

# RF Exposure Evaluation Report

**APPLICANT** : Shenzhen Gongjin Electronics Co.,Ltd.  
**EQUIPMENT** : Nokia Smart Node  
**BRAND NAME** : Nokia  
**MODEL NAME** : Nokia Multi-Standard Smart Node N77(SN5I77)  
**FCC ID** : V4VSN5I77  
**STANDARD** : 47 CFR Part 2.1091  
FCC KDB 447498 D01 v06

The product evaluation date was started from Apr. 19, 2023 and completed on Apr. 19, 2023. We, Sporton International Inc. (Kunshan), would like to declare that the device has been evaluated in accordance with 47 CFR Part 2.1091 and FCC KDB 447498 D01 v06, and pass the limit. Without written approval of Sporton International Inc. (Kunshan), the test report shall not be reproduced except in full.

**Note:**

1. The Nokia Multi Standard Smart Node N77 can work in SA mode (5G Only): n77 MIMO (Model: SN5I77; FCC ID: V4VSN5I77).
2. The Nokia Multi Standard Smart Node N77 can work in NSA mode (5G+4G), provided that smart node 4G (Model SN4IBN; FCC ID: V4V1SN4IBN) devices and 5G (Model : SN5I77; FCC ID: V4VSN5I77) devices need to be used together(n77 MIMO+ B2/B14/B66 MIMO).



Approved by: Si Zhang

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**1. Administration Data**

**1.1. Testing Laboratory**

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Testing Laboratory			
Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	SAR01-KS	CN1257	314309

Applicant	
Company Name	Shenzhen Gongjin Electronics Co.,Ltd.
Address	No.2 Danzi North Road, Kengzi Street, Pingshan District, Shenzhen, Guangdong, 518122, P.R. China

Manufacturer	
Company Name	Nokia Solutions and Networks Oy
Address	Karakaari 7, 02610 Espoo, Finland



## 2. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	Nokia Smart Node
Brand Name	Nokia
Model Name	Nokia Multi-Standard Smart Node N77(SN5I77)
FCC ID	V4VSN5I77
Wireless Technology and Frequency Range	5G NR n77 : 3700 MHz ~ 3980 MHz
Mode	5G NR : CP-OFDM QPSK, 16QAM, 64QAM, 256QAM
Antenna Gain	Ant.1 5G NR n77: 6.14 dBi Ant.2 5G NR n77: 8.16 dBi
Antenna Type	WWAN: Dipole Antenna
HW Version	V0.2
SW Version	1.2.26.47.77
EUT Stage	Identical Prototype

**Remark:**

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. WWAN support SISO/MIMO mode, we only chose MIMO tune up power to perform MPE calculation conservatively for MIMO power is higher.

**Comments and Explanations:**

1. The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.
2. The maximum RF output tune up power, antenna gain also the safe distance used for evaluate RF exposure were declared by manufacturer.



**3. Maximum RF average output tune up power among production units**

**<5GNR>**

Mode		Maximum Average power(dBm)		
		Ant1	Ant2	Ant1+2
5GNR	n77	25.50	25.50	28.50

Note: WWAN support SISO/MIMO mode, we only chose MIMO tune up power to perform MPE calculation conservatively for MIMO power is higher.



### 4. RF Exposure Limit Introduction

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
<b>(A) Limits for Occupational/Controlled Exposures</b>				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f <sup>2</sup> )	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

The MPE was calculated at 20 cm for Standalone and 26 cm for Simultaneous to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:

S = Power Density

P = Output Power at Antenna Terminals

G = Gain of Transmit Antenna (linear gain)

R = Distance from Transmitting Antenna

## **5. Radio Frequency Radiation Exposure Evaluation**

### **5.1. Standalone Power Density Calculation**

**<Standalone for 5GNR>:**

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Average EIRP (mW)	Power Density at 20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
5G NR n77 MIMO	3700.0	8.16	28.50	36.660	4634.469	0.922	1.000

**<Simultaneous for 5GNR in combination with a 4G(LTE) Unit>:**

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Average EIRP (mW)	Power Density at 26cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Power Density / Limit
5G NR n77 MIMO	3700.0	8.16	28.50	36.660	4634.469	0.546	1.000	0.546

**Note:**

Note:

1. Chose the maximum power and the maximum antenna gain to do MPE analysis.
2. The MIMO mode is completely uncorrelated, so selected the higher SISO gain among all antennas as MIMO gain to perform MPE calculation.

### **5.2. Collocated Power Density Calculation**

NR MIMO Power Density / Limit	LTE MIMO Power Density / Limit	$\Sigma$ (Power Density / Limit) of 5G NR + LTE MIMO
0.546	0.417	0.963

**Note:**

1. The device support LTE + 5G NR simultaneous transmission mode, they also support LTE MIMO + 5G NR MIMO simultaneous transmission mode.
2. The maximum power density /limit of Smart Node 4G were leveraged from MPE test report with Sproton No: FA151309.
3. LTE MIMO+NR MIMO was used to cover LTE+ 5G NR EN-DC mode for conservatively evaluation.
4.  $\Sigma$ (Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for LTE + NR.
5. Considering the NR module collocation with the LTE module transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of 2 collocated transmitters is compliant.

### **Conclusion:**

According to 47 CFR §2.1091, the MPE was calculated at 20 cm for Standalone and 26 cm for Simultaneous to show compliance with the power density limit, the RF exposure analysis concludes that the RF Exposure is FCC compliant.

-----THE END-----