

# RF Exposure Evaluation declaration

Product Name : MOXA IEEE 802.11 a/b/g/n PCI-e

Model No. : WAPN002

FCC ID : SLE-WAPN002

Applicant : Moxa Inc.

Address : Fl.4. No.135. Lane 235, Baoqiao Rd. Xindian Dist, New Taipei City, Taiwan.

Date of Receipt : Oct. 21, 2011

Date of Declaration : Nov. 23, 2011

Report No. : 11A306R-RFUSP32V01

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 <sup>2</sup> )	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  $\text{mW/cm}^2$

$P_{out}$  = 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

$P_d$  is the limit of MPE,  $1 \text{ mW/cm}^2$ . 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:  $18^\circ\text{C}$  and 78% RH.

### 1.3. Test Result of RF Exposure Evaluation

Product : MOXA IEEE 802.11 a/b/g/n PCI-e  
 Test Item : RF Exposure Evaluation  
 Test Site : No.3 OATS

#### Antenna Gain

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2 dBi in logarithm scale.

#### 802.11a

##### Output Power Into Antenna & RF Exposure Evaluation Distance (2 dBi):

Channel	Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )
36	5180.00	43.6516	0.013764
44	5220.00	45.7088	0.014412
48	5240.00	47.8630	0.015091

#### 802.11a

##### Output Power Into Antenna & RF Exposure Evaluation Distance (2 dBi):

Channel	Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )
52	5260.00	50.1187	0.015803
60	5300.00	54.9541	0.017327
64	5320.00	48.4172	0.015266

#### 802.11a

##### Output Power Into Antenna & RF Exposure Evaluation Distance (2 dBi):

Channel	Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )
100	5500.00	47.8630	0.015091
120	5600.00	47.8630	0.015091
140	5700.00	10.0693	0.003175

**802.11n-20BW**
**Output Power Into Antenna & RF Exposure Evaluation Distance (2 dBi):**

Channel	Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )
36	5180.00	20.4644	0.006453
44	5220.00	20.7014	0.006527
48	5240.00	20.9411	0.006603

**802.11n-20BW**
**Output Power Into Antenna & RF Exposure Evaluation Distance (2 dBi):**

Channel	Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )
52	5260.00	20.7014	0.006527
60	5300.00	21.9280	0.006914
64	5320.00	21.7270	0.006851

**802.11n-20BW**
**Output Power Into Antenna & RF Exposure Evaluation Distance (2 dBi):**

Channel	Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )
100	5500.00	21.6770	0.006835
120	5600.00	21.4783	0.006772
140	5700.00	20.6538	0.006512

### 802.11n-40BW

#### Output Power Into Antenna & RF Exposure Evaluation Distance (2 dBi):

Channel	Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )
38	5190.00	21.4289	0.006757
46	5230.00	20.5589	0.006482

### 802.11n-40BW

#### Output Power Into Antenna & RF Exposure Evaluation Distance (2 dBi):

Channel	Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )
54	5270.00	20.6063	0.006497
62	5310.00	19.8609	0.006262

### 802.11n-40BW

#### Output Power Into Antenna & RF Exposure Evaluation Distance (2 dBi):

Channel	Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )
102	5510.00	21.1836	0.006679
118	5590.00	22.1820	0.006994
134	5670.00	21.2814	0.006710

The distance r (4th column) calculated from the Fries transmission formula is far shorter than 20 cm separation requirement.