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MPE Report

Test Report No.	:	1609FS13
Applicant	:	TP-LINK TECHNOLOGIES CO., LTD.
Product Type	:	AC900 Wireless Dual Band Gigabit Router
Trade Name	:	TP-LINK
Model Number	:	Archer C2
Date of Received	:	Jul. 20, 2016
Test Period	:	Jul. 26, 2016
Date of Issued	:	Sep. 19, 2016
Test Specification	:	ANSI / IEEE Std.C95.1-1992 / IEEE Std. 1528-2013
		47 CFR § 2.1091
		47 CFR § 1.1310
Location of Test Lab.	:	Chang-an Lab.

1. The test operations have to be performed with cautious behavior, the test results are as attached.
2. The test results are under chamber environment of A Test Lab Techno Corp. A Test Lab Techno Corp. does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples.
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4. This document may be altered or revised by A Test Lab Techno. Corp. personnel only, and shall be noted in the revision section of the document.

Approved By : (Bill Hu)

Tested By : (Mark Duan)

Contents

1. Description of Equipment under Test (EUT)

Applicant	TP-LINK TECHNOLOGIES CO., LTD. Building 24 (floors 1,3,4,5) and 28 (floors1-4) Central Science and Technology Park,Shennan Rd, Nanshan, Shenzhen,China		
Manufacturer	TP-LINK TECHNOLOGIES CO., LTD. Building 24 (floors 1,3,4,5) and 28 (floors1-4) Central Science and Technology Park,Shennan Rd, Nanshan, Shenzhen,China		
Product Type	AC900 Wireless Dual Band Gigabit Router		
Trade Name	TP-LINK		
Model Number	Archer C2		
FCC ID	TE7C2V3		
Frequency Range	IEEE 802.11b / 802.11g / 802.11n 2.4GHz 20MHz :		2412 - 2462 MHz
	IEEE 802.11n 2.4GHz 40MHz :		2422 - 2452 MHz
	IEEE 802.11a U-NII Band I :		5180 - 5240 MHz
	IEEE 802.11a U-NII Band III :		5745 - 5825 MHz
	IEEE 802.11n 5GHz 20MHz U-NII Band I :		5180 - 5240 MHz
	IEEE 802.11ac 20MHz U-NII Band I :		5180 - 5240 MHz
	IEEE 802.11n 5GHz 20MHz U-NII Band III :		5745 - 5825 MHz
	IEEE 802.11ac 20MHz U-NII Band III :		5745 - 5825 MHz
	IEEE 802.11n 5GHz 40MHz U-NII Band I :		5190 - 5230 MHz
	IEEE 802.11ac 40MHz U-NII Band I :		5190 - 5230 MHz
	IEEE 802.11n 5GHz 40MHz U-NII Band III :		5755 - 5795 MHz
	IEEE 802.11ac 40MHz U-NII Band III :		5755 - 5795 MHz
	IEEE 802.11ac 80 MHz U-NII Band I		5210 MHz
	IEEE 802.11ac 80 MHz U-NII Band III		5775 MHz
Antenna information	Type	Max. Gain (dBi)	
	Dipole Antenna	2.4GHz	1.88
		5GHz Band I	2.24
		5GHz Band III	2.30
Directional Gain	2.4GHz: 1.88 dBi (please refer to RF report)		
Antenna Delivery	IEEE 802.11b / IEEE 802.11g / IEEE 802.11n 2.4GHz:3TX + 3RX IEEE 802.11a / IEEE 802.11n 5GHz / IEEE 802.11ac :1TX + 1RX		
RF Evaluation	0.138 mW/cm^2		

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

2. 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.

3. RF Output Power

The conducted power turn-up tolerance reference manufacturer specification.

Band	Date Rate	CH	Frequency (MHz)	Average Conducted power (dBm)			
				ANT-0	ANT-1	ANT-2	ANT-0+1+2
IEEE 802.11b	1M	1	2412.0	18.30	19.26	18.41	23.45
		6	2437.0	19.00	20.36	20.07	24.62
		11	2462.0	18.45	19.82	19.17	23.95
IEEE 802.11g	6M	1	2412.0	12.17	13.47	13.25	17.77
		6	2437.0	19.95	21.43	20.58	25.47
		11	2462.0	15.01	15.56	15.25	20.05
IEEE 802.11n 2.4GHz 20MHz	19.5M	1	2412.0	11.91	13.13	12.92	17.46
		6	2437.0	19.52	20.91	20.25	25.03
		11	2462.0	14.25	14.68	14.33	19.20
IEEE 802.11n 2.4GHz 40MHz	40.5M	3	2422.0	8.75	9.80	9.19	14.04
		6	2437.0	13.99	14.78	14.12	19.08
		9	2452.0	9.60	9.99	9.71	14.54

