

## MPE Report

Applicant : Draytek Corporation  
Product Type : 11ax Ceiling AP  
Trade Name : DrayTek  
Model Number : VigorAP 1060C  
Applicable Standard : IEEE Std.C95.1  
47 CFR § 2.1091 / 47 CFR § 1.1310  
Received Date : May 13, 2020  
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### Issued by

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Taiwan Accreditation Foundation accreditation number: 1330  
Test Firm MRA designation number: TW0010

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### Revision History

Rev.	Issued Date	Revisions	Revised By
00	Nov. 04, 2020	Initial Issue	Nicole Chu
01	Nov. 10, 2020	P13 Revised Limit	Nicole Chu



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## 1. *Reference Applicable Standard*

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.	1992
47 CFR Part §2.1091	Radiofrequency radiation exposure evaluation: mobile devices.	-
47 CFR Part §1.1310	Radiofrequency radiation exposure limits.	-



## 2. Description of Equipment under Test (EUT)

Applicant	Draytek Corporation No.26, Fu Shing Rd., HuKou County, Hsinchu Industrial Park, Hsinchu, 303 Taiwan		
Manufacturer	DrayTek Corporation No.26, Fu Shing Rd., HuKou County, Hsinchu Industrial Park, Hsinchu, 303 Taiwan		
Product Type	11ax Ceiling AP		
Trade Name	DrayTek		
Model Number	VigorAP 1060C		
FCC ID	VGYAP1060C		
Frequency Range	Operate Band		Frequency Range (MHz)
	IEEE 802.11b / 802.11g		2412 - 2462
	IEEE 802.11n 2.4 GHz 20 MHz(256-QAM) IEEE 802.11ax 2.4 GHz 20 MHz		2412 - 2462
	IEEE 802.11n 2.4 GHz 40 MHz (256-QAM) IEEE 802.11ax 2.4 GHz 40 MHz		2422 - 2452
	IEEE 802.11a U-NII Band I		5180 - 5240
	IEEE 802.11a U-NII Band III		5745 - 5825
	IEEE 802.11ac 5 GHz 20 MHz U-NII Band I IEEE 802.11ax 20 MHz U-NII Band I		5180 - 5240
	IEEE 802.11ac 5 GHz 20 MHz U-NII Band III IEEE 802.11ax 20 MHz U-NII Band III		5745 - 5825
	IEEE 802.11ac 5 GHz 40 MHz U-NII Band I IEEE 802.11ax 40 MHz U-NII Band I		5190 - 5230
	IEEE 802.11ac 5 GHz 40 MHz U-NII Band III IEEE 802.11ax 40 MHz U-NII Band III		5755 - 5795
	IEEE 802.11ac 80 MHz		5210
	IEEE 802.11ax 80 MHz		5775
	Antenna Information	Model	Type
5718A0514300		PIFA Antenna	2412 - 2472 3.70
5718A0515300		PIFA Antenna	2412 - 2472 4.08
5718A0516300		PIFA Antenna	2412 - 2472 4.12
5718A0517300		PIFA Antenna	2412 - 2472 5.01
G <sub>ANT</sub>		4.25	
Directional		10.26	
5718A0518300		PIFA Antenna	5150~5250 5.13
			5725~5850 5.19
5718A0522300		PIFA Antenna	5150~5250 4.26
			5725~5850 3.81
5718A0520300		PIFA Antenna	5150~5250 4.03
			5725~5850 4.56
5718A0521300		PIFA Antenna	5150~5250 5.04
			5725~5850 5.04
G <sub>ANT</sub>		5150~5250 4.64	
		5725~5850 4.68	
Directional		5150~5250 10.65	
		5725~5850 10.69	



Antenna Delivery	IEEE 802.11b: 1TX / 1RX (Diversity) IEEE 802.11g : 4TX / 4RX (CDD) IEEE 802.11n 2.4 GHz 20 MHz / 40 MHz: 4TX / 4RX (STBC / Beamforming on) IEEE 802.11ax 2.4 GHz 20 MHz / 40 MHz: 4TX / 4RX (STBC / Beamforming on) IEEE 802.11a: 4TX / 4RX(CDD) IEEE 802.11ac 20 MHz / 40 MHz / 80 MHz: 4TX / 4RX (STBC / Beamforming on) IEEE 802.11ax 20 MHz / 40 MHz / 80 MHz: 4TX / 4RX (STBC / Beamforming on)
RF Evaluation	0.443 mw/cm <sup>2</sup>
Operate Temp. Range	0 ~ +40°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.

**EUT Modify Description :**

Modify Description:

(1)The differences between the original EUT and new one:

- a. Remove a USB Port, a Ethernet RJ45 Port, HW Watchdog IC, Scanning Radio, Flash NOR and Bluetooth LE function.
- b. In new one, DDR4 RAM is 1 GB.

(2)Update applicant name, applicant address, manufacture name, manufacture address, product type, model number, trade name, FCC ID and product's appearance.

