

MPE Report

Applicant : Control4
Product Type : 802.11ac 2x2 Wave 2 Access Point, Outdoor
Trade Name : pakedge
Model Number : WA-2200-O, WA-2200-O-1
Test Specification : ANSI / IEEE Std.C95.1-1992 / IEEE Std. 1528-2013
47 CFR § 2.1091
47 CFR § 1.1310
Received Date : Jun. 18, 2019
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Issue by

Approved By :



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Taiwan Accreditation Foundation accreditation number: 1330

Test Firm MRA designation number: TW0010

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 or completeness of the information provided by the customer, if there is any doubt or error in the information which affects the validity of the test results, the laboratory does not take the responsibility.



Revision History

Rev.	Issue Date	Revisions	Revised By
00	Aug. 02, 2019	Initial Issue	Jennifer Liu



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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	Control4 11734 S. Election Road, Draper, Utah, 84020, United States				
Manufacturer	Control4 11734 S. Election Road, Draper, Utah, 84020, United States				
Product Type	802.11ac 2x2 Wave 2 Access Point, Outdoor				
Trade Name	pakedge				
Model Number	WA-2200-O, WA-2200-O-1				
Models different description	Those model numbers differ from each other in selling region.				
FCC ID	R33WA2200-OUT				
Frequency Range	Operate Band			Frequency Range (MHz)	
	IEEE 802.11a U-NII Band II-A			5260-5320	
	IEEE 802.11a U-NII Band II-C			5500-5700	
	IEEE 802.11n 5 GHz / 802.11ac 20 MHz U-NII Band II-A			5260-5320	
	IEEE 802.11n 5 GHz / 802.11ac 20 MHz U-NII Band II-C			5500-5700	
	IEEE 802.11n 5 GHz / 802.11ac 40 MHz U-NII Band II-A			5270-5310	
	IEEE 802.11n 5 GHz / 802.11ac 40 MHz U-NII Band II-C			5510-5670	
	IEEE 802.11ac 80 MHz U-NII Band II-A			5290	
	IEEE 802.11ac 80 MHz U-NII Band II-C			5530	
Antenna Information	Antenna	Model	Type	Frequency (MHz)	Max. Gain (dBi)
	ANT-0	5718A0382300	Metal PIFA Antenna	5250-5350	5.57
				5470-5725	4.56
	ANT-1	5718A0382300	Metal PIFA Antenna	5250-5350	6.26
				5470-5725	4.27
	G _{ANT}			5150-5250	5.93
				5725-5850	4.42
	Directional Gain			5150-5250	8.93
				5725-5850	7.43



Antenna Delivery	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
Operate Temp. 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

Band	Data Rate (Mbps)	Frequency (MHz)	Average Conducted power (dBm)		
			ANT-0	ANT-1	ANT-0+1
IEEE 802.11a	6M	5260.0	16.02	15.81	18.93
		5280.0	16.11	15.91	19.02
		5300.0	16.06	16.01	19.05
		5320.0	16.08	16.21	19.16
		5500.0	16.92	17.05	20.00
		5520.0	16.76	16.95	19.87
		5540.0	16.68	16.91	19.81
		5560.0	16.74	16.96	19.86
		5580.0	16.71	17.14	19.94
		5660.0	16.81	17.26	20.05
		5680.0	16.73	17.23	20.00
		5700.0	15.95	16.42	19.20
IEEE 802.11ac 20 MHz	13M	5260.0	19.08	18.81	21.96
		5280.0	19.11	18.92	22.03
		5300.0	19.05	18.99	22.03
		5320.0	18.04	18.17	21.12
		5500.0	17.71	18.02	20.88
		5520.0	17.61	17.91	20.77
		5540.0	17.65	17.95	20.81
		5560.0	17.62	17.99	20.82
		5580.0	17.64	18.04	20.85
		5660.0	17.66	18.15	20.92
		5680.0	17.65	18.21	20.95
		5700.0	16.68	17.32	20.02
IEEE 802.11ac 40 MHz	27M	5270.0	17.11	17.01	20.07
		5310.0	16.13	16.21	19.18
		5510.0	15.89	16.15	19.03
		5550.0	19.91	20.01	22.97
IEEE 802.11ac 80 MHz	58.6M	5670.0	19.91	20.11	23.02
		5290.0	16.01	15.95	18.99
		5530.0	16.56	16.97	19.78

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.

Beamforming on

Band	Data Rate (Mbps)	Frequency (MHz)	Average Conducted power (dBm)		
			ANT-0	ANT-1	ANT-0+1
IEEE 802.11ac 20 MHz	13M	5260.0	15.56	15.33	18.46
		5280.0	15.59	15.45	18.53
		5300.0	15.55	15.48	18.53
		5320.0	14.61	14.64	17.64
		5500.0	14.11	14.44	17.29
		5520.0	14.16	14.44	17.31
		5540.0	14.14	14.41	17.29
		5560.0	14.13	14.46	17.31
		5580.0	14.12	14.51	17.33
		5660.0	14.14	14.59	17.38
		5680.0	14.13	14.68	17.42
		5700.0	13.11	13.76	16.46
IEEE 802.11ac 40 MHz	27M	5270.0	13.62	13.53	16.59
		5310.0	12.63	12.74	15.70
		5510.0	12.26	12.63	15.46
		5550.0	16.34	16.48	19.42
		5670.0	16.45	16.56	19.52
IEEE 802.11ac 80 MHz	58.6M	5290.0	12.52	12.48	15.51
		5530.0	12.98	13.43	16.22

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 Result

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	5 GHz	5250-5350	1	20	22.53	5.93	3.92	1	701.92	0.140
		5470-5725	1	20	23.52	4.42	2.77	1	622.99	0.124
Wi-Fi Antenna (Beamforming on)	5 GHz	5250-5350	1	20	19.03	8.93	7.82	1	625.47	0.124
		5470-5725	1	20	20.02	7.43	5.53	1	555.55	0.111

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 and gain to provide MPE results.
3. The Numeric Gain calculated by $10^{(\text{ant. Gain(dBi)} / 10)}$.
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.
7. The summary result is same as the original data, please refer test report number: 1907FS17 (FCC ID: R33WA2200-OUT)

Simultaneous Transmitting :

$$\text{Total MPE} = 2.4\text{GHz MPE} + 5\text{GHz MPE} = 0.150 + 0.165 = 0.315 \text{ (mw)/cm}^2 < 1 \text{ (mw)/cm}^2$$

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