

RF Exposure Evaluation declaration

Product Name : Dual Band 3x3 802.11AC Gigabit Router
Model No. : RT-AC66U
FCC ID. : MSQ-RTAC66U

Applicant : ASUSTeK COMPUTER INC.

Address : No. 15, Li-Te Rd., Peitou, Taipei 112, Taiwan R.O.C.

Date of Receipt : 2012/04/27
Date of Declaration : 2012/05/21
Report No. : 125201R-RF-US-Exp
Report Version : V1.0

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

Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

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

P_d is the limit of MPE, 1 mW/cm². 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	Dual Band 3x3 802.11AC Gigabit Router
Test Mode	Mode 1: Transmit
Test Condition	RF Exposure Evaluation

Antenna Gain

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2dBi or 1.58 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	246.6039	0.07776
6	2437	301.9952	0.09522
11	2462	270.3958	0.08526

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	297.8516	0.09391
6	2437	337.2873	0.10635
11	2462	175.7924	0.05543

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/cm².

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Antenna Gain

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Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11n (20MHz) (ANT 0+1+2)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
1	2412	554.6257	0.17488
6	2437	592.9253	0.18695
11	2462	639.7348	0.20171

IEEE 802.11n (40MHz) (ANT 0+1+2)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
3	2422	321.3661	0.10133
6	2437	290.4023	0.09157
9	2452	328.8516	0.10369

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Antenna Gain

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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	31.8420	0.01004
40	5220	33.2660	0.01049
44	5240	30.5492	0.00963

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	580.7644	0.18312
153	5785	552.0774	0.17407
165	5825	540.7543	0.17050

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Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11 n(20MHz) (ANT 0+1+2)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
36	5180	34.6737	0.01093
40	5220	35.8096	0.01129
44	5240	35.3997	0.01116

IEEE 802.11 n(20MHz) (ANT 0+1+2)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
149	5745	797.9947	0.25161
153	5785	801.6781	0.25277
165	5825	799.8343	0.25219

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Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11 n(40MHz) (ANT 0+1+2)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
38	5190	46.7735	0.01475
46	5230	44.3609	0.01399

IEEE 802.11 n(40MHz) (ANT 0+1+2)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
151	5755	790.6786	0.24930
159	5795	746.4488	0.23536

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/cm².

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Antenna Gain

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Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11ac (20MHz) (ANT 0+1+2)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
36	5180	40.9261	0.01290
40	5220	40.8319	0.01287
44	5240	39.9945	0.01261

IEEE 802.11ac (20MHz) (ANT 0+1+2)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
149	5745	630.9573	0.19894
153	5785	610.9420	0.19263
165	5825	522.3962	0.16471

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Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11ac (40MHz) (ANT 0+1+2)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
38	5190	41.8794	0.01320
46	5230	41.4954	0.01308

IEEE 802.11ac (40MHz) (ANT 0+1+2)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
151	5755	472.0630	0.14884
159	5795	463.4469	0.14613

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Test Condition	RF Exposure Evaluation

Antenna Gain

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Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11ac (80MHz) (ANT 0+1+2)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
42	5210	46.2381	0.01458

IEEE 802.11ac (80MHz) (ANT 0+1+2)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
155	5775	760.3263	0.23973

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/cm².