

RF Exposure Evaluation Report

APPLICANT : Nokia Shanghai Bell Co., Ltd.
EQUIPMENT : NOKIA WiFi Beacon 19
BRAND NAME : NOKIA
MODEL NAME : Beacon 19
FCC ID : 2ADZRBEACON19
STANDARD : 47 CFR Part 2.1091
FCC KDB 447498 D01 v06

The product evaluation date was started from Jul. 25, 2024 and completed on Jul. 25, 2024. 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.



Approved by: Si Zhang

Sporton International Inc. (Kunshan)

No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300
People's Republic of China



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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA452305	Rev. 01	Initial issue of report.	Aug. 12, 2024



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		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	SAR01-KS	CN1257	314309

Applicant	
Company Name	Nokia Shanghai Bell Co., Ltd.
Address	No.388, Ningqiao Rd, Pilot Free Trade Zone, Shanghai, 201206 P.R. China

Manufacturer	
Company Name	Nokia of America Corporation
Address	2301 Sugar Bush Rd. Raleigh, NC 27612



2. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	NOKIA WiFi Beacon 19
Brand Name	NOKIA
Model Name	Beacon 19
FCC ID	2ADZRBEACON19
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2412 MHz - 2462 MHz WLAN 5.2GHz Band: 5180 MHz - 5240 MHz WLAN 5.3GHz Band: 5260 MHz - 5320 MHz WLAN 5.5GHz Band: 5500 MHz - 5720 MHz WLAN 5.8GHz Band: 5745 MHz - 5825 MHz WLAN 6GHz U-NII-5: 6105 MHz - 6425 MHz WLAN 6GHz U-NII-6: 6425 MHz - 6525 MHz WLAN 6GHz U-NII-7: 6525 MHz - 6875 MHz WLAN 6GHz U-NII-8: 6875 MHz - 7125 MHz
Mode	WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 2.4GHz 802.11ax HE20/HE40 WLAN 2.4GHz 802.11be EHT20/EHT40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac/ax VHT20/VHT40/VHT80/VHT160/HE20/HE40/HE80/HE160 WLAN 5GHz 802.11be EHT20/EHT40/EHT80/EHT160 WLAN 6GHz 802.11ax HE20/HE40/HE80/HE160 WLAN 6GHz 802.11be EHT20/EHT40/EHT80/EHT160/EHT320
Antenna Type	WLAN: Dipole Antenna
EUT Stage	Production Unit

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. This device support beamforming for WLAN 2.4GHz 802.11 ax/be HE20/HE40/EHT20/EHT40 and WLAN 5GHz 802.11 ac/ax/be VHT20/VHT40/VHT80/VHT160/HE20/HE40/HE80/HE160/EHT20/EHT40/EHT80/EHT160, and WLAN 6GHz 802.11 ax/be HE20/HE40/HE80/HE160/EHT20/EHT40/EHT80/EHT160/EHT320.
3. The device supports 1S4T(CDD&TXBF) mode for WLAN 2.4GHz/5GHz, and 1S4T(CDD&TXBF) and 4S4T(SDM) mode for WLAN 6GHz; 1S4T: NSS=1, MIMO 4Tx; 4S4T: NSS=4, MIMO 4Tx.
4. WLAN2.4GHz/WLAN5GHz/WLAN6GHz all support SISO and MIMO mode, MIMO tune up power was chosen to perform MPE calculation conservatively.
5. For WLAN CDD&Beamforming mode, the MPE calculation performed separately.
6. There are two samples, sample 1 is Inpaq antenna and sample 2 is AOT antenna. And for WLAN6GHz has AOT antenna only. The detail gain value please refers to following gain table. Please refer to the antenna report for the maximum Single antenna gain and CDD (Cyclic Delay Diversity) directional gain and TXBF (Tx Beamforming) directional gain.

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.

For Antenna Gain:

Manufacturer	Frequency Bands	Maximum Single Antenna gain (dBi)												CDD Gain (dBi)	SDM Gain (dBi)	Beamforming Gain (dBi)
		ANT1	ANT2	ANT3	ANT4	ANT5	ANT6	ANT7	ANT8	ANT A	ANT B	ANT C	ANT D			
AOT antenna	WLAN 2.4GMHz	1.79	2.36	1.23	2.57	/	/	/	/	/	/	/	/	-0.01	/	5.79
	WLAN 5.2GMHz	/	/	/	/	2.16	2.31	2.32	2.84	/	/	/	/	-0.27	/	5.39
	WLAN 5.3GMHz	/	/	/	/	2.16	2.31	2.32	2.84	/	/	/	/	-0.27	/	5.39
	WLAN 5.5GMHz	/	/	/	/	1.95	2.36	2.24	2.26	/	/	/	/	-0.21	/	5.78
	WLAN 5.8GMHz	/	/	/	/	2.01	2.59	2.17	2.31	/	/	/	/	-0.09	/	5.72
	WLAN 6GMHz	/	/	/	/	/	/	/	/	3.59	3.6	3.52	3.66	0.09	0.09	5.03
Inpaq antenna	WLAN 2.4GMHz	1.8	1.69	1.57	1.72	/	/	/	/	/	/	/	/	-0.2	/	5.75
	WLAN 5.2GMHz	/	/	/	/	2.37	2.53	2.71	2.75	/	/	/	/	-0.65	/	5.35
	WLAN 5.3GMHz	/	/	/	/	2.37	2.53	2.71	2.75	/	/	/	/	-0.65	/	5.35
	WLAN 5.5GMHz	/	/	/	/	3.44	1.86	2.05	3.33	/	/	/	/	0.04	/	5.72
	WLAN 5.8GMHz	/	/	/	/	3.13	2.73	2.66	3.71	/	/	/	/	0.07	/	5.7

