RF Exposure Evaluation declaration

Product Name ： Dual-band Gigabit Wireless-N Router
Model No. ： RT-N56U
FCC ID. ： MSQ-RTN56U

Applicant : Asustek Computer Inc.
Address ： No.150 Li-Te Rd., Peitou, Taipei, Taiwan

Date of Receipt : 2010/07/18
Date of Declaration : 2010/09/30
Report No. : 107261R-RF-US-Exp
Report Version : V1.0

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	Dual-band Gigabit Wireless-N Router
Test Mode	Mode 1: Transmit
Test Condition	RF Exposure Evaluation

Antenna Gain

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 3.8dBi or 2.4 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	109.3956	0.05221
6	2437	105.4387	0.05032
11	2462	114.2878	0.05454

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	201.3724	0.09610
6	2437	196.3360	0.09370
11	2462	190.5461	0.09093

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	Dual-band Gigabit Wireless-N Router
Test Mode	Mode 1: Transmit
Test Condition	RF Exposure Evaluation

Antenna Gain

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 3.8dBi or 2.4 in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11n (20MHz)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm^2)
1	2412	203.2357	0.0970
6	2437	201.3724	0.0961
11	2462	187.0682	0.0893

IEEE 802.11n (40MHz)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm^2)
3	2422	258.2260	0.1233
6	2437	257.6321	0.1230
9	2452	260.6153	0.1244

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	Dual-band Gigabit Wireless-N Router
Test Mode	Mode 1: Transmit
Test Condition	RF Exposure Evaluation

Antenna Gain

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 5.1dBi or 3.2 in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11a			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm^2)
36	5180	28.5102	0.01815
40	5220	26.4850	0.01686
44	5240	27.0396	0.01721

IEEE 802.11a			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm^2)
149	5745	78.5236	0.0499
153	5785	75.3356	0.0479
165	5825	75.3356	0.0479

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	Dual-band Gigabit Wireless-N Router
Test Mode	Mode 1: Transmit
Test Condition	RF Exposure Evaluation

Antenna Gain

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 5.1dBi or 3.2 in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11 n(20MHz)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm^2)
36	5180	27.2270	0.01733
40	5220	26.1818	0.01667
44	5240	27.4157	0.01745

IEEE 802.11 n(20MHz)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm^2)
149	5745	77.8037	0.04953
153	5785	78.3430	0.04987
165	5825	78.5236	0.04999

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	Dual-band Gigabit Wireless-N Router
Test Mode	Mode 1: Transmit
Test Condition	RF Exposure Evaluation

Antenna Gain

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 5.1dBi or 3.2 in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11 n(40MHz)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm^2)
38	5190	42.1697	0.02685
46	5230	41.4954	0.02642

IEEE 802.11 n(40MHz)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm^2)
151	5755	74.9894	0.04774
159	5795	76.3836	0.04863

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.

1.4. Test result of RF Exposure Evaluation (Collocation Mode)

For collocation mode is simulation when EUT insert WWAN card and use maximum output power for this RF Exposure Evaluation.

WWAN:

Output Power into Antenna & RF Exposure Evaluation Distance:

Frequency band	ERP (mW)	Power Density at R = 20 cm (mW/cm^2)	Limit ($f/1500 mW/cm^2$)
850	1500	0.298416	0.5666

Frequency band	EIRP (mW)	Power Density at R = 20 cm (mW/cm^2)	Limit (mW/cm2)
1900	2000	0.397888	1

Result of Collocation Evaluation:

Frequency band	(Pd of WWAN)/(Pd WWAN limit) + (Pd of WLAN)/(Pd WLAN limit)	Limit
850(WWAN) + 2452(802.11n(40MHz))	(0.298416/0.5666) + (0.2606/1) = 0.7873	<1
1900(WWAN) + 2452(802.11n(40MHz))	(0.397888/1) + (0.2606/1) = 0.6585	<1