RF Exposure Evaluation Declaration

FCC ID:	2AD8UFZCWI2A1
APPLICANT:	Nokia Solutions and Networks

Application Type:	Certification
Product:	Wireless Access Point
Model No.:	WI2A-AC200i
Trademark:	Nokia
FCC Classification:	Digital Transmission System (DTS)
	Unlicensed National Information Infrastructure (UNII)

Reviewed By : Robin Wu
(Robin Wu)

Approved By : Marlin Chen
(Marlin Chen)

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

Revision History

Report No.	Version	Description	Issue Date
1506RSU00614	Rev. 01	Initial report	10-01-2015

1. PRODUCT INFORMATION

1.1. Equipment Description

Product Name	Wireless Access Point
Model No.	WI2A-AC200i
Brand Name	Nokia
Hardware Version	v2.0
Wi-Fi Specification	802.11a/b/g/n/ac
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/ac-VHT20:: 5180~5240MHz, 5745~5825MHz For 802.11n-HT40/ac-VHT40: 5190~5230MHz, 5755~5795MHz For 802.11ac-VHT80: 5210MHz, 5775MHz
Type of Modulation	802.11b: DSSS 802.11g/a/n/ac: OFDM
Maximum Average Output Power	**For 2.4GHz Band:** 802.11b: 26.36dBm 802.11g: 25.49dBm 802.11n-HT20: 25.39dBm 802.11n-HT40: 25.46dBm **For 5GHz Band:** 802.11a: 26.29dBm 802.11n-HT20: 26.09dBm 802.11n-HT40: 25.98dBm 802.11ac-VHT20: 26.18dBm 802.11ac-VHT40: 26.00dBm 802.11ac-VHT80: 21.15dBm

1.2. Antenna Description

Antenna Type	Frequency Band (MHz)	Tx Paths	Per Chain Max Antenna Gain (dBi)		Beam Forming Directional Gain (dBi)	CDD Directional Gain (dBi)
			Ant 1	Ant 2		
PCB Antenna	2412 ~2462	2	3.23	2.38	5.83	5.83
	5150 ~ 5250	2	5.40	4.53	7.99	7.99
	5725 ~ 5850	2	6.00	5.86	8.94	8.94

1. The EUT supports Cyclic Delay Diversity (CDD) technology for 802.11a/b/g mode, and CDD signals are correlated.
2. The EUT supports Beam Forming technology for 802.11n/ac mode, and exclude 802.11b/g mode.

   Correlated signals include, but are not limited to, signals transmitted in any of the following modes:

- Unequal Antenna gains, with equal transmit powers. For Antenna gains given by G_1, G_2, …, G_N dBi transmit signals are correlated, then
- Directional gain = $10*\log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2/N_{ANT}]$ dBi [Note the “20”s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

  For example: 5250 ~ 5350MHz Directional Gain = $10*\log[(10^{5.40/20} + 10^{4.53/20})^2/2]$ = 7.99 dBi

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*r2)

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, $1mW/cm^2$. 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 Access Point
Test Item	RF Exposure Evaluation

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 5.83dBi for 2.4GHz, 7.99dBi for 5.2GHz and 8.94dBi for 5.80GHz in logarithm scale.

For 2.4GHz ISM Band:

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-HT20/ n-HT40	2412 ~ 2462	26.36	0.3294	1

For 5GHz UNII Band:

Test Mode	Frequency Band (MHz)	Maximum Average Output Power (dBm)	Power Density at R = 20 cm (mW/cm^2)	Limit (mW/cm^2)
802.11a/n-HT20/ n-H40/ac-VHT20 ac-VHT40/ac-VHT80	5180 ~ 5240	26.29	0.5330	1
	5725 ~ 5825	26.22	0.6527	1

CONCULISON:

Both of the WLAN 2.4GHz Band and WLAN 5GHz Band can transmit simultaneously. Therefore, the Max Power Density at R (20 cm) = 0.3294mW/cm^2+ 0.6527mW/cm^2 = 0.9821mW/cm^2 < 1mW/cm^2.

So the EUT complies with the requirement.

The End