RF Exposure Evaluation Declaration

Product Name	:	VDSL2 Security Firewall
Model No.	:	Vigor2860, Other models please refer to the report attachment 1
FCC ID.	:	VGYV2860VNPLUS

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	:	2013/03/27
Issued Date	:	2013/11/29
Report No.	:	134094R-RF-US-Exp
Report Version	:	V1.0

Testing Laboratory
1313

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^2)	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: $Pd = (Pout*G)/(4*pi*r^2)$

Where

Pd = power density in mW/cm^2

Pout = 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

Pd id the limit of MPE, 1 mW/cm^2. 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℃ 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^2)
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^2)
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^2.

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^2)
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^2)
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^2.

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 4.12dBi or 2.58dBi in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11 a			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm^2)
36	5180	3.1696	0.00163
40	5220	3.2137	0.00165
44	5240	3.2584	0.00167

IEEE 802.11 a			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm^2)
149	5745	16.9044	0.00868
157	5785	21.2324	0.01090
165	5825	22.9087	0.01176

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^2.

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 4.12dBi or 2.58dBi 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^2)
36	5180	3.0620	0.00157
40	5220	2.8973	0.00149
44	5240	3.0061	0.00154

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^2)
149	5745	101.8591	0.05228
157	5785	116.6810	0.05989
165	5825	128.2331	0.06582

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^2.

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 4.12dBi or 2.58dBi 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^2)
38	5190	5.0119	0.00257
46	5230	5.0119	0.00257

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^2)
151	5755	77.2681	0.03966
159	5795	92.2571	0.04735

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^2.

Attachment 1

➢ **EUT Detailed Model Number and Detailed Difference**

Mode	Model-name	VDSL2 #1 (RJ11)	VDSL2 #2 (RJ11)	FXS (RJ11)	FXO (RJ11)	WLAN-1	WLAN-2	WLAN mode	WAN #1	RJ45 Port #1~6	USB 2.0 x 2
1	Vigor2860	V							RJ45	LAN#1~6 (RJ45)	V
2	Vigor2860n	V				V (2.4G)		1	RJ45	LAN#1~6 (RJ45)	V
3	Vigor2860n-plus	V				V (2.4G)	V (5G)	2	RJ45	LAN#1~6 (RJ45)	V
4	Vigor2860ac	V				V (2.4G)	V (5G/11ac)	3	RJ45	LAN#1~6 (RJ45)	V
5	Vigor2860n_dual	V				V (2.4G or 5G)		4	RJ45	LAN#1~6 (RJ45)	V
6	Vigor2860V	V		V	V				RJ45	LAN#1~6 (RJ45)	V
7	Vigor2860Vn	V		V	V	V (2.4G)		1	RJ45	LAN#1~6 (RJ45)	V
8	Vigor2860Vn-plus	V		V	V	V (2.4G)	V (5G)	2	RJ45	LAN#1~6 (RJ45)	V
9	Vigor2860Vac	V		V	V	V (2.4G)	V (5G/11ac)	3	RJ45	LAN#1~6 (RJ45)	V
10	Vigor2860Vn_dual	V		V	V	V (2.4G or 5G)		4	RJ45	LAN#1~6 (RJ45)	V
11	Vigor2862	V	V(dual)						RJ45	LAN#1~6 (RJ45)	V
12	Vigor2862n	V	V(dual)			V (2.4G)		1	RJ45	LAN#1~6 (RJ45)	V
13	Vigor2862n-plus	V	V(dual)			V (2.4G)	V (5G)	2	RJ45	LAN#1~6 (RJ45)	V
14	Vigor2862ac	V	V(dual)			V (2.4G)	V (5G/11ac)	3	RJ45	LAN#1~6 (RJ45)	V
15	Vigor2862n_dual	V	V(dual)			V (2.4G or 5G)		4	RJ45	LAN#1~6 (RJ45)	V