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

<For CDD/MIMO Mode>

<2.4GHz WLAN >

Mode		Maximum Average Power (dBm)
		Ant.1+2+3+4
2.4GHz	802.11b	27.5
	802.11g	30.0
	802.11n-HT20	29.0
	802.11n-HT40	24.0
	802.11ax-HE20	30.0
	802.11ax-HE40	25.5
	802.11be-EHT20	30.0
	802.11be-EHT40	25.5

**<5GHz WLAN >**

Mode		Maximum Average Power (dBm)
		Ant.5+6+7+8
5.2GHz	802.11a	29.0
	802.11n-HT20	27.5
	802.11n-HT40	26.0
	802.11ac-VHT20	27.5
	802.11ac-VHT40	26.0
	802.11ac-VHT80	23.5
	802.11ax-HE20	28.0
	802.11ax-HE40	26.5
	802.11ax-HE80	24.0
	802.11be-EHT20	28.0
	802.11be-EHT40	26.5
	802.11be-EHT80	24.0
5.3GHz	802.11a	22.5
	802.11n-HT20	23.0
	802.11n-HT40	23.5
	802.11ac-VHT20	23.0
	802.11ac-VHT40	23.5
	802.11ac-VHT80	22.5
	802.11ac-VHT160	23.5
	802.11ax-HE20	23.5
	802.11ax-HE40	23.98
	802.11ax-HE80	23.0
	802.11ax-HE160	23.98
	802.11be-EHT20	23.5
	802.11be-EHT40	23.98
	802.11be-EHT80	23.0
	802.11be-EHT160	23.98
5.5GHz	802.11a	22.5
	802.11n-HT20	22.5
	802.11n-HT40	23.98
	802.11ac-VHT20	22.5
	802.11ac-VHT40	23.98
	802.11ac-VHT80	23.98
	802.11ac-VHT160	23.0
	802.11ax-HE20	23.0
	802.11ax-HE40	23.98
	802.11ax-HE80	23.98
	802.11ax-HE160	23.0
	802.11be-EHT20	23.0
	802.11be-EHT40	23.98
	802.11be-EHT80	23.98
	802.11be-EHT160	23.0
5.8GHz	802.11a	30.0
	802.11n-HT20	29.5
	802.11n-HT40	29.5



	802.11ac-VHT20	29.5
	802.11ac-VHT40	29.5
	802.11ac-VHT80	28.0
	802.11ax-HE20	30.0
	802.11ax-HE40	30.0
	802.11ax-HE80	29.0
	802.11be-EHT20	30.0
	802.11be-EHT40	30.0
	802.11be-EHT80	29.0

<6GHz WLAN>

Mode		Maximum Average Power (dBm)	
		Ant.A+B+C+D	
		1S4T	4S4T
6GHz	802.11ax-HE20	12.5	17.0
	802.11ax-HE40	15.5	20.5
	802.11ax-HE80	18.5	23.5
	802.11ax-HE160	21.5	26.5
	802.11be-EHT20	12.5	17.0
	802.11be-EHT40	15.5	20.5
	802.11be-EHT80	18.5	23.5
	802.11be-EHT160	21.5	26.5
	802.11be-EHT320	24.5	29.0

Note: WLAN2.4GHz/WLAN5GHz/WLAN6GHz all support SISO/MIMO mode, MIMO tune up power was chosen to perform MPE calculation conservatively.

**<For Beamforming Mode>****<2.4GHz WLAN >**

Mode		Maximum Average Power (dBm)
		Ant.1+2+3+4
2.4GHz	802.11ax-HE20	25.0
	802.11ax-HE40	20.0
	802.11be-EHT20	25.0
	802.11be-EHT40	20.0

