

RF Exposure Evaluation declaration

Product Name : Wireless-AC2900 Dual Band Gigabit Router
Trade Name : ASUS
Model No. : RT-AC86U, RT-AC68U Extreme,
RT-AC86A, RT-AC86P, RT-AC86R,
RT-AC86X, RT-AC2900, AC2900
FCC ID. : MSQ-RTACHN00

Applicant : ASUSTeK COMPUTER INC.

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

Date of Receipt : Feb. 13, 2017

Date of Declaration : Jun. 26, 2017

Report No. : 1720225R-RF-US-Exp

Report Version : V2.0



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

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	Wireless-AC2900 Dual Band Gigabit Router
Test Mode	Transmit_CDD mode
Test Condition	RF Exposure Evaluation

Antenna Gain

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.33 dBi or 1.36 dBi 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	546.7641	0.14793
6	2437	984.2377	0.26630
11	2462	341.5860	0.09242

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	311.2433	0.08421
6	2437	988.0980	0.26734
11	2462	135.4565	0.03665

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.

The results are evaluated using the maximum power.

Product	Wireless-AC2900 Dual Band Gigabit Router
Test Mode	Transmit_ MIMO Mode
Test Condition	RF Exposure Evaluation

Antenna Gain

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.33 dBi or 1.36 dBi 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	255.9175	0.06924
6	2437	976.1128	0.26410
11	2462	135.1450	0.03657

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	124.3942	0.03366
6	2437	137.9749	0.03733
9	2452	53.8022	0.01456

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.

The results are evaluated using the maximum power.

Product	Wireless-AC2900 Dual Band Gigabit Router
Test Mode	Transmit_ Beamforming Mode
Test Condition	RF Exposure Evaluation

Antenna Gain

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.33 dBi or 1.36 dBi 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	214.8325	0.05813
6	2437	854.0828	0.23108
11	2462	68.2025	0.01845

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	108.2680	0.02929
6	2437	85.7235	0.02319
9	2452	30.4649	0.00824

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.

The results are evaluated using the maximum power.

Product	Wireless-AC2900 Dual Band Gigabit Router
Test Mode	Transmit_ CDD Mode
Test Condition	RF Exposure Evaluation

Antenna Gain

5.2 Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.57 dBi or 1.44 dBi in linear scale.

5.8 Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.85 dBi or 1.53 dBi in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11a (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
36	5180	367.9595	0.10541
40	5220	571.8735	0.16383
44	5240	608.5552	0.17434

IEEE 802.11a (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
149	5745	954.1134	0.29042
157	5785	974.0921	0.29650
165	5825	994.9471	0.30285

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.

The results are evaluated using the maximum power.

Product	Wireless-AC2900 Dual Band Gigabit Router
Test Mode	Transmit_ MIMO Mode
Test Condition	RF Exposure Evaluation

Antenna Gain

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5.8 Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.85 dBi or 1.53 dBi in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11n (20MHz) (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
36	5180	335.8149	0.09620
40	5220	594.4290	0.17029
44	5240	638.4105	0.18289

IEEE 802.11n (20MHz) (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
149	5745	992.2018	0.30201
157	5785	983.1052	0.29924
165	5825	992.2018	0.30201

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.

The results are evaluated using the maximum power.

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Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11n (40MHz) (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
38	5190	182.0120	0.05214
46	5230	657.8093	0.18845

IEEE 802.11n (40MHz) (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
151	5755	986.5066	0.30028
159	5795	983.1052	0.29924

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.

The results are evaluated using the maximum power.

Product	Wireless-AC2900 Dual Band Gigabit Router
Test Mode	Transmit_ MIMO Mode
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Antenna Gain

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5.8 Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.85 dBi or 1.53 dBi in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11ac (80MHz) (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
42	5210	230.7278	0.06610

IEEE 802.11ac (80MHz) (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
155	5775	957.4145	0.29142

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.

The results are evaluated using the maximum power.

Product	Wireless-AC2900 Dual Band Gigabit Router
Test Mode	Transmit_ Beamforming Mode
Test Condition	RF Exposure Evaluation

Antenna Gain

5.2 Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.57 dBi or 1.44 dBi in linear scale.

