

MPE TEST REPORT

Applicant Nokia Shanghai Bell Co., Ltd.
FCC ID 2ADZRBEACON31
Product NOKIA WiFi Beacon 3.1
Brand NOKIA
Model Beacon 3.1
Report No. R2308A0899-M1
Issue Date October 19, 2023

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC 47 CFR Part 1 1.1310**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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Table of Contents

1	Test Laboratory.....	3
1.1	Notes of the Test Report.....	3
1.2	Test Facility.....	3
1.3	Testing Location.....	3
1.4	Laboratory Environment.....	3
2	Description of Equipment Under Test.....	4
3	Maximum Output Power (Measured) /Tune up and Antenna Gain.....	5
4	Test Result.....	6
	ANNEX A: The EUT Appearance.....	8

1 Test Laboratory

1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA Technology (Shanghai) Co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2 Test Facility

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform measurements.

1.3 Testing Location

Company: TA Technology (Shanghai) Co., Ltd.
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1.4 Laboratory Environment

Temperature	Min. = 18°C, Max. = 25 °C
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5 Ω
Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

2 Description of Equipment Under Test

Client Information

Applicant	Nokia Shanghai Bell Co., Ltd.
Applicant address	No.388, Ningqiao Rd, Pilot Free Trade Zone, Shanghai, 201206 P.R. China
Manufacturer	Nokia of America Corporation.
Manufacturer address	2301 Sugar Bush Road, Raleigh, North Carolina, 27612, United States of America

General Technologies

EUT Description			
Model	Beacon 3.1		
SN	ALCLB299643A		
Hardware Version	PEM1		
Software Version	3TN00626		
Frequency	Band	TX (MHz)	RX (MHz)
	Wi-Fi 2.4G	2400 ~ 2483.5	2400 ~ 2483.5
	Wi-Fi 5G (U-NII-1)	5150 ~ 5250	5150 ~ 5250
	Wi-Fi 5G (U-NII-2A)	5250 ~ 5350	5250 ~ 5350
	Wi-Fi 5G (U-NII-2C)	5470 ~ 5725	5470 ~ 5725
	Wi-Fi 5G (U-NII-3)	5725 ~ 5850	5725 ~ 5850
Date of Testing	August 23, 2023 ~ September 26, 2023		
Date of Sample Received	August 7, 2023		
Note: 1. The EUT is sent from the applicant to TA and the information of the EUT is declared by the applicant. 2. All indications of Pass/Fail in this report are opinions expressed by TA Technology (Shanghai) Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only.			

Hardware code information

Mnemonic	KIT Code	EMA Code	Part Description
Beacon 3.1	3TN00511****(* Can be any capital letter from A to Z)	3TN00512****(* Can be any capital letter from A to Z)	Beacon 3.1, 1G WAN,2x1G LAN, WIFI6 2+2

3 Maximum Output Power and Antenna Gain

The numeric gain (G) of the antenna with a gain specified in dB is determined by

$$\text{Numeric gain (G)} = 10^{(\text{antenna gain}/10)}$$

Band		Maximum Output Power		Antenna Gain (dBi)	Numeric Gain	
		(dBm)	(mW)			
AOT	Wi-Fi 2.4G		27.69	587.489	3.00	1.995
	Wi-Fi 5G	U-NII-1	29.04	801.678	3.10	2.042
		U-NII-2A	23.98	250.035	3.10	2.042
		U-NII-2C	23.85	242.661	2.90	1.950
		U-NII-3	28.09	644.169	2.90	1.950
DZZ	Wi-Fi 2.4G		27.31	538.270	2.64	1.837
	Wi-Fi 5G	U-NII-1	29.04	801.678	2.64	1.837
		U-NII-2A	23.98	250.035	2.64	1.837
		U-NII-2C	23.85	242.661	2.84	1.923
		U-NII-3	28.09	644.169	2.76	1.888

4 Test Result

According to section 1.1310 of FCC 47 CFR Part 1, limits for maximum permissible exposure (MPE) are as following.

TABLE 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)	Averaging Time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3-30	1842/f	4.89/f	*(900/f ²)	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

Note1. Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational / controlled limits apply provided he or she is made aware of the potential for exposure.

Note2: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

The maximum permissible exposure for 1500~100,000MHz is 1.0. So

Band	The Maximum Permissible Exposure (mW/cm ²)
Wi-Fi 2.4GHz	1.000
Wi-Fi 5GHz	1.000

RF Exposure Calculations:

The following information provides the minimum separation distance for the highest gain antenna provided. This calculation is based on the conducted power, considering maximum power and antenna gain. The formula shown in KDB 447498 D01 is used in the calculation.

Equation from KDB 447498 D01 General RF Exposure Guidance v06 (10/23/2015) is:

$$S = PG / 4\pi R^2$$

Where: S = power density (in appropriate units, e.g. mW/cm²)

P = Time-average maximum tune up procedure (in appropriate units, e.g., mW)

G = the numeric gain of the antenna

R = distance to the center of radiation of the antenna (20 cm = limit for MPE)

Band		Maximum Output Power (dBm)	Antenna Gain (dBi)	Maximum EIRP (dBm)	PG (mW)	Result (mW/cm ²)	Limit Value (mW/cm ²)	The MPE ratio	
AOT	Wi-Fi 2.4GHz	27.69	3.00	30.690	1172.195	0.233	1.000	0.233	
	Wi-Fi 5GHz	U-NII-1	29.04	3.10	32.140	1636.817	0.326	1.000	0.326
		U-NII-2A	23.98	3.10	27.080	510.505	0.102	1.000	0.102
		U-NII-2C	23.85	2.90	26.750	473.151	0.094	1.000	0.094
		U-NII-3	28.09	2.90	30.990	1256.030	0.250	1.000	0.250
DZZ	Wi-Fi 2.4GHz	27.31	2.64	29.950	988.553	0.197	1.000	0.197	
	Wi-Fi 5GHz	U-NII-1	29.04	2.64	31.680	1472.313	0.293	1.000	0.293
		U-NII-2A	23.98	2.64	26.620	459.198	0.091	1.000	0.091
		U-NII-2C	23.85	2.84	26.690	466.659	0.093	1.000	0.093
		U-NII-3	28.09	2.76	30.850	1216.186	0.242	1.000	0.242

Note: R = 20cm

$\pi = 3.1416$

The MPE ratio = Mac Result ÷ Limit Value

So the simultaneous transmitting antenna pairs as below:

AOT: \sum of EMF ratios= Wi-Fi 2.4G Antenna + Wi-Fi 5G Antenna = 0.233 + 0.326 = 0.559 < 1

DZZ: \sum of EMF ratios= Wi-Fi 2.4G Antenna + Wi-Fi 5G Antenna = 0.197 + 0.293 = 0.490 < 1

Note: For transmitters, minimum separation distance is 20cm, even if calculations indicate MPE distance is less.

ANNEX A: The EUT Appearance

The EUT Appearance are submitted separately.

*****END OF REPORT *****