RF Exposure Report

Report No.:	SA150820E01A
FCC ID:	2AD8UFZPFWFE01; 2AD8UFZPFWFG01; 2AD8UFZPFWFF01
Test Model:	FWFE; FWFG; FWFF
Series Model:	FWFI
Received Date:	Aug. 20, 2015
Test Date:	Sep. 17 to Oct. 20, 2015
Issued Date:	Jan. 15, 2016
Applicant:	Nokia Solutions and Networks
Address:	1455 West Shure Drive, Arlington Heights, IL 60004, USA
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	No. 81-1, Lu Liao Keng, 9th Ling,Wu Lung Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan R.O.C.
Test Location (1):	No. 81-1, Lu Liao Keng, 9th Ling,Wu Lung Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan R.O.C.
Test Location (2):	No. 49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan R.O.C.
Test Location (3):	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.

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Release Control Record

Issue No.	Description	Date Issued
SA150820E01A	Original release.	Jan. 15, 2016

1 Certificate of Conformity

Product:	Flexi Zone Indoor Pico BTS
Brand:	Nokia
Test Model:	FWFE; FWFG; FWFF
Series Model:	FWFI
Hardware Version:	473236A .101; 473238A.101; 473237A.101; 473771A.101
Sample Status:	MASS-PRODUCTION
Applicant:	Nokia Solutions and Networks
Test Date:	Sep. 17 to Oct. 20, 2015
Standards:	FCC Part 2 (Section 2.1091) KDB 447498 D01 GENERAL RF EXPOSURE GUIDANCE V06 IEEE STD C95.1-2005 FCC Part 1 (Section 1.1310)

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 : _____ , **Date:** Jan. 15, 2016
Lori Chung / Specialist

Approved by : _____ , **Date:** Jan. 15, 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/cm2)	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/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

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** and installations by professional service personnel.

3 Antenna Gain

WWAN Antenna Spec.							
Antenna No	Brand	Model	Antenna Type	Antenna Connector	Gain(dBi) <Including cable loss>	Cable Length (mm)	Frequency (MHz)
Internal WWAN (Main)	TongDa	U81B045	PIFA	i-pex(MHF)	5.94	90	1930-1990
Internal WWAN (Aux)					4.5	225	
External WWAN (Main & Aux)	Larsen	DASLTE500NFMIMO	1/4 Wave monopoles on ground plane	N-Female/1/4" low loss, low PIM, plenum rated	2	NA	698~960
					5		1710~2170
WLAN Antenna Spec.							
Antenna No	Brand	Model	Antenna Type	Antenna Connector	Gain(dBi) <Including cable loss>	Cable Length (mm)	Frequency (MHz)
Internal WIFI (Main)	TongDa	T-543-8141037-3	PIFA	i-pex(MHF)	3.3	90	2412~2472
					2.4		5150~5825
Internal WIFI (Aux)	TongDa	T-543-8141037-4	PIFA	i-pex(MHF)	3	70	2412~2472
					2.9		5150~5825
GPS Antenna Spec.							
Antenna No	Brand	Model	Antenna Type	Antenna Connector	Gain(dBic) <Including cable loss>	Cable Length (mm)	Frequency (MHz)
External GPS Ant	TongDa	T-543-8141037-9	ElecPatch	SMA Male	4.0	9140 ± 100	GPS：1575.42 ± 3 MHz Glonass：1602 ± 8 MHz
BT Antenna Spec.							
Antenna No	Brand	Model	Antenna Type	Antenna Connector	Gain(dBi) <Including cable loss>	Cable Length (mm)	Frequency (MHz)
Internal BT Ant	INPAQ	Fz PICO	Chip	NA	-1.22	NA	2400~2500

The functions support of each model as below table:

Model name	WWAN		Wi-Fi	BT	GPS
	Internal antenna	External antenna			
FWFE	✓	-	✓	✓	✓
FWFI	✓	-	✓	✓	✓
FWFG	-	✓	-	✓	✓
FWFF	✓	-	-	✓	✓

4 Calculation Result of Maximum Conducted Power

For WLAN

(Model: FWFE & FWFI)

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
2412-2462	340.489	6.16	20	0.27979	1
5180-5240	293.463	5.66	20	0.21492	1
5260-5320	250.344	5.66	20	0.18334	1
5500 -5580 & 5660 - 5700	248.333	5.66	20	0.18187	1
5745-5825	331.042	5.66	20	0.24244	1

NOTE:
2.4GHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 6.16$dBi
5GHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 5.66$dBi

For BT

(Model: FWFE & FWFI)

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
2402-2480	9.840	-1.22	20	0.00148	1

(Model: FWFG & FWFF)

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
2402-2480	9.795	-1.22	20	0.00147	1

For WWAN

WCDMA SC MODE

(Model: FWFE, FWFI & FWFF – with internal antenna)

Frequency Band (MHz)	Max Power (dBm)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
1932.4-1987.6	23.41	219.28	5.94	20	0.17129	1

(Model: FWFG – with external antenna)

Frequency Band (MHz)	Max Power (dBm)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
1932.4-1987.6	23.18	207.97	5	20	0.131	1

WCDMA MC MODE

(Model: FWFE, FWFI & FWFF – with internal antenna)

Frequency Band (MHz)	Max Power (dBm)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
1932.4-1987.6	24.79	301.46	5.94	20	0.23548	1

(Model: FWFG – with external antenna)

Frequency Band (MHz)	Max Power (dBm)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
1932.4-1987.6	24.73	297.080	5	20	0.187	1

Conclusion:

The formula of calculated the MPE is:

CPD1 / LPD1 + CPD2 / LPD2 + ……etc. < 1

CPD = Calculation power density

LPD = Limit of power density

Model	Scenario	The formula of calculated the MPE	Calcualtion Power Density	Limit	Results
FWFE & FWFI	WLAN 2.4GHz + WLAN 5GHz + BT + WWAN (WCDMA SC MODE)	0.27979 + 0.24244 + 0.00148 + 0.17129	0.695	1	Pass
	WLAN 2.4GHz + WLAN 5GHz + BT + WWAN (WCDMA MC MODE)	0.27979 + 0.24244 + 0.00148 + 0.23548	0.75919	1	Pass
FWFG	BT + WWAN (WCDMA SC MODE)	0.00147 + 0.131	0.13247	1	Pass
	BT + WWAN (WCDMA MC MODE)	0.00147 + 0.187	0.18847	1	Pass
FWFF	BT + WWAN (WCDMA SC MODE)	0.00147 + 0.17129	0.17276	1	Pass
	BT + WWAN (WCDMA MC MODE)	0.00147 + 0.23548	0.23695	1	Pass

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
WWAN FDD Band 2+ Bluetooth + 2.4GHz WiFi + 5GHz WiFi	0.2	0.2

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