5.8 Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.85 dBi or 1.53 dBi in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11n (20MHz) (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
36	5180	286.8138	0.08217
40	5220	594.4290	0.17029
44	5240	638.4105	0.18289

IEEE 802.11n (20MHz) (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
149	5745	841.9766	0.25628
157	5785	847.8129	0.25806
165	5825	859.6071	0.26165

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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Product	Wireless-AC2900 Dual Band Gigabit Router
Test Mode	Transmit_ Beamforming Mode
Test Condition	RF Exposure Evaluation

Antenna Gain

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Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11n (40MHz) (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
38	5190	124.1081	0.03555
46	5230	468.5975	0.13424

IEEE 802.11n (40MHz) (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
151	5755	209.8940	0.06389
159	5795	214.7830	0.06538

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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Test Mode	Transmit_ Beamforming Mode
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+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
42	5210	130.3467	0.03734

IEEE 802.11ac (80MHz) (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
155	5775	855.2636	0.26033

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.

The results are evaluated using the maximum power.

Product	Wireless-AC2900 Dual Band Gigabit Router
Test Mode	Transmit_ CDD Mode
Test Condition	RF Exposure Evaluation

Antenna Gain

5.3G Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.6 dBi or 1.45 dBi in linear scale.

5.5G Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.78 dBi or 1.51 dBi in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11a (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
52	5260	135.3044	0.03903
60	5300	150.3370	0.04337
64	5320	157.2507	0.04536

IEEE 802.11a (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
100	5500	113.6104	0.03413
116	5580	132.2322	0.03972
140	5700	126.1306	0.03789

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.

The results are evaluated using the maximum power.

Product	Wireless-AC2900 Dual Band Gigabit Router
Test Mode	Transmit_ MIMO Mode
Test Condition	RF Exposure Evaluation

Antenna Gain

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5.5G Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.78 dBi or 1.51 dBi in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11n (20MHz) (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
52	5260	163.1529	0.04706
60	5300	159.6102	0.04604
64	5320	153.7525	0.04435

IEEE 802.11n (20MHz) (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
100	5500	125.0536	0.03757
116	5580	127.8839	0.03842
140	5700	123.5585	0.03712

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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Test Mode	Transmit_ MIMO Mode
Test Condition	RF Exposure Evaluation

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Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11n (40MHz) (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
54	5270	246.2198	0.07103
62	5310	141.1963	0.04073

IEEE 802.11n (40MHz) (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
102	5510	197.8464	0.05943
110	5500	238.9695	0.07179
134	5670	235.4033	0.07072

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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Test Condition	RF Exposure Evaluation

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Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11ac (80MHz) (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
58	5290	118.7994	0.03427

IEEE 802.11ac (80MHz) (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
106	5530	186.6685	0.05608
122	5610	246.2165	0.07396

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.

The results are evaluated using the maximum power.

Product	Wireless-AC2900 Dual Band Gigabit Router
Test Mode	Transmit_ Beamforming Mode
Test Condition	RF Exposure Evaluation

Antenna Gain

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Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11n (20MHz) (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
52	5260	163.1529	0.04706
60	5300	159.6102	0.04604
64	5320	114.3716	0.03299

IEEE 802.11n (20MHz) (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
100	5500	131.7874	0.03959
116	5580	119.0135	0.03575
140	5700	109.4148	0.03287

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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Test Mode	Transmit_ Beamforming Mode
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Antenna Gain

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Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11n (40MHz) (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
54	5270	184.3153	0.05317
62	5310	74.0141	0.02135

IEEE 802.11n (40MHz) (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
102	5510	113.4521	0.03408
110	5500	252.3994	0.07582
134	5670	118.9366	0.03573

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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Test Mode	Transmit_ Beamforming Mode
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Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11ac (80MHz) (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
58	5290	50.4456	0.01455

IEEE 802.11ac (80MHz) (ANT 0+1+2+3)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
106	5530	77.8607	0.02339
122	5610	216.4356	0.06502

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.

The results are evaluated using the maximum power.

Product	Wireless-AC2900 Dual Band Gigabit Router
Test Mode	Transmit
Test Condition	RF Exposure Evaluation

Power Density (2.4GHz) (mW/cm ²)	Power Density (5GHz) (mW/cm ²)	Total Power Density (2.4GHz+5GHz) (mW/cm ²)	Limit (mW/cm ²)
0.267	0.302	0.569	1