



Test report No. : 4789387588-US-R2-V0
Page : 1 of 12
Issued date : Jul. 9, 2020
FCC ID : VGYAP1000C

Maximum Permissible Exposure Report

Product : 802.11ac Ceiling-mount AP
Model Name : VigorAP 1000
Series Model : VigorAP 1000C
FCC ID : VGYAP1000C
Test Regulation : 47 CFR FCC Part 2.1091
Received Date : Feb. 27, 2020
Issued Date : Jul. 9, 2020
Applicant : DrayTek Corp.
No.26 Fu Shing Rd., HuKou County, Hsin-Chu Industrial Park,
Hsin-Chu, Taiwan 303 R.O.C
Issued By : Underwriters Laboratories Taiwan Co., Ltd.
Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd.,
Zhudong Township, Hsinchu County, Taiwan



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REVISION HISTORY

Original Test Report No.: 4789387588-US-R2-V0

Rev.	Test report No.	Date	Page revised	Contents
Original	4789387588-US-R2-V0	Jun. 30, 2020	-	Initial issue
-	4789387588-US-R2-V0	Jul. 8, 2020	P.11~P.12	Modify conclusion.
-	4789387588-US-R2-V0	Jul. 9, 2020	P.11~P.12	Modify chapter 6.

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1. Attestation of Test Results

APPLICANT: DrayTek Corp.
 No.26 Fu Shing Rd., HuKou County, Hsin-Chu Industrial Park, Hsin-Chu, Taiwan 303 R.O.C

MANUFACTURER DrayTek Corp.
 No.26 Fu Shing Rd., HuKou County, Hsin-Chu Industrial Park, Hsin-Chu, Taiwan 303 R.O.C

EUT DESCRIPTION: 802.11ac Ceiling-mount AP

BRAND: DrayTek

MODEL: VigorAP 1000

SERIES MODEL: VigorAP 1000C

SAMPLE STAGE: Engineering sample

APPLICABLE STANDARDS	
STANDARD	Test Results
47 CFR FCC PART 2.1091	PASS

Underwriters Laboratories Taiwan Co., Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by Underwriters Laboratories Taiwan Co., Ltd. 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.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Underwriters Laboratories Taiwan Co., Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Underwriters Laboratories Taiwan Co., Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Prepared By:

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 Project Handler

Date : Jul. 9, 2020

Approved and Authorized By:

Howard Kao
 Project Engineer

Date : Jul. 9, 2020

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2. Test Methodology and Reference Procedures

The tests documented in this report were performed in accordance with KDB 447498 D01 General RF Exposure Guidance v06.

3. Facilities and Accreditation

Test Location	Underwriters Laboratories Taiwan Co., Ltd.
Address	Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan
Accreditation Certificate	Underwriters Laboratories Taiwan Co., Ltd. is accredited by TAF, Laboratory Code 3398. The full scope of accreditation can be viewed at http://accreditation.taftw.org.tw/taf/public/basic/viewApplyItems.action?unitNo=3398

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4. Equipment Under Test

4.1. Description of EUT

Product Name	802.11ac Ceiling-mount AP	
Brand Name	DrayTek	
Model Name	VigorAP 1000	
Series Model	VigorAP 1000C	
S/N	19C001DAA04F33C	
Operating Frequency	WLAN	2.4GHz: 2412MHz ~ 2462MHz 5GHz: 5180MHz ~ 5240MHz 5745MHz ~ 5825MHz
Modulation	WLAN	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM, 64QAM, 16QAM, QPSK, BPSK
Number of Channel	WLAN	2.4GHz: 802.11b, 802.11g, 802.11n (HT20): 11 802.11n (HT40): 7 5.18 ~ 5.24GHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 4 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (HT80): 1 5.745 ~ 5.825GHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 5 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1
Normal Voltage	12Vdc from adapter	

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Note:

1. The models difference table as below:

Main Model	Function				
	Antenna		Wi-Fi		
	PIFA Internal	Dipole External	2.4G	5G1	5G2
VigorAP 1000	-	V	V	V	V
Series Model	Function difference				
	Antenna		Wi-Fi		
	PIFA Internal	Dipole External	2.4G	5G1	5G2
VigorAP 1000C	V	-	V	V	V

The model: VigorAP 1000C is sold in black and white. The internal structure is the same but the color is different.

