

RF Exposure Report

Report No.: SA151022E06A

FCC ID: 2AD8UFZCWM2A1

Test Model: WM2A-AC210m

Received Date: Oct. 22, 2015

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Applicant: Nokia Solutions and Networks.OY

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Release Control Record

Issue No.	Description	Date Issued
SA151022E06A	Original release.	Apr. 14, 2016

1 Certificate of Conformity

Product: Wi-Fi AP Module 802.11 ac

Brand: Nokia

Test Model: WM2A-AC210m

Hardware Version: AM2

Sample Status: MASS-PRODUCTION

Applicant: Nokia Solutions and Networks.OY

Test Date: Dec. 02 to 16, 2015

Standards: FCC Part 2 (Section 2.1091)
KDB 447498 D01 GENERAL RF EXPOSURE GUIDANCE V06
IEEE STD C95.1-2005
FCC 47 CFR § 1.13.10

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : C. L, **Date:** Apr. 14, 2016
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Approved by : May Chen, **Date:** Apr. 14, 2016
May Chen / Manager

2 RF Exposure

2.1 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 Exposure				
300-1500	F/1500	30
1500-100,000	1.0	30

F = Frequency in MHz

2.2 MPE Calculation Formula

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

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

2.3 Classification

The antenna of this product, under normal use condition, is at least 20cm away from the body of the user.

So, this device is classified as **fixed device**.

3 Antenna Gain

WLAN – 5GHz Antenna spec.

Antenna No	PCB Chain No.	Brand	Model	Antenna Type	Gain(dBi)	Frequency (GHz to GHz)
1	U20	Galtronics	02102140-06084A4	PIFA	6.03	5.15~5.25
					6.17	5.25~5.35
					5.57	5.47~5.725
					5.18	5.725~5.85
2	U21	Galtronics	02102140-06084A1	PIFA	5.1	5.15~5.25
					4.91	5.25~5.35
					5.23	5.47~5.725
					5.73	5.725~5.85

Cable Spec.

Antenna No	Brand	Model	Connector Type	Cable Loss(dB)	Cable Length (cm)
1	Galtronics	LL100	MMCX	0	30.6
2	Galtronics	LL100	MMCX	0	9.1

4 Calculation Result

For 2.4GHz and 5GHz (U-NII-1 band and U-NII-3 band) data was copied from the original test report (Report No.: SA151022E06)

For 1TX Chain 0 Mode:

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
2412-2462	89.536	5.17	20	0.05858	1
5180-5240	182.81	6.03	20	0.14579	1
5250~5350	182.81	6.17	20	0.15057	1
5470~5725	182.39	5.57	20	0.13084	1
5745-5825	163.682	5.18	20	0.10733	1

For 1TX Chain 1 Mode:

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
2412-2462	89.125	4.27	20	0.04739	1
5180-5240	196.789	5.10	20	0.12669	1
5250~5350	193.642	4.91	20	0.11932	1
5470~5725	191.867	5.23	20	0.12727	1
5745-5825	163.305	5.73	20	0.12154	1

For 2TX Mode:

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
2412-2462	199.467	7.74	20	0.23583	1
5180-5240	368.481	8.59	20	0.52984	1
5250~5350	223.973	8.57	20	0.32057	1
5470~5725	242.038	8.41	20	0.33390	1
5745-5825	384.025	8.47	20	0.53714	1

NOTE:

2412-2462MHz : Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 7.74\text{dBi}$

5180-5240MHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 8.59\text{dBi}$

5250-5350MHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 8.57\text{dBi}$

5470-5725MHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 8.41\text{dBi}$

5745-5825MHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 8.47\text{dBi}$

Conclusion:

The formula of calculated the MPE is:

$$CPD1 / LPD1 + CPD2 / LPD2 + \dots \text{etc.} < 1$$

CPD = Calculation power density

LPD = Limit of power density

Therefore, the worst-case situation is $0.23583 / 1 + 0.53714 / 1 = 0.773$, which is less than "1". This confirmed that the device comply with FCC 1.1310 MPE limit.

5 Brief Summary of results

The wireless device described within this report has been shown to be capable of compliance with the basic restrictions related to human exposure to electromagnetic fields for both General public and Occupational. The calculations shown in this report were made in accordance the procedures specified in the applied test specification(s)

Configuration	Required Compliance Boundary(m)	
	Occupational	General Population
2.4GHz WiFi + 5GHz WiFi	0.2	0.2

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