After the verification of worst cast of AC Power Conducted Emission and Transmitter Radiated Emissions, all test data can be referred to the original report and showed in this report.

Original Report : 2007FS16 Rev.01

Modify: 2007FS18 Rev.00

### 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

$$S_{eirp} = \frac{EIRP}{4\pi d^2} = \frac{PG}{4\pi d^2} (W / m^2)$$

Where

S: is the input power (W);

G: is the antenna gain;

d : is the distance between antennas and evaluation point (m).



#### 4. Power Density Limit – RF Exposure Evaluation

Thv In 47 CFR § 1.1310, use of the device as based upon the user's awareness and ability to exercise control over human exposure. The two categories defined are Occupational / Controlled Exposure and General Population / Uncontrolled. These two categories are defined as follow:

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 <sup>2</sup> )	Averaging Time E  <sup>2</sup> , H  <sup>2</sup> or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824 / f	2.19 / f	(180 / f <sup>2</sup> )*	30
30-300	27.5	0.073	0.2	30
300-1500	-	-	F / 1,500	30
1,500-100,000	-	-	1.0	30
Limits for Occupational / Controlled Exposure				
Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm <sup>2</sup> )	Averaging Time E  <sup>2</sup> , H  <sup>2</sup> or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1,842 / f	4.89 / f	(900 / f <sup>2</sup> )*	6
30-300	61.4	0.163	1.0	6
300-1,500	-	-	F / 300	6
1,500-100,000	-	-	5	6





#### 4.1 Conducted Power

Beamforming on

Band	Data Rate or Sub-test	CH	Frequency (MHz)			Average Conducted power (dBm)		
						ANT-0	ANT-1	All ANT
802.11n_HT20 (256-QAM)	26M	1	2412			10.76	10.84	16.68
		6	2437			13.01	13.04	18.90
		11	2462			10.58	10.39	16.22
802.11n_HT40 (256-QAM)	54M	3	2422			10.42	10.45	16.43
		6	2437			11.14	11.19	17.07
		9	2452			9.06	8.99	14.98
Band	Data Rate or Sub-test	CH	Frequency (MHz)	RU	RU Number	Average Conducted power (dBm)		
						ANT-0	ANT-1	All ANT
802.11ax_HE20	MCS0	1	2412	242	1	10.34	10.32	16.30
		6	2437	242	1	13.04	13.04	19.00
		11	2462	242	1	8.23	8.46	14.27
802.11ax_HE40	MCS0	3	2422	484	1	9.46	9.42	15.42
		6	2437	484	1	10.21	10.28	16.19
		9	2452	484	1	8.06	8.11	14.07



Beamforming off

Band	Date Rate or Sub-test	CH	Frequency (MHz)			Average Conducted power (dBm)		
						ANT-0	ANT-1	All ANT
802.11b	1M	1	2412			19.28	19.42	---
		6	2437			19.21	19.24	---
		11	2462			19.32	19.49	---
802.11g	6M	1	2412			16.66	16.82	22.70
		6	2437			19.24	19.35	25.24
		11	2462			16.74	16.83	22.76
802.11n_HT20 (256-QAM)	26M	1	2412			17.34	17.28	23.09
		6	2437			19.31	19.34	25.18
		11	2462			16.77	16.62	22.61
802.11n_HT40 (256-QAM)	54M	3	2422			16.81	16.84	22.82
		6	2437			17.54	17.57	23.55
		9	2452			15.44	15.52	21.48
Band	Date Rate or Sub-test	CH	Frequency (MHz)	RU	RU Number	Average Conducted power (dBm)		
						ANT-0	ANT-1	All ANT
802.11ax_HE20	MCS0	1	2412	242	1	16.72	16.81	22.68
		6	2437	242	1	19.21	19.32	25.21
		11	2462	242	1	14.74	14.82	20.72
802.11ax_HE40	MCS0	3	2422	484	1	15.82	15.96	21.89
		6	2437	484	1	16.54	16.71	22.68
		9	2452	484	1	14.41	14.58	20.53