2. The EUT provides two completed transmitters and two receivers.

Modulation Mode	Tx,Rx Function
802.11a	2TX,2RX
802.11b	2TX,2RX
802.11g	2TX,2RX
802.11n (HT20)	2TX,2RX
802.11n (HT40)	2TX,2RX
802.11ac (VHT20)	2TX,2RX
802.11ac (VHT40)	2TX,2RX
802.11ac (VHT80)	2TX,2RX

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3. The EUT contains following accessory devices

Product	Brand	Model	Description
Dipole antenna 1	Angeei	DPD2430SRW	Antenna gain: 2.4~2.49GHz: 2.3 dBi 5.15~5.85GHz: 3.5 dBi
Dipole antenna 2	Walsin	RFDPA131300SBL B805	Antenna gain: 2.4~2.49GHz: 2.3 dBi 5.15~5.85GHz: 3.9 dBi
AC adapter	Channel Well Technology	2ABL024F	Input: 100-240V, 50-60Hz, 0.8A Output: 12.0V 2.0A Length: 1.5m
Mounting Bracket	N/A	N/A	N/A
Ethernet Cable	N/A	N/A	Length: 3.0m

4. The above EUT information is declared by manufacturer and for more detailed features description, please refer the manufacturer's or user's manual.

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4.2. Description Of Available Antennas

For VigorAP 1000

Antenna	Brand Name	Model Name	Antenna Type	Antenna Gain(dBi)
WLAN 2.4GHz	Angeei	DPD2430SRW	Dipole	2.3
	Walsin	RFDPA131300SBLB805	Dipole	2.3

Antenna	Brand Name	Model Name	Antenna Type	Antenna Gain(dBi)
WLAN 5GHz	Angeei	DPD2430SRW	Dipole	3.5
	Walsin	RFDPA131300SBLB805	Dipole	3.9

For VigorAP 1000C

Antenna	Brand Name	Model Name	Antenna Type	Antenna Gain(dBi)
WLAN 2.4GHz	Radiation Technology	C0504-ANG0002	PIFA	1
	Radiation Technology	C0504-ANG0003	PIFA	1

Antenna	Brand Name	Model Name	Antenna Type	Antenna Gain(dBi)
WLAN 5GHz	Radiation Technology	C0504-ANG0004	PIFA	2
	Radiation Technology	C0504-ANG0006	PIFA	2

Note: The above antenna information was provided from customer and for more detailed features description, please refer the manufacturer's specification or user's manual.

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5. Requirement

Limits for General Population/Uncontrolled Exposure

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/cm ²)	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 1: f = frequency in MHz, * means Plane-wave equivalent power density

Note 2: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

Power Density (S) is calculated by the following formula:

$$S = (P * G) / 4\pi R^2$$

where: S = power density (in appropriate units, e.g. mW/ cm²)

P = power input to the antenna (in appropriate units, e.g., mW)

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 (appropriate units, e.g., cm)

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6. Radio Frequency Radiation Exposure Evaluation

Model: VigorAP1000

Non-Beamforming Mode

WLAN 2.4GHz

WLAN 2.4GHz						
Evaluation Frequency	Max. Average Power	Directional Gain	Max. EIRP	Max. EIRP	Power density @ 20 cm	Limit
(MHz)	(dBm)	(dBi)	(dBm)	(mW)	(mW/cm ²)	(mW/cm ²)
2437	25.5	5.31	30.81	1205.036	0.240	1