Mode	Model-name	VDSL2 #1 (RJ11)	VDSL2 #2 (RJ11)	FXS (RJ11)	FXO (RJ11)	WLAN-1	WLAN-2	WLAN mode	WAN #1	RJ45 Port #1~6	USB 2.0 x 2
16	Vigor2862V	V	V(dual)	V	V				RJ45	LAN#1~6 (RJ45)	V
17	Vigor2862Vn	V	V(dual)	V	V	V (2.4G)		1	RJ45	LAN#1~6 (RJ45)	V
18	Vigor2862Vn-plus EMC Worse case	V	V(dual)	V	V	V (2.4G)	V (5G)	2	RJ45	LAN#1~6 (RJ45)	V
19	Vigor2862Vac	V	V(dual)	V	V	V (2.4G)	V (5G/11ac)	3	RJ45	LAN#1~6 (RJ45)	V
20	Vigor2862Vn_dual	V	V(dual)	V	V	V (2.4G or 5G)		4	RJ45	LAN#1~6 (RJ45)	V
21	Vigor2863	V	V (bond)						RJ45	LAN#1~6 (RJ45)	V
22	Vigor2863n	V	V (bond)			V (2.4G)		1	RJ45	LAN#1~6 (RJ45)	V
23	Vigor2863V	V	V (bond)	V	V				RJ45	LAN#1~6 (RJ45)	V
24	Vigor2863Vn	V	V (bond)	V	V	V (2.4G)		1	RJ45	LAN#1~6 (RJ45)	V
25	Vigor2925								RJ45	WAN#2/LAN #1~5(RJ45)	V
26	Vigor2925n					V (2.4G)		1	RJ45	WAN#2/LAN #1~5(RJ45)	V
27	Vigor2925n-plus					V (2.4G)	V (5G)	2	RJ45	WAN#2/LAN #1~5(RJ45)	V
28	Vigor2925ac					V (2.4G)	V (5G/11ac)	3	RJ45	WAN#2/LAN #1~5(RJ45)	V
29	Vigor2925n_dual					V (2.4G or 5G)		4	RJ45	WAN#2/LAN #1~5(RJ45)	V
30	Vigor2925V			V	V				RJ45	WAN#2/LAN #1~5(RJ45)	V

Mode	Model-name	VDSL2 #1 (RJ11)	VDSL2 #2 (RJ11)	FXS (RJ11)	FXO (RJ11)	WLAN-1	WLAN-2	WLAN mode	WAN #1	RJ45 Port #1~6	USB 2.0 x 2
31	Vigor2925Vn			V	V	V (2.4G)		1	RJ45	WAN#2/LAN #1~5(RJ45)	V
32	Vigor2925Vn-plus			V	V	V (2.4G)	V (5G)	2	RJ45	WAN#2/LAN #1~5(RJ45)	V
33	Vigor2925Vac			V	V	V (2.4G)	V (5G/11ac)	3	RJ45	WAN#2/LAN #1~5(RJ45)	V
34	Vigor2925Vn_dual			V	V	V (2.4G or 5G)		4	RJ45	WAN#2/LAN #1~5(RJ45)	V
35	Vigor2925F								SFP	WAN#2/LAN #1~5(RJ45)	V
36	Vigor2925Fn					V (2.4G)		1	SFP	WAN#2/LAN #1~5(RJ45)	V
37	Vigor2925Fn-plus					V (2.4G)	V (5G)	2	SFP	WAN#2/LAN #1~5(RJ45)	V
38	Vigor2925Fac					V (2.4G)	V (5G/11ac)	3	SFP	WAN#2/LAN #1~5(RJ45)	V
39	Vigor2925Fn_dual					V (2.4G or 5G)		4	SFP	WAN#2/LAN #1~5(RJ45)	V
40	Vigor2925FV			V	V				SFP	WAN#2/LAN #1~5(RJ45)	V
41	Vigor2925FVn			V	V	V (2.4G)		1	SFP	WAN#2/LAN #1~5(RJ45)	V
42	Vigor2925FVn-plus			V	V	V (2.4G)	V (5G)	2	SFP	WAN#2/LAN #1~5(RJ45)	V
43	Vigor2925FVac			V	V	V (2.4G)	V (5G/11ac)	3	SFP	WAN#2/LAN #1~5(RJ45)	V
44	Vigor2925FVn_dual			V	V	V (2.4G or 5G)		4	SFP	WAN#2/LAN #1~5(RJ45)	V
45	Vigor2860F	V							SFP	LAN#1~6 (RJ45)	V