Beamforming on

Band	Data Rate or Sub-test	CH	Frequency (MHz)			Average Conducted power (dBm)		
						ANT-0	ANT-1	All ANT
802.11ac_5G_VHT20	26M	36	5180			11.91	12.14	18.11
		40	5200			12.95	13.11	19.06
		44	5220			12.93	13.08	19.03
		48	5240			13.14	13.33	19.24
		149	5745			12.76	12.74	18.98
		153	5765			12.75	12.64	18.91
		157	5785			12.81	12.68	18.96
		161	5805			12.77	12.65	18.92
802.11ac_5G_VHT40	54M	38	5190			10.26	10.42	16.33
		46	5230			13.21	13.41	19.34
		151	5755			12.84	12.85	19.16
		159	5795			13.22	12.78	19.29
802.11ac_5G_VHT80	117.2M	42	5210			10.06	10.09	16.07
		155	5775			12.86	12.67	19.08
Band	Data Rate or Sub-test	CH	Frequency (MHz)	RU	RU Number	Average Conducted power (dBm)		
						ANT-0	ANT-1	All ANT
802.11ax_5G_HE20	MCS 0	36	5180	242	1	11.81	12.04	17.96
		40	5200	242	1	13.25	13.41	19.32
		44	5220	242	1	13.21	13.44	19.29
		48	5240	242	1	13.51	13.57	19.49
		149	5745	242	1	13.02	12.78	19.19
		153	5765	242	1	13.01	12.73	19.16
		157	5785	242	1	13.09	12.82	19.23
		161	5805	242	1	13.06	12.77	19.18
802.11ax_5G_HE40	MCS 0	38	5190	484	1	10.36	10.46	16.40
		46	5230	484	1	13.24	13.56	19.40
		151	5755	484	1	12.94	13.02	19.32
		159	5795	484	1	13.26	12.97	19.41
802.11ax_5G_HE80	MCS 0	42	5210	968	1	9.68	9.76	15.74
		155	5775	968	1	13.08	12.97	19.35



Beamforming off

Band	Date Rate or Sub-test	CH	Frequency (MHz)			Average Conducted power (dBm)		
						ANT-0	ANT-1	All ANT
802.11a	6M	36	5180			16.51	16.71	22.65
		40	5200			16.48	16.69	22.65
		44	5220			16.46	16.65	22.61
		48	5240			16.61	16.91	22.75
		149	5745			19.24	18.94	25.28
		153	5765			19.28	18.78	25.26
		157	5785			19.31	18.82	25.30
		161	5805			19.25	18.80	25.26
		165	5825			19.52	19.15	25.46
802.11ac_5G_VHT20	26M	36	5180			18.22	18.34	24.34
		40	5200			19.32	19.24	25.28
		44	5220			19.29	19.20	25.24
		48	5240			19.41	19.34	25.35
		149	5745			19.14	18.80	25.13
		153	5765			19.20	18.79	25.18
		157	5785			19.22	18.85	25.24
		161	5805			19.19	18.82	25.21
802.11ac_5G_VHT40	54M	38	5190			16.64	16.74	22.76
		46	5230			19.51	19.68	25.59
		151	5755			19.21	19.18	25.44
		159	5795			19.48	19.12	25.55
802.11ac_5G_VHT80	117.2M	42	5210			16.44	16.48	22.46
		155	5775			19.22	18.94	25.36
Band	Date Rate or Sub-test	CH	Frequency (MHz)	RU	RU Number	Average Conducted power (dBm)		
						ANT-0	ANT-1	All ANT
802.11ax_5G_HE20	MCS 0	36	5180	242	1	18.12	18.21	24.20
		40	5200	242	1	19.61	19.51	25.50
		44	5220	242	1	19.55	19.48	25.45
		48	5240	242	1	19.72	19.61	25.58
		149	5745	242	1	19.14	18.82	25.27
		153	5765	242	1	19.22	19.00	25.32
		157	5785	242	1	19.31	19.02	25.38
		161	5805	242	1	19.29	18.97	25.32
		165	5825	242	1	19.64	19.21	25.55
802.11ax_5G_HE40	MCS 0	38	5190	484	1	16.82	16.88	22.93
		46	5230	484	1	19.64	19.91	25.76
		151	5755	484	1	19.32	19.14	25.54
		159	5795	484	1	19.54	19.24	25.67
802.11ax_5G_HE80	MCS 0	42	5210	968	1	16.14	16.19	22.14
		155	5775	968	1	19.32	19.14	25.51

## 5. Test Result

Antenna	Band	Frequency (MHz)	Limit (mw)/cm <sup>2</sup>	Distance	Tune-up Power	ANT Gain	Numeric Gain	Duty Cycle	Power with Duty cycle	Power Density
				(cm)	(dBm)				(mW)	(mW)/cm <sup>2</sup>
				[R]	[P]	(dBi)	[G]		[P]x[G]	[S]
Wi-Fi Antenna	2.4GHz	2412-2462	1.000	20	25.74	4.25	2.66	1	997.76	0.198
	5GHz	5150-5250	1.000	20	26.26	4.64	2.91	1	1230.01	0.245
		5725-5850	1.000	20	26.17	4.68	2.94	1	1216.97	0.242
Wi-Fi Antenna (Beamforming)	2.4GHz	2412-2462	1.000	20	19.50	10.26	10.62	1	947.27	0.188
	5GHz	5150-5250	1.000	20	19.99	10.65	11.61	1	1158.20	0.230
		5725-5850	1.000	20	19.96	10.69	11.72	1	1160.98	0.231

**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.

**Simultaneous Transmitting :**

$$\text{Total MPE} = 2.4\text{GHz MPE} + 5\text{GHz MPE} = 0.198 + 0.245 = 0.443 \text{ (mW)/cm}^2 < 1 \text{ (mW)/cm}^2$$

---END---