RF Exposure Evaluation Declaration

FCC ID:	TK4WLM200NX
APPLICANT:	Compex Systems Pte Ltd
Application Type:	Certification
Product:	WIRELESS-N NETWORK MINI PCI ADAPTER
Model No.:	WLM200NX
Brand Name:	COMPEX
FCC Classification:	Unlicensed National Information Infrastructure (UNII) Digital Transmission System (DTS)

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ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

Revision History

Report No.	Version	Description	Issue Date	Note
1608RSU01103	Rev. 01	Initial report	08-30-2016	Valid

1. PRODUCT INFORMATION

1.1. Equipment Description

Product Name	WIRELESS-N NETWORK MINI PCI ADAPTER
Model No.	WLM200NX
Brand Name	COMPEX
WLAN Specification	
Frequency Range	**2.4GHz:** For 802.11b/g/n-HT20: 2412 ~ 2462 MHz For 802.11n-HT40: 2422 ~ 2452 MHz **5GHz:** For 802.11a/n-HT20: 5745~5825MHz For 802.11n-HT40: 5755~5795MHz
Type of Modulation	802.11b: DSSS 802.11g/a/n: OFDM

1.2. Antenna Description

Antenna Type	Frequency Band (GHz)	Manufacturer	Tx Paths	Max Peak Gain (dBi)	Directional Gain (dBi)	
					For Power	For PSD
Dipole Antenna	2.4	Compex Systems Pte Ltd	2	2	2	5.01
	5		2	2	2	5.01
PCB Antenna	2.4	Taoglas Antenna Solutions	2	3	3	6.01
	5		2	5	5	8.01

Note:

The EUT supports Cyclic Delay Diversity (CDD) mode, and CDD signals are correlated.

For CDD transmissions, directional gain is calculated as follows, N_{ANT} = 2, N_{SS} = 1.

1. If all antennas have the same gain, G_{ANT}, Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows.
   - For power spectral density (PSD) measurements on all devices,
     Array Gain = 10 log (N_{ANT}/ N_{SS}) dB = 3.01;
   - For power measurements on IEEE 802.11 devices,
     Array Gain = 0 dB for $N_{ANT} \leq 4$;
2. If antenna gains are not equal, the user may use either of the following methods to calculate directional gain, provided that each transmit antenna is driven by only one spatial stream:
   - Directional gain may be calculated by using the formulas applicable to equal gain antennas with G_{ANT} set equal to the gain of the antenna having the highest gain;
   - $$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

     $g_{j,k} = 10^{G_k/20}$ if the kth antenna is being fed by spatial stream j, or zero if it is not;

     G_k is the gain in dBi of the kth antenna.

2. RF Exposure Evaluation

2.1. 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

Calculation 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 is the limit of MPE, $1mW/cm^2$. 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.

2.2. Test Result of RF Exposure Evaluation

Product	WIRELESS-N NETWORK MINI PCI ADAPTER
Test Item	RF Exposure Evaluation

Antenna Gain: Refer to Clause 1.2 of antenna description.

Test Mode	Frequency Band (MHz)	Maximum Average Output Power (dBm)	Power Density at R = 20 cm (mW/cm^2)	Limit (mW/cm^2)
802.11b/g/n	2412 ~ 2462	23.69	0.0928	1
802.11a/n	5745 ~ 5825	22.59	0.1142	1

CONCULISON:

The Max Power Density at R (20 cm) = 0.1142mW/cm^2 < 1mW/cm^2.

So the EUT complies with the requirement.

The End