Mode	Model-name	VDSL2 #1 (RJ11)	VDSL2 #2 (RJ11)	FXS (RJ11)	FXO (RJ11)	WLAN-1	WLAN-2	WLAN mode	WAN #1	RJ45 Port #1~6	USB 2.0 x 2
46	Vigor2860Fn	V				V (2.4G)		1	SFP	LAN#1~6 (RJ45)	V
47	Vigor2860Fn-plus	V				V (2.4G)	V (5G)	2	SFP	LAN#1~6 (RJ45)	V
48	Vigor2860Fac	V				V (2.4G)	V (5G/11ac)	3	SFP	LAN#1~6 (RJ45)	V
49	Vigor2860Fn_dual	V				V (2.4G or 5G)		4	SFP	LAN#1~6 (RJ45)	V
50	Vigor2860FV	V		V	V				SFP	LAN#1~6 (RJ45)	V
51	Vigor2860FVn	V		V	V	V (2.4G)		1	SFP	LAN#1~6 (RJ45)	V
52	Vigor2860FVn-plus	V		V	V	V (2.4G)	V (5G)	2	SFP	LAN#1~6 (RJ45)	V
53	Vigor2860FVac	V		V	V	V (2.4G)	V (5G/11ac)	3	SFP	LAN#1~6 (RJ45)	V
54	Vigor2860FVn_dual	V		V	V	V (2.4G or 5G)		4	SFP	LAN#1~6 (RJ45)	V
55	VigorIPPBX2860	V		V	V				RJ45	LAN#1~6 (RJ45)	V
56	VigorIPPBX2860n	V		V	V	V (2.4G)		1	RJ45	LAN#1~6 (RJ45)	V
57	VigorIPPBX2860n-plus	V		V	V	V (2.4G)	V (5G)	2	RJ45	LAN#1~6 (RJ45)	V
58	VigorIPPBX2860ac	V		V	V	V (2.4G)	V (5G/11ac)	3	RJ45	LAN#1~6 (RJ45)	V
59	VigorIPPBX2860n_dual	V		V	V	V (2.4G or 5G)		4	RJ45	LAN#1~6 (RJ45)	V
60	Vigor3220								RJ45	LAN#2/WAN #1~5(RJ45)	V

Mode	Model-name	VDSL2 #1 (RJ11)	VDSL2 #2 (RJ11)	FXS (RJ11)	FXO (RJ11)	WLAN-1	WLAN-2	WLAN mode	WAN #1	RJ45 Port #1~6	USB 2.0 x 2
61	Vigor3220n					V (2.4G)		1	RJ45	LAN#2/WAN #1~5(RJ45)	V
62	Vigor3220n-plus					V (2.4G)	V (5G)	2	RJ45	LAN#2/WAN #1~5(RJ45)	V
63	Vigor3220ac					V (2.4G)	V (5G/11ac)	3	RJ45	LAN#2/WAN #1~5(RJ45)	V
64	Vigor3220n_dual					V (2.4G or 5G)		4	RJ45	LAN#2/WAN #1~5(RJ45)	V
65	Vigor3220V			V	V				RJ45	LAN#2/WAN #1~5(RJ45)	V
66	Vigor3220Vn			V	V	V (2.4G)		1	RJ45	LAN#2/WAN #1~5(RJ45)	V
67	Vigor3220Vn-plus			V	V	V (2.4G)	V (5G)	2	RJ45	LAN#2/WAN #1~5(RJ45)	V
68	Vigor3220Vac			V	V	V (2.4G)	V (5G/11ac)	3	RJ45	LAN#2/WAN #1~5(RJ45)	V
69	Vigor3220Vn_dual			V	V	V (2.4G or 5G)		4	RJ45	LAN#2/WAN #1~5(RJ45)	V
70	Vigor3220F								SFP	LAN#2/WAN #1~5(RJ45)	V
71	Vigor3220Fn					V (2.4G)		1	SFP	LAN#2/WAN #1~5(RJ45)	V
72	Vigor3220Fn-plus					V (2.4G)	V (5G)	2	SFP	LAN#2/WAN #1~5(RJ45)	V
73	Vigor3220Fac					V (2.4G)	V (5G/11ac)	3	SFP	LAN#2/WAN #1~5(RJ45)	V
74	Vigor3220Fn_dual					V (2.4G or 5G)		4	SFP	LAN#2/WAN #1~5(RJ45)	V
75	Vigor3220FV			V	V				SFP	LAN#2/WAN #1~5(RJ45)	V

Mode	Model-name	VDSL2 #1 (RJ11)	VDSL2 #2 (RJ11)	FXS (RJ11)	FXO (RJ11)	WLAN-1	WLAN-2	WLAN mode	WAN #1	RJ45 Port #1~6	USB 2.0 x 2
76	Vigor3220FVn			V	V	V (2.4G)		1	SFP	LAN#2/WAN #1~5(RJ45)	V
77	Vigor3220FVn-plus			V	V	V (2.4G)	V (5G)	2	SFP	LAN#2/WAN #1~5(RJ45)	V
78	Vigor3220FVac			V	V	V (2.4G)	V (5G/11ac)	3	SFP	LAN#2/WAN #1~5(RJ45)	V
79	Vigor3220FVn_dual			V	V	V (2.4G or 5G)		4	SFP	LAN#2/WAN #1~5(RJ45)	V