APPENDIX I
RADIO FREQUENCY EXPOSURE

LIMIT

According to §15.247(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this chapter.

EUT Specification

EUT	150MBPS WIRELESS N ADSL2+ MODEM ROUTER		
Model	DL4311; DL4311D		
RF Module	Realtek	Model:	RTL8188ER-CG
Model Discrepancy	All the model numbers (list on this report) are identical, just for marketing purpose only except Antenna.		
	Model Number	**Antenna**	
	DL4311	Fixed	
	DL4311D	Detachable	
Frequency band (Operating)	☒ 802.11b/g/n HT20: 2.412GHz ~ 2.462GHz 802.11n HT40: 2.422GHz ~ 2.452GHz ☐ Others		
Device category	☐ Portable (<20cm separation) ☒ Mobile (>20cm separation) ☐ Others		
Exposure classification	☐ Occupational/Controlled exposure (S = 5mW/cm^2) ☒ General Population/Uncontrolled exposure (S=1mW/cm^2)		
Antenna Specification	2.4GHz: Antenna Gain : 5.00 dBi (Numeric gain 3.16)		
Maximum Average output power	IEEE 802.11b Mode: 18.29 dBm (67.453 mW) IEEE 802.11g Mode: 12.70 dBm (18.621 mW) IEEE 802.11n HT 20 Mode: 12.75 dBm (18.836 mW) IEEE 802.11n HT 40 Mode: 15.56 dBm (35.975 mW)		
Maximum Tune up Power	IEEE 802.11b Mode: 19.00 dBm (79.433 mW) IEEE 802.11g Mode: 17.00 dBm (50.119 mW) IEEE 802.11n HT 20 Mode: 16.00 dBm (39.811 mW) IEEE 802.11n HT 40 Mode: 16.00 dBm (39.811 mW)		
Evaluation applied	☒ MPE Evaluation* ☐ SAR Evaluation ☐ N/A		

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	2014/03/22	Initial Issue	ALL	Scott Hsu

TEST RESULTS

No non-compliance noted.

Calculation

Given $E = \frac{\sqrt{30 \times P \times G}}{d}$ & $S = \frac{E^2}{377}$

Where E = Field strength in Volts / meter
P = Power in Watts
G = Numeric antenna gain
d = Distance in meters
S = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{377 d^2}$$

Changing to units of mW and cm, using:

P (mW) = P (W) / 1000 and

d (cm) = d(m) / 100

Yields

$$S = \frac{30 \times (P/1000) \times G}{377 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2}$$ ***Equation 1***

Where d = Distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power density in mW / cm^2

Maximum Permissible Exposure

Substituting the MPE safe distance using d = 20 cm into Equation 1:

$$S = 0.000199 \times P \times G$$

Where P = Power in mW
G = Numeric antenna gain
S = Power density in mW / cm^2

IEEE 802.11b mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)
1	2412	79.433	3.16	20	0.0500	1

IEEE 802.11g mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)
1	2412	50.119	3.16	20	0.0315	1

IEEE 802.11n HT20 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)
11	2462	39.811	3.16	20	0.0250	1

IEEE 802.11n HT40 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)
6	2437	39.811	3.16	20	0.0250	1