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

Band	Date Rate	CH	Frequency (MHz)	Average Conducted power (dBm)
				ANT-0
IEEE 802.11a	6M	36	5180.0	19.33
		40	5200.0	19.27
		44	5220.0	19.28
		48	5240.0	19.31
		149	5745.0	19.33
		153	5765.0	19.43
		157	5785.0	19.40
		161	5805.0	19.32
		165	5825.0	19.44
IEEE 802.11ac 20MHz	6.5M	36	5180.0	19.48
		40	5200.0	19.19
		44	5220.0	19.27
		48	5240.0	19.24
		149	5745.0	19.25
		153	5765.0	19.42
		157	5785.0	19.32
		161	5805.0	19.40
		165	5825.0	19.42
IEEE 802.11ac 40MHz	13.5M	38	5190.0	18.07
		46	5230.0	19.51
		151	5755.0	19.44
		159	5795.0	19.48
IEEE 802.11ac 80MHz	29.3M	42	5210.0	14.54
		155	5775.0	19.21

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

4. Test Result

Band	Data Rate	Frequency (MHz)	Limit (mw/cm^2)	Distance [R] (cm)	Max tune-up Power (upper limit) [P] (dBm)	ANT Gain (dBi)	Numeric Gain [G]	Duty Cycle	[P] x [G] with Duty cycle [TP] (mW)	Power Density [S] (mw/cm^2)
IEEE 802.11b (CDD)	1M	2412	1	20	23.45	1.88	1.54	1	340.82	0.068
		2437	1	20	24.62	1.88	1.54	1	446.19	0.089
		2462	1	20	23.95	1.88	1.54	1	382.4	0.076
IEEE 802.11g (CDD)	6M	2412	1	20	17.77	1.88	1.54	1	92.16	0.018
		2437	1	20	25.47	1.88	1.54	1	542.65	0.108
		2462	1	20	20.05	1.88	1.54	1	155.78	0.031
IEEE 802.11n 2.4GHz / 20MHz (CDD)	19.5M	2412	1	20	17.46	1.88	1.54	1	85.81	0.017
		2437	1	20	25.03	1.88	1.54	1	490.37	0.098
		2462	1	20	19.2	1.88	1.54	1	128.09	0.025
IEEE 802.11n 2.4GHz / 40MHz (CDD)	40.5M	2422	1	20	14.04	1.88	1.54	1	39.04	0.008
		2437	1	20	19.08	1.88	1.54	1	124.6	0.025
		2452	1	20	14.54	1.88	1.54	1	43.8	0.009

Band	Data Rate	Frequency (MHz)	Limit (mw/cm^2)	Distance [R] (cm)	Max tune-up Power (upper limit) [P] (dBm)	ANT Gain (dBi)	Numeric Gain [G]	Duty Cycle	[P] x [G] with Duty cycle [TP] (mW)	Power Density [S] (mw/cm^2)
IEEE 802.11a	6M	5180	1	20	19.44	2.24	1.67	1	146.8	0.029
		5200	1	20	19.44	2.24	1.67	1	146.8	0.029
		5220	1	20	19.44	2.24	1.67	1	146.8	0.029
		5240	1	20	19.44	2.24	1.67	1	146.8	0.029
		5745	1	20	19.44	2.30	1.7	1	149.43	0.030
		5765	1	20	19.44	2.30	1.7	1	149.43	0.030
		5785	1	20	19.44	2.30	1.7	1	149.43	0.030
		5805	1	20	19.44	2.30	1.7	1	149.43	0.030
		5825	1	20	19.44	2.30	1.7	1	149.43	0.030
IEEE 802.11ac 20MHz	6.5M	5180	1	20	19.48	2.24	1.67	1	148.16	0.029
		5200	1	20	19.48	2.24	1.67	1	148.16	0.029
		5220	1	20	19.48	2.24	1.67	1	148.16	0.029
		5240	1	20	19.48	2.24	1.67	1	148.16	0.029
		5745	1	20	19.48	2.30	1.7	1	150.82	0.030
		5765	1	20	19.48	2.30	1.7	1	150.82	0.030
		5785	1	20	19.48	2.30	1.7	1	150.82	0.030
		5805	1	20	19.48	2.30	1.7	1	150.82	0.030
		5825	1	20	19.48	2.30	1.7	1	150.82	0.030
IEEE 802.11ac 40MHz	13.5.M	5190	1	20	19.51	2.24	1.67	1	149.18	0.030
		5230	1	20	19.51	2.24	1.67	1	149.18	0.030
		5755	1	20	19.51	2.30	1.7	1	151.86	0.030
		5795	1	20	19.51	2.30	1.7	1	151.86	0.030
IEEE 802.11ac 80MHz	29.3.M	5210	1	20	14.54	2.24	1.67	1	47.5	0.009
		5775	1	20	19.21	2.30	1.7	1	141.73	0.028

Note:

1. The Numeric Gain calculated by 10^(ant. Gain(dBi) /10).
2. Each band max power which perform MPE of any configurations.
3. The device operating Wi-Fi 2.4GHz mode is CDD with transmit signals to 3TX.
4. This Device 2.4G could be transmission simultaneous with 5G.Therefore, calculate total MPE is required.
5. MPE use directional Gain of reference when 2.4G, otherwise use normal gain value. (Please refer RF Report)

Simultaneous MPE：

Total MPE = 2.4GHz MPE + 5GHz MPE = 0.108 + 0.030 = 0.138 mW/cm^2 < $1mW/cm^2$