



RF Exposure Evaluation Declaration

FCC ID: 2AD8UFW2RN01
Application: Nokia Solutions and Networks, OY
Application Type: Certification
Product: Flexi Zone Unlicensed LTE
Model No.: FW2RN
Brand Name: Nokia
Test Procedure(s): KDB 447498 D01v06

Reviewed By:

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Approved By:

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Testing Laboratory
3261

The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standards through the calibration of the equipment and evaluated measurement uncertainty herein.

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Revision History

Report No.	Version	Description	Issue Date	Note
1907TW0105-U2	Rev. 01	Initial Report	07-29-2019	Valid

§2.1033 General Information

Applicant:	Nokia Solutions and Networks, OY
Applicant Address:	2000 W. Lucent Lane, Naperville, Illinois, United States, 60563
Manufacturer:	Nokia Solutions and Networks, OY
Manufacturer Address:	2000 W. Lucent Lane, Naperville, Illinois, United States, 60563
Test Site:	MRT Technology (Taiwan) Co., Ltd
Test Site Address:	No. 38, Fuxing Second Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C)

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Fuxing Rd., Taoyuan, Taiwan (R.O.C)

- MRT facility is a FCC registered (Reg. No. 153292) test facility with the site description report on file and is designated by the FCC as an Accredited Test Film.
- MRT facility is an IC registered (MRT Reg. No. 21723-1) test laboratory with the site description on file at Industry Canada.
- MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (TAF) under the American Association for Laboratory Accreditation Program (TAF Cert. No. 3261) in EMC, Telecommunications and Radio testing for FCC, Industry Taiwan, EU and TELEC Rules.

1. PRODUCT INFORMATION

1.1. Equipment Description

Product Name:	Flexi Zone Unlicensed LTE
Model No.:	FW2RN
Brand Name:	Nokia
Test Device Serial No.:	EB191390028
Hardware Version:	475254A.x22
Software Version:	TLF00
LTE Operating Band (s):	LTE Band 46d
Type of Modulation:	QPSK, 16QAM, 64QAM, 256QAM
Carrier Bandwidth:	20MHz
T _x Frequency Range:	5745 ~ 5825.1 MHz
R _x Frequency Range:	5745 ~ 5825.1 MHz
Antenna Specification:	Refer to Section 1.2
Cable Specification:	Nokia Part Number: 475312A, Cable Loss: 0.8dB

1.2. Antenna Information

Antenna Type	Nokia Part Number	Frequency Band (MHz)	T _x Paths	Max Antenna Gain (dBi)
Directional Antenna	FA2RE (475214A)	5735 ~ 5835	2	6.0
Omini Antenna	FA2RA (473121A)	5735 ~ 5835	2	7.5

Note 1: The directional gain = $G_{ANT} + 10 \log(N_{ANT}/N_{SS})$ dBi, where N_{SS} = the number of independent spatial streams of data and G_{ANT} is the antenna gain in dBi. So, the directional gain = 6 or 7.5dBi + 3.01 = 9.01 or 10.51dBi.

Note 2: Two type antennas not supporting simultaneous transmission.

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: $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot r^2)$

Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

r = distance between observation point and center of the radiator in cm

P_d is the limit of MPE, 1mW/cm². 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	Flexi Zone Unlicensed LTE
Test Item	RF Exposure Evaluation (For General Population)

Test Mode	Frequency Band (MHz)	Maximum EIRP (dBm)	Safety Distance (cm)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
Directional Antenna					
LTE Band 46d	5745 ~ 5825.1	35.93	20	0.7793	1
Omni Antenna					
LTE Band 46d	5745 ~ 5825.1	35.65	20	0.7307	1

Note: The EIRP = Maximum Conducted Output Power + Directional Gain.

Product	Flexi Zone Unlicensed LTE
Test Item	RF Exposure Evaluation (For Occupational)

Test Mode	Frequency Band (MHz)	Maximum EIRP (dBm)	Safety Distance (cm)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
Directional Antenna					
LTE Band 46d	5745 ~ 5825.1	35.93	20	0.7793	5
Omni Antenna					
LTE Band 46d	5745 ~ 5825.1	35.65	20	0.7307	5

Note: The EIRP = Maximum Conducted Output Power + Directional Gain.

2.3. Summary of Test Result

The maximum calculations of above situations

Model	Configuration	The formula of calculated the MPE (mW/cm ²)	Limit	Result
General Population	LTE Band 46d	0.7793	1	Pass
Occupational		0.7793	5	Pass

The device described within this report has been shown to be capable of compliance with 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 specifications

Required Compliance Boundary (cm)	
General Population	Occupational
20	20

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