

RF Exposure Evaluation Declaration

Product Name : Dual Band 3x3 802.11ac PCI-E Adapter
Model No. : PCE-AC68
FCC ID. : MSQ-PCEAC68

Applicant : ASUSTeK COMPUTER INC.

Address : 4F, No. 150, Li-Te Rd., Peitou, Taipei, Taiwan

Date of Receipt : 2013/07/02

Date of Declaration : 2013/08/29

Report No. : 137132R-RF-US-Exp

Report Version : V4.0



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

Where

Pd = power density in mW/cm²

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 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 PCI-E Adapter
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 3dBi or 2 in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11b(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	639.7348	0.25454
6	2437	623.7348	0.24818
11	2462	260.6154	0.10370

IEEE 802.11g(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	283.1392	0.11266
6	2437	615.1769	0.24477
11	2462	154.5254	0.06148

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.

Product	Dual Band 3x3 802.11ac PCI-E Adapter
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 3dBi or 2 in linear scale.

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	224.3882	0.08928
6	2437	561.0480	0.22323
11	2462	140.9289	0.05607

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	112.2018	0.04464
6	2437	210.3778	0.08371
9	2452	71.9449	0.02863

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.

Product	Dual Band 3x3 802.11ac PCI-E Adapter
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 3dBi or 2 in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11a(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	16.5196	0.00657
40	5220	16.8655	0.00671
44	5240	16.9044	0.00673

IEEE 802.11a(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	626.6139	0.24932
157	5785	653.1306	0.25987
165	5825	620.8690	0.24704

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.

Product	Dual Band 3x3 802.11ac PCI-E Adapter
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 3dBi or 2 in linear scale.

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	19.2309	0.00765
40	5220	18.8365	0.00749
44	5240	19.3642	0.00770

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	533.3349	0.21221
157	5785	612.3504	0.24365
165	5825	588.8437	0.23429

Product	Dual Band 3x3 802.11ac PCI-E Adapter
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Test Condition	RF Exposure Evaluation

Antenna Gain

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 3dBi or 2 in linear scale.

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	36.5595	0.01455
46	5230	39.8107	0.01584

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	398.1072	0.15840
159	5795	594.2922	0.23646

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.

Product	Dual Band 3x3 802.11ac PCI-E Adapter
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 3dBi or 2 in linear scale.

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	46.7735	0.01861

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	302.7610	0.12046

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.

Product	Dual Band 3x3 802.11ac PCI-E Adapter
Test Mode	Mode 2: Transmit (Beamforming mode)
Test Condition	RF Exposure Evaluation

Antenna Gain

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 7.77dBi or 5.98 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	18.0717	0.02150
40	5220	18.5780	0.02210
44	5240	18.7932	0.02236

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	283.1392	0.11266
157	5785	274.7894	0.10933
165	5825	275.4229	0.10959

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.

Product	Dual Band 3x3 802.11ac PCI-E Adapter
Test Mode	Mode 2: Transmit (Beamforming mode)
Test Condition	RF Exposure Evaluation

Antenna Gain

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 7.77dBi or 5.98 in linear scale.

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	19.0634	0.00759
40	5220	19.3642	0.00770
44	5240	19.3286	0.00769

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	625.1727	0.24875
157	5785	659.1739	0.26228
165	5825	625.1727	0.24875

Product	Dual Band 3x3 802.11ac PCI-E Adapter
Test Mode	Mode 2: Transmit (Beamforming mode)
Test Condition	RF Exposure Evaluation

Antenna Gain

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 7.77dBi or 5.98 in linear scale.

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	31.5500	0.01255
46	5230	32.2107	0.01282

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	346.7369	0.13796
159	5795	662.2165	0.26349

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.

Product	Dual Band 3x3 802.11ac PCI-E Adapter
Test Mode	Mode 2: Transmit (Beamforming mode)
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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	31.9154	0.01270

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	312.6079	0.12438

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.