



Test report No. : 4789166774-US-R2-V0  
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Issued date : Apr. 8, 2020  
FCC ID : VGY2765

# **Maximum Permissible Exposure Report**

**Product** : DSL Router

**Model Name** : Vigor2765Vac

**Series Model** : Vigor2765ac, Vigor2766ac, Vigor2766Vac, Vigor2135ac, Vigor2135Vac, Vigor2135Fac, Vigor2135FVac, Vigor2125ac, Vigor2125Vac, Vigor2125Fac, Vigor2125FVac

**FCC ID** : VGY2765

**Test Regulation** : 47 CFR FCC Part 2.1091

**Received Date** : Sep. 11, 2019

**Issued Date** : Apr. 8, 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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Doc No: 17-EM-F0864 / 3.0



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## REVISION HISTORY

**Original Test Report No.: 4789166774-US-R2-V0**

[illegible]

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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:** DSL Router

**BRAND:** DrayTek

**MODEL:** Vigor2765Vac

**SERIES MODEL:** Vigor2765ac, Vigor2766ac, Vigor2766Vac, Vigor2135ac, Vigor2135Vac, Vigor2135Fac, Vigor2135FVac, Vigor2125ac, Vigor2125Vac, Vigor2125Fac, Vigor2125FVac

**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  
Project Handler

Date : Apr. 8, 2020

Approved and Authorized By:

Howard Kao Date : Apr. 8, 2020  
Project Engineer

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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

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

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## 4. Equipment Under Test

### 4.1. Description of EUT

|                            |                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                         |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product Name</b>        | DSL Router                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                         |
| <b>Brand Name</b>          | DrayTek                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                         |
| <b>Model Name</b>          | Vigor2765Vac                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                         |
| <b>Series Model</b>        | Vigor2765ac, Vigor2766ac, Vigor2766Vac, Vigor2135ac, Vigor2135Vac, Vigor2135Fac, Vigor2135FVac, Vigor2125ac, Vigor2125Vac, Vigor2125Fac, Vigor2125FVac |                                                                                                                                                                                                                                                                                                                                         |
| <b>S/N</b>                 | 191001DAA185F58                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                         |
| <b>Operating Frequency</b> | WLAN                                                                                                                                                   | 2.4GHz: 2412MHz ~ 2462MHz<br>5GHz: 5180MHz ~ 5240MHz<br>5745MHz ~ 5825MHz                                                                                                                                                                                                                                                               |
| <b>Modulation</b>          | WLAN                                                                                                                                                   | CCK, DQPSK, DBPSK for DSSS<br>64QAM, 16QAM, QPSK, BPSK for OFDM<br>256QAM, 64QAM, 16QAM, QPSK, BPSK                                                                                                                                                                                                                                     |
| <b>Number of Channel</b>   | WLAN                                                                                                                                                   | 2.4GHz:<br>802.11b, 802.11g, 802.11n (HT20): 11<br>802.11n (HT40): 7<br>5.18 ~ 5.24GHz:<br>802.11a, 802.11n (HT20), 802.11ac (VHT20): 4<br>802.11n (HT40), 802.11ac (VHT40): 2<br>802.11ac (HT80): 1<br>5.745 ~ 5.825GHz:<br>802.11a, 802.11n (HT20), 802.11ac (VHT20): 5<br>802.11n (HT40), 802.11ac (VHT40): 2<br>802.11ac (VHT80): 1 |
| <b>Normal Voltage</b>      | 12Vdc from adapter                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                         |

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Note:

1. The models difference table as below:

| Main Model    | Function            |       |     |              |             |
|---------------|---------------------|-------|-----|--------------|-------------|
|               | DSL                 | gfast | FXS | Eth-RJ45 WAN | Eth-SFP WAN |
| Vigor2765Vac  | V                   | -     | V   | -            | -           |
| Series Model  | Function difference |       |     |              |             |
|               | DSL                 | gfast | FXS | Eth-RJ45 WAN | Eth-SFP WAN |
| Vigor2765ac   | V                   | -     | -   | -            | -           |
| Vigor2766ac   | V                   | V     | -   | -            | -           |
| Vigor2766Vac  | V                   | V     | V   | -            | -           |
| Vigor2135ac   | -                   | -     | -   | V            | -           |
| Vigor2135Vac  | -                   | -     | V   | V            | -           |
| Vigor2135Fac  | -                   | -     | -   | -            | V           |
| Vigor2135FVac | -                   | -     | V   | -            | V           |
| Vigor2125ac   | -                   | -     | -   | V            | -           |
| Vigor2125Vac  | -                   | -     | V   | V            | -           |
| Vigor2125Fac  | -                   | -     | -   | -            | V           |
| Vigor2125FVac | -                   | -     | V   | -            | V           |

- The above models are declared for market purpose by the manufacturer, the difference between the main model and the series model is the combination of hardware design and appearance, there are no changes in RF-related parts, which will not affect RF characteristic.

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                                                                                            |
|-------------------------|-------------------------|-------------|--------------------------------------------------------------------------------------------------------|
| AC Adapter              | Channel Well Technology | 2ABL024F US | Input: 100-240Vac, 0.8A,<br>Output: 12Vdc, 2A<br>Length: 1.5 m, non-shielded cable<br>w/o ferrite core |
| RJ-45 Cable             | Tung-Li                 | 5U422-20    | Length: 3 m, non-shielded cable                                                                        |
| RJ-11 Cable             | N/A                     | N/A         | Length: 1.8 m, non-shielded cable,<br>6P4C                                                             |
| RJ-11 to RJ-45<br>Cable | N/A                     | N/A         | Length: 2.2 m, non-shielded cable,<br>6P4C                                                             |
| RJ-45 to RJ-45<br>Cable | N/A                     | N/A         | Length: 2.2 m, non-shielded cable,<br>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

| Antenna | Brand Name | Model Name         | Antenna Type | Antenna Gain(dBi) |
|---------|------------|--------------------|--------------|-------------------|
| WLAN    | Walsin     | RFDPA131300SBLB805 | Dipole       | 2.18              |
| 2.4GHz  | Walsin     | RFDPA131300SBLB805 | Dipole       | 2.18              |

| Antenna | Brand Name | Model Name         | Antenna Type | Antenna Gain(dBi) |
|---------|------------|--------------------|--------------|-------------------|
| WLAN    | Walsin     | RFDPA131300SBLB805 | Dipole       | 4.45              |
| 5GHz    | Walsin     | RFDPA131300SBLB805 | Dipole       | 4.45              |

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 <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/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/ cm<sup>2</sup>)

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 <sup>2</sup> ) | (mW/cm <sup>2</sup> ) |
| 2412 ~ 2462          | 24.86              | 5.19             | 30.05     | 1011.579  | 0.201                 | 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 <sup>2</sup> ) | (mW/cm <sup>2</sup> ) |
| 5180 ~ 5240          | 25.49              | 7.46             | 32.95     | 1972.423  | 0.392                 | 1                     |
| 5745 ~ 5825          | 25.16              | 7.46             | 32.62     | 1828.100  | 0.364                 | 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 <sup>2</sup> ) | (mW/cm <sup>2</sup> ) |
| 5180 ~ 5240          | 24.65              | 7.46             | 32.11     | 1625.549  | 0.323                 | 1                     |
| 5745 ~ 5825          | 24.72              | 7.46             | 32.18     | 1651.962  | 0.329                 | 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/cm<sup>2</sup>) = 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=0.201+0.392=0.593, 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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