

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:



(Paddy Chen)

Approved By:



(Chenz Ker)



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.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Taiwan) Co., Ltd.



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

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 |

_____ The End _____