

# RF Exposure Evaluation declaration

Product Name : VDSL2 Security Firewall  
Model No. : Vigor2860ac, Vigor2860Vac, Vigor2862ac, Vigor2862Vac,  
Vigor2925ac, Vigor2925Vac, Vigor2925Fac, Vigor2925Fvac,  
Vigor2860Fac, Vigor2860Fvac, VigorIPPBX2860ac,  
IPOffice3860ac, IPOffice2860ac, Vigor3220ac,  
Vigor3220Vac, Vigor3220Fac, Vigor3220Fvac,  
Vigor2132n-plus, Vigor2132Vn-plus, Vigor2132Fn-plus,  
Vigor2132FVn-plus, Vigor2132ac, Vigor2132Vac,  
Vigor2132Fac, Vigor2132Fvac, VigorBX 2000ac,  
VigorBX 2000Fac  
FCC ID. : VGYV2860AC

Applicant : DrayTek Corp.

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

Date of Receipt : 2014/09/18

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Report No. : 1490454R-RF-US-Exp

Report Version : V1.0



The declaration results relate only to the samples calculated.

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## 1. RF Exposure Evaluation

### 1.1. Limits

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)

#### LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Average Time (Minutes)
(A) Limits for Occupational/ Control Exposures				
300-1500	--	--	F/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/ Uncontrolled Exposures				
300-1500	--	--	F/1500	6
1500-100,000	--	--	1	30

F= Frequency in MHz

Friis Formula

Friis transmission formula:  $P_d = (P_{out} * G) / (4 * \pi * r^2)$

Where

$P_d$  = power density in mW/cm<sup>2</sup>

$P_{out}$  = output power to antenna in mW

G = gain of antenna in linear scale

$\pi$  = 3.1416

R = distance between observation point and center of the radiator in cm

$P_d$  is the limit of MPE, 1 mW/cm<sup>2</sup>. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

### 1.2. Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

The temperature and related humidity: 18°C and 78% RH.

### 1.3. Test Result of RF Exposure Evaluation

Product	VDSL2 Security Firewall
Test Mode	Transmit
Test Condition	RF Exposure Evaluation

#### Antenna Gain

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.95dBi or 1.57 in linear scale.

#### Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11b			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )
1	2412	38.9045	0.01215
6	2437	36.1410	0.01129
11	2462	28.7740	0.00899

IEEE 802.11g			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )
1	2412	55.0808	0.01720
6	2437	51.6416	0.01613
11	2462	44.9780	0.01405

The power density Pd (4th column) at a distance of 20 cm calculated from the Friis transmission formula is far below the limit of 1 mW/cm<sup>2</sup>.

Product	VDSL2 Security Firewall
Test Mode	Transmit
Test Condition	RF Exposure Evaluation

### Antenna Gain

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.95dBi or 1.57 in linear scale.

### Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11n (20MHz) (ANT 0+1)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )
1	2412	53.2108	0.01662
6	2437	46.2381	0.01444
11	2462	40.9261	0.01278

IEEE 802.11n (40MHz) (ANT 0+1)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )
3	2422	44.7713	0.01398
6	2437	45.7088	0.01428
9	2452	43.4510	0.01357

The power density Pd (4th column) at a distance of 20 cm calculated from the Friis transmission formula is far below the limit of 1 mW/cm<sup>2</sup>.

Product	VDSL2 Security Firewall
Test Mode	Mode 1: Transmit (CDD Mode)
Test Condition	RF Exposure Evaluation

### Antenna Gain

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 4.12dBi or 2.58 in linear scale.

### Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11a (ANT 0+1)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )
36	5180	224.9573	0.1156
40	5220	231.4195	0.1189
44	5240	226.7253	0.1165

IEEE 802.11a (ANT 0+1)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )
149	5745	186.7239	0.0959
157	5785	227.6670	0.1170
165	5825	144.6439	0.0743

The power density Pd (4th column) at a distance of 20 cm calculated from the Friis transmission formula is far below the limit of 1 mW/cm<sup>2</sup>.

Product	VDSL2 Security Firewall
Test Mode	Mode 1: Transmit (CDD Mode)
Test Condition	RF Exposure Evaluation

### Antenna Gain

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 4.12dBi or 2.58 in linear scale.

### Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11 n(20MHz) (ANT 0+1)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )
36	5180	227.7194	0.1170
40	5220	229.9323	0.1181
44	5240	220.1405	0.1131

IEEE 802.11 n(20MHz) (ANT 0+1)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )
149	5745	187.7587	0.0965
157	5785	201.3724	0.1035
165	5825	144.0788	0.0740

The power density Pd (4th column) at a distance of 20 cm calculated from the Friis transmission formula is far below the limit of 1 mW/cm<sup>2</sup>.

Product	VDSL2 Security Firewall
Test Mode	Mode 1: Transmit (CDD Mode)
Test Condition	RF Exposure Evaluation

### Antenna Gain

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 4.12dBi or 2.58 in linear scale.

### Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11 n(40MHz) (ANT 0+1)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )
38	5190	222.7922	0.1145
46	5230	244.2868	0.1255

IEEE 802.11 n(40MHz) (ANT 0+1)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )
151	5755	166.2647	0.0854
159	5795	224.7502	0.1155

The power density Pd (4th column) at a distance of 20 cm calculated from the Friis transmission formula is far below the limit of 1 mW/cm<sup>2</sup>.

Product	VDSL2 Security Firewall
Test Mode	Mode 1: Transmit (CDD Mode)
Test Condition	RF Exposure Evaluation

### Antenna Gain

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 4.12dBi or 2.58 in linear scale.

### Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11ac (80MHz) (ANT 0+1)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )
42	5210	61.2774	0.0315

IEEE 802.11ac (80MHz) (ANT 0+1)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )
155	5775	111.1988	0.0571

The power density Pd (4th column) at a distance of 20 cm calculated from the Friis transmission formula is far below the limit of 1 mW/cm<sup>2</sup>.