WLAN 5GHz

WLAN 5GHz						
Evaluation Frequency	Max. Average Power	Directional Gain	Max. EIRP	Max. EIRP	Power density @ 20 cm	Limit
(MHz)	(dBm)	(dBi)	(dBm)	(mW)	(mW/cm ²)	(mW/cm ²)
5230	24.90	6.91	31.81	1517.050	0.302	1
5795	24.99	6.91	31.90	1548.817	0.308	1

Beamforming Mode

WLAN 5GHz

WLAN 5GHz						
Evaluation Frequency	Max. Average Power	Directional Gain	Max. EIRP	Max. EIRP	Power density @ 20 cm	Limit
(MHz)	(dBm)	(dBi)	(dBm)	(mW)	(mW/cm ²)	(mW/cm ²)
5210	20.03	6.91	26.94	494.311	0.098	1
5795	19.83	6.91	26.74	472.063	0.094	1

Note:

1. Max. EIRP (dBm) = Max. Average power (dBm) + Antenna Gain (dBi)
2. Max. EIRP (mW) = $10^{(\text{Max. EIRP (dBm)} / 10)}$
3. Power density (mW/cm²) = Max. EIRP (mW) / [$4 \times \pi \times (\text{calculated distance})^2$], the calculated distance is 20 cm.

Conclusion:

The formula of calculated the MPE is:

$$\text{CPD1} / \text{LPD1} + \text{CPD2} / \text{LPD2} + \dots \text{etc.} < 1$$

CPD = Calculation power density

LPD = Limit of power density

WLAN 2.4GHz + WLAN 5GHz=0.24+0.308+0.302=0.85, therefore the maximum calculations of above situations are less than the “1” limit.

According to 47 CFR §2.1091, the RF exposure analysis concludes that the RF Exposure is FCC compliant.

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Model: VigorAP1000C

Non-Beamforming Mode

WLAN 2.4GHz

WLAN 2.4GHz						
Evaluation Frequency	Max. Average Power	Directional Gain	Max. EIRP	Max. EIRP	Power density @ 20 cm	Limit
(MHz)	(dBm)	(dBi)	(dBm)	(mW)	(mW/cm ²)	(mW/cm ²)
2437	25.50	4.01	29.51	893.305	0.178	1

WLAN 5GHz

WLAN 5GHz						
Evaluation Frequency	Max. Average Power	Directional Gain	Max. EIRP	Max. EIRP	Power density @ 20 cm	Limit
(MHz)	(dBm)	(dBi)	(dBm)	(mW)	(mW/cm ²)	(mW/cm ²)
5230	24.90	5.01	29.91	979.490	0.195	1
5795	24.99	5.01	30.00	1000.000	0.199	1

Beamforming Mode

WLAN 5GHz

WLAN 5GHz						
Evaluation Frequency	Max. Average Power	Directional Gain	Max. EIRP	Max. EIRP	Power density @ 20 cm	Limit
(MHz)	(dBm)	(dBi)	(dBm)	(mW)	(mW/cm ²)	(mW/cm ²)
5210	20.03	5.01	25.04	319.154	0.063	1
5795	19.83	5.01	24.84	304.789	0.061	1

Note:

4. Max. EIRP (dBm) = Max. Average power (dBm) + Antenna Gain (dBi)
5. Max. EIRP (mW) = $10^{(\text{Max. EIRP (dBm)} / 10)}$
6. Power density (mW/cm²) = Max. EIRP (mW) / [$4 \times \pi \times (\text{calculated distance})^2$], the calculated distance is 20 cm.

Conclusion:

The formula of calculated the MPE is:

$$\text{CPD1} / \text{LPD1} + \text{CPD2} / \text{LPD2} + \dots \text{etc.} < 1$$

CPD = Calculation power density

LPD = Limit of power density

WLAN 2.4GHz + WLAN 5GHz=0.178+0.199+0.195=0.572, therefore the maximum calculations of above situations are less than the “1” limit.

According to 47 CFR §2.1091, the RF exposure analysis concludes that the RF Exposure is FCC compliant.

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