<5GHz WLAN >

Mode		Maximum Average Power (dBm)
		Ant.5+6+7+8
5.2GHz	802.11ac-VHT20	23.5
	802.11ac-VHT40	23.5
	802.11ac-VHT80	18.5
	802.11ax-HE20	24.5
	802.11ax-HE40	24.0
	802.11ax-HE80	19.5
	802.11be-EHT20	24.5
	802.11be-EHT40	24.0
	802.11be-EHT80	19.5
5.3GHz	802.11ac-VHT20	22.0
	802.11ac-VHT40	23.0
	802.11ac-VHT80	19.5
	802.11ac-VHT160	19.5
	802.11ax-HE20	22.5
	802.11ax-HE40	23.5
	802.11ax-HE80	20.0
	802.11ax-HE160	20.0
	802.11be-EHT20	22.5
	802.11be-EHT40	23.5
	802.11be-EHT80	20.0
	802.11be-EHT160	20.0
5.5GHz	802.11ac-VHT20	21.5
	802.11ac-VHT40	23.98
	802.11ac-VHT80	23.0
	802.11ac-VHT160	18.5
	802.11ax-HE20	22.5
	802.11ax-HE40	23.98
	802.11ax-HE80	23.98
	802.11ax-HE160	19.0
	802.11be-EHT20	22.5
	802.11be-EHT40	23.98
	802.11be-EHT80	23.98
	802.11be-EHT160	19.0
5.8GHz	802.11ac-VHT20	29.0



	802.11ac-VHT40	28.5
	802.11ac-VHT80	24.0
	802.11ax-HE20	30.0
	802.11ax-HE40	29.0
	802.11ax-HE80	24.5
	802.11be-EHT20	30.0
	802.11be-EHT40	29.0
	802.11be-EHT80	24.5

<6GHz WLAN>

Mode		Maximum Average Power (dBm)
		Ant.A+B+C+D
6GHz	802.11ax-HE20	12.5
	802.11ax-HE40	15.5
	802.11ax-HE80	18.5
	802.11ax-HE160	21.5
	802.11be-EHT20	12.5
	802.11be-EHT40	15.5
	802.11be-EHT80	18.5
	802.11be-EHT160	21.5
	802.11be-EHT320	23.5

Note: This device support beamforming for WLAN 2.4GHz 802.11 ax/be HE20/HE40/EHT20/EHT40 and WLAN 5GHz 802.11 ac/ax/be VHT20/VHT40/VHT80/VHT160/HE20/HE40/HE80/HE160/EHT20/EHT40/EHT80/EHT160, and WLAN 6GHz 802.11 ax/be HE20/HE40/HE80/HE160/EHT20/EHT40/EHT80/EHT160/EHT320.

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 ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	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

The MPE was calculated at 25 cm 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

<WLAN MIMO Mode>

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Average EIRP (dBm)	Average EIRP (mW)	Power Density at 25cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
WLAN2.4GHz	2412	2.57	30.00	32.570	1807.174	0.230	1.000	0.230
WLAN5.2GHz	5180	2.84	29.00	31.840	1527.566	0.195	1.000	0.195
WLAN5.3GHz	5260	2.84	23.98	26.820	480.839	0.061	1.000	0.061
WLAN5.5GHz	5500	3.44	23.98	27.420	552.077	0.070	1.000	0.070
WLAN5.8GHz	5745	3.71	30.00	33.710	2349.633	0.299	1.000	0.299
WLAN6GHz	6105	0.09	29.00	29.090	810.961	0.103	1.000	0.103

<WLAN Beamforming Mode>

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Average EIRP (dBm)	Average EIRP (mW)	Power Density at 25cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
WLAN2.4GHz	2412	5.79	25.00	30.790	1199.499	0.153	1.000	0.153
WLAN5.2GHz	5180	5.39	24.50	29.890	974.990	0.124	1.000	0.124
WLAN5.3GHz	5260	5.39	23.50	28.890	774.462	0.099	1.000	0.099
WLAN5.5GHz	5500	5.78	23.98	29.760	946.237	0.121	1.000	0.121
WLAN5.8GHz	5745	5.72	30.00	35.720	3732.502	0.475	1.000	0.475
WLAN6GHz	6105	5.03	23.50	28.530	712.853	0.091	1.000	0.091

Note:

- For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band.
- For WLAN 2.4GHz/5GHz, chose the maximum RF output tune up power and the maximum antenna gain of all antennas among same frequency WLAN bands to perform MPE calculation conservatively. For WLAN 6GHz, chose the maximum RF output tune up power and the maximum antenna gain of CDD and SDM mode among same frequency WLAN bands to perform MPE calculation conservatively.

**5.2. Collocated Power Density Calculation**

<WLAN 2.4GHz + WLAN 5GHz + WLAN 6GHz >:

Maximum WLAN 2.4GHz Power Density / Limit	Maximum WLAN 5GHz Power Density / Limit	Maximum WLAN 6GHz Power Density / Limit	Σ (Power Density / Limit) of WLAN 2.4GHz + WLAN 5GHz + WLAN 6GHz
0.230	0.475	0.103	0.808

Note:

1. For collocation analysis, choose the highest (power density/limit) among WLAN 2.4GHz/5GHz/6GHz MIMO mode and Beamforming mode respectively.
2. Σ (Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for WLAN 2.4GHz + WLAN 5GHz + WLAN 6GHz.
3. Considering all transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and collocated transmitters is compliant.

Conclusion:

According to 47 CFR §2.1091, the equipment at least 25 cm to show compliance with the power density limit, the RF exposure analysis concludes that the RF Exposure is FCC compliant.

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