



Test report No. : 4789400505A-US-R2-V0
Page : 1 of 11
Issued date : Nov. 4, 2020
FCC ID : VGY2865

Maximum Permissible Exposure Report

Product : 35b & G.Fast Security Router
Model Name : Vigor 2866FVac
Series Model : Refer to Ch.4.1 Note 1
FCC ID : VGY2865
Test Regulation : 47 CFR FCC Part 2.1091
Received Date : Mar. 2, 2020
Issued Date : Nov. 4, 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



The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report are responsible of the test sample(s) provided by the client only and are not to be used to indicate applicability to other similar products.

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Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan
Telephone :+886-2-7737-3000
Facsimile (FAX) :+886-3-583-7948

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Telephone :+886-2-7737-3000
Facsimile (FAX) :+886-3-583-7948



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: 35b & G.Fast Security Router

BRAND: DrayTek

MODEL: Vigor 2866FVac

SERIES MODEL: Refer to Ch.4.1 Note 1

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:

Cindy Hsin

Cindy Hsin
 Project Handler

Date : Nov. 4, 2020

Approved and Authorized By:

Mike Cai

Mike Cai
 Engineer Project Associate

Date : Nov. 4, 2020

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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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 | 35b & G.Fast Security Router | |
| Brand Name | DrayTek | |
| Model Name | Vigor 2866FVac | |
| Series Model | Vigor 2865ac, Vigor 2865Vac, Vigor 2865Fac, Vigor 2865FVac, Vigor 2866ac, Vigor 2866Vac, Vigor 2866Fac, Vigor 2927ac, Vigor 2927Vac, Vigor 2927Fac, Vigor 2927FVac, Vigor 2923ac, Vigor 2923Vac, Vigor 2923Fac, Vigor 2923FVac, Vigor 2925ac, Vigor 2925Vac, Vigor 2925Fac, Vigor 2925FVac, Vigor 2926_v1ac, Vigor 2926_v1Vac, Vigor 2926_v1Fac, Vigor 2926_v1FVac | |
| S/N | 209001DAA41E018 | |
| 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 Name | DSL | G. fast | SFP | WWAN | LAN | Wi-Fi 2.4G | Wi-Fi 5G | FXS |
|-------------------|-----------|---------|-----|------|------------|------------|----------|-----|
| Vigor 2866FVac | VDSL2/35b | V | V | - | Eth/RJ45x5 | V | V | V |
| Series Model Name | DSL | G. fast | SFP | WWAN | LAN | Wi-Fi 2.4G | Wi-Fi 5G | FXS |
| Vigor 2865ac | VDSL2/35b | - | - | - | Eth/RJ45x6 | V | V | - |
| Vigor 2865Vac | VDSL2/35b | - | - | - | Eth/RJ45x6 | V | V | V |
| Vigor 2865Fac | VDSL2/35b | - | V | - | Eth/RJ45x5 | V | V | - |
| Vigor 2865FVac | VDSL2/35b | - | V | - | Eth/RJ45x5 | V | V | V |
| Vigor 2866ac | VDSL2/35b | V | - | - | Eth/RJ45x6 | V | V | - |
| Vigor 2866Vac | VDSL2/35b | V | - | - | Eth/RJ45x6 | V | V | V |
| Vigor 2866Fac | VDSL2/35b | V | V | - | Eth/RJ45x5 | V | V | - |
| Vigor 2927ac | - | - | - | - | Eth/RJ45x6 | V | V | - |
| Vigor 2927Vac | - | - | - | - | Eth/RJ45x6 | V | V | V |
| Vigor 2927Fac | - | - | V | - | Eth/RJ45x6 | V | V | - |
| Vigor 2927FVac | - | - | V | - | Eth/RJ45x6 | V | V | V |
| Vigor 2923ac | - | - | - | - | Eth/RJ45x6 | V | V | - |
| Vigor 2923Vac | - | - | - | - | Eth/RJ45x6 | V | V | V |
| Vigor 2923Fac | - | - | V | - | Eth/RJ45x6 | V | V | - |
| Vigor 2923FVac | - | - | V | - | Eth/RJ45x6 | V | V | V |
| Vigor 2925ac | - | - | - | - | Eth/RJ45x6 | V | V | - |
| Vigor 2925Vac | - | - | - | - | Eth/RJ45x6 | V | V | V |
| Vigor 2925Fac | - | - | V | - | Eth/RJ45x6 | V | V | - |
| Vigor 2925FVac | - | - | V | - | Eth/RJ45x6 | V | V | V |
| Vigor 2926_v1ac | - | - | - | - | Eth/RJ45x6 | V | V | - |
| Vigor 2926_v1Vac | - | - | - | - | Eth/RJ45x6 | V | V | V |
| Vigor 2926_v1Fac | - | - | V | - | Eth/RJ45x6 | V | V | - |
| Vigor 2926_v1FVac | - | - | V | - | Eth/RJ45x6 | V | V | V |

Note:

- The above model are declared by manufacturer for market segmentation that difference between main model and the series model is the combination of hardware design and appearance, there is nothing changed to RF related part that does not affect the RF characteristics.

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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 |

3. The EUT contains following accessory devices

| Product | Brand | Model | Description | Remark |
|------------------------|-------------------------|----------|---|----------|
| AC adapter 1 | Channel Well Technology | 2ABN036F | Input: 100-240Vac, 1.0A Output:12Vdc, 3A Length: 1.5m | Optional |
| AC adapter 2 | Channel Well Technology | 2ABL030F | Input: 100-240Vac, 1.0A Output:12Vdc, 2.5A Length: 1.5m | Optional |
| AC adapter 3 | Channel Well Technology | 2ABL024F | Input: 100-240Vac, 1.0A Output:12Vdc, 2A Length: 1.5m | Optional |
| RJ-45 Cable (Ethernet) | Tung-Li | 5U422-20 | Length: 3meter, non-shielded cable | - |
| RJ-11 Cable | N/A | N/A | Length: 1.8meter, non-shielded cable, 6P4C | - |

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 WLAN

| Ant. No. | Brand Name | Model Name | Antenna Type | Antenna Gain(dBi) | |
|----------|------------|--------------------|--------------|-------------------|------|
| | | | | 2.4GHz | 5GHz |
| Ant 0 | Walsin | RFDPA131300SBLB805 | Dipole | 2.3 | 3.9 |
| Ant 1 | Walsin | RFDPA131300SBLB806 | Dipole | 2.3 | 3.9 |
| Ant 2 | Angeei | DPD2430SRW | Dipole | 2.3 | 3.5 |
| Ant 3 | Angeei | DPD2430SRB | Dipole | 2.3 | 3.5 |

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

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 | 22.23 | 5.31 | 27.54 | 567.545 | 0.113 | 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) |
| 5240 | 21.91 | 6.91 | 28.82 | 762.079 | 0.152 | 1 |
| 5785 | 24.66 | 6.91 | 31.57 | 1435.489 | 0.286 | 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) |
| 5220 | 20.71 | 6.91 | 27.62 | 578.096 | 0.115 | 1 |
| 5745 | 23.50 | 6.91 | 30.41 | 1099.006 | 0.219 | 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 = 0.113 + 0.286 = 0.399, 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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Facsimile (FAX) : +886-3-583-7948