IEEE 802.11ac 40 MHz	27M	5190.0	12.32	12.05	15.20
		5230.0	12.31	12.10	**15.22**
		5755.0	20.01	20.21	**23.12**
		5795.0	19.96	20.23	23.11
IEEE 802.11ac 80 MHz	58.6M	5210.0	12.02	11.92	**14.98**
		5775.0	19.75	20.02	**22.90**

Note: The relevant measured result has the offset with cable loss already.

Beamforming on

Band	Date Rate (Mbps)	Frequency (MHz)	Average Conducted power (dBm)		
			ANT-0	ANT-1	ANT-0+1
IEEE 802.11n 2.4 GHz 20 MHz (64QAM/256QAM)	13M	2412.0	12.91	13.02	15.98
		2437.0	17.54	17.61	**20.59**
		2462.0	13.06	13.16	16.12
IEEE 802.11n 2.4 GHz 40 MHz (64QAM/256QAM)	27M	2422.0	11.33	11.19	14.27
		2437.0	13.02	13.24	**16.14**
		2452.0	11.42	11.18	14.31
IEEE 802.11ac 20 MHz	13M	5180.0	8.99	8.70	11.86
		5200.0	8.93	8.59	11.77
		5220.0	8.93	8.75	11.85
		5240.0	8.95	8.85	**11.91**
		5745.0	17.45	17.75	20.61
		5765.0	17.44	17.73	20.60
		5785.0	17.42	17.80	20.62
		5805.0	17.48	17.81	**20.66**
		5825.0	17.45	17.73	20.60
IEEE 802.11ac 40 MHz	27M	5190.0	8.78	8.58	11.69
		5230.0	8.82	8.62	**11.73**
		5755.0	16.66	16.82	**19.75**
		5795.0	16.61	16.83	19.73
IEEE 802.11ac 80 MHz	58.6M	5210.0	8.48	8.39	**11.45**
		5775.0	16.38	16.62	**19.51**

Note:1. The relevant measured result has the offset with cable loss already.

2. Evaluated high and low data rate, the report record worst case low data rate measurement results.

5. Test Results

Antenna	Band	Frequency (MHz)	Limit (mw)	Distance [R] (cm)	Max tune-up Power (upper limit) [P] (dBm)	ANT Gain (dBi)	Numeric Gain [G]	Duty Cycle	Power with Duty cycle [TP] (mW)	Power Density [S] (mw/cm^2)
Wi-Fi Antenna	2.4 GHz	2412-2462	1	20	25.24	3.55	2.26	1	755.34	0.150
	5 GHz	5180-5240	1	20	15.88	5.50	3.55	1	137.34	0.027
		5745-5825	1	20	24.52	4.66	2.92	1	827.7	0.165
Wi-Fi Antenna (Beamforming on)	2.4 GHz	2412-2462	1	20	21.09	6.56	4.53	1	581.62	0.116
	5 GHz	5180-5240	1	20	12.41	8.50	7.08	1	123.34	0.025
		5745-5825	1	20	21.16	7.67	5.85	1	763.83	0.152

Note:

1. Mobile or fixed location transmitters, minimum separation distance is 20 cm, even if calculations indicate MPE distance is less.
2. We used the maximum power to provide MPE results.
3. The Numeric Gain calculated by 10^(ant. Gain(dBi) /10).
4. The MPE results are evaluated by lowest data rate for WLAN.
5. The device operating IEEE 802.11 a/b/g mode is 2TX CDD.
6. The device operating IEEE 802.11 ac/n mode is 2TX MIMO / STBC.

Simultaneous Transmitting：

Total MPE = 2.4GHz MPE + 5GHz MPE = 0.150 + 0.165 = 0.315 (mw)/cm^2 < 1 (mw)/cm^2

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