

RF Exposure Evaluation Report

APPLICANT : Nokia Shanghai Bell Co., Ltd.
EQUIPMENT : NOKIA WiFi Beacon 24
BRAND NAME : NOKIA
MODEL NAME : Beacon 24
FCC ID : 2ADZRBEACON24
STANDARD : 47 CFR Part 2.1091
FCC KDB 447498 D01 v06

The product evaluation date was started from Feb. 08, 2025 and completed on Feb. 08, 2025. 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)

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People's Republic of China***



Table of Contents

1. ADMINISTRATION DATA	4
1.1. Testing Laboratory	4
2. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)	5
3. MAXIMUM RF AVERAGE OUTPUT TUNE UP POWER AMONG PRODUCTION UNITS	7
4. RF EXPOSURE LIMIT INTRODUCTION	8
5. RADIO FREQUENCY RADIATION EXPOSURE EVALUATION	9
5.1. Standalone Power Density Calculation	9
5.2. Collocated Power Density Calculation.....	10



Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA3N0928-02	Rev. 01	Initial issue of report.	Feb. 17, 2025



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 24
Brand Name	NOKIA
Model Name	Beacon 24
FCC ID	2ADZRBEACON24
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2412 MHz - 2462 MHz WLAN 5.2GHz Band: 5150 MHz - 5250 MHz WLAN 5.3GHz Band: 5250 MHz - 5350 MHz WLAN 5.6GHz Band: 5470 MHz - 5725 MHz WLAN 5.8GHz Band: 5725 MHz - 5850 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 802.11a/ax 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. The device supports 4S4T(SDM) mode for WLAN 6GHz; 4S4T: NSS=4, MIMO 4Tx.
3. WLAN2.4GHz/WLAN5GHz/WLAN6GHz all support SISO and MIMO mode, MIMO tune up power was chosen to perform MPE calculation conservatively.
4. The device supports 1S4T(CDD&TXBF) and 4S4T(SDM) mode for WLAN6GHz 802.11ax/be; 1S4T: NSS=1, MIMO 4Tx; 4S4T: NSS=4, MIMO 4Tx
5. For WLAN CDD&Beamforming mode, the MPE calculation performed separately.
6. The detail gain value 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 and SDM (Space Division Multiplexing) directional gain.
7. This is a variant report, the difference could be referred to the Beacon 24 _Class II Permissive Change letter which is exhibit separately. According to the difference, added WLAN 6GHz SDM mode evaluation based on original report, and other Bands evaluation data are leveraged from original report which can be referred to Sporton Report Number FA3N0940.

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.



Manufacturer	Frequency Bands	Maximum Single Antenna gain (dBi)								Beamforming Gain (dBi)
		ANT A	ANT B	ANT C	ANT D	ANT1	ANT2	ANT3	ANT4	
AOT antenna	WLAN 2.4GMHz	3.14	2.67	3.71	2.25	/	/	/	/	5.83
	WLAN 5.2GMHz	/	/	/	/	2.97	4.09	4.22	3.85	5.77
	WLAN 5.3GMHz	/	/	/	/	2.97	5.09	4.67	3.85	5.83
	WLAN 5.5GMHz	4.11	4.46	4.15	3.82	/	/	/	/	5.95
	WLAN 5.8GMHz	3.82	3.80	3.64	4.04	/	/	/	/	5.95
PSA antenna	WLAN 2.4GMHz	2.10	2.11	2.43	3.11	/	/	/	/	4.78
	WLAN 5.2GMHz	/	/	/	/	2.62	2.14	2.40	2.16	5.37
	WLAN 5.3GMHz	/	/	/	/	2.62	3.12	2.16	2.16	5.37
	WLAN 5.5GMHz	2.07	1.81	1.74	2.31	/	/	/	/	5.67
	WLAN 5.8GMHz	2.07	1.80	1.70	3.11	/	/	/	/	5.39

Frequency Band	Maximum Single Antenna gain (dBi)				SDM DG (dBi)		TXBF DG (dBi)	
	ANT5	ANT6	ANT7	ANT8	For Power	For PSD	For Power	For PSD
6GHz UNII-5	4.43	3.20	4.67	3.43	0.93	4.90	4.90	4.90
6GHz UNII-6	4.39	3.54	4.05	3.91	1.04	4.49	4.49	4.49
6GHz UNII-7	4.38	3.64	4.38	3.91	0.94	5.40	5.40	5.40
6GHz UNII-8	4.99	4.54	4.38	5.32	0.94	5.37	5.37	5.37

**3. Maximum RF average output tune up power among production units****<For Non-Beamforming Mode>**

Mode	Maximum Average Power (dBm)
	Ant.1+2+3+4
WLAN 5GHz (5150 MHz - 5350 MHz)	29.28

Mode	Maximum Average Power (dBm)
	Ant.A+B+C+D
WLAN 2.4GHz	29.99
WLAN 5GHz (5470 MHz - 5850 MHz)	29.57

Mode	Maximum Average Power (dBm)
	Ant.5+6+7+8
WLAN 6GHz	24.34

<For SDM Mode>

Mode	Maximum Average Power (dBm)
	Ant.5+6+7+8
WLAN 6GHz	28.88

<For Beamforming Mode>

Mode	Maximum Average Power (dBm)
	Ant.1+2+3+4
WLAN 5GHz (5150 MHz - 5350 MHz)	28.37

Mode	Maximum Average Power (dBm)
	Ant.A+B+C+D
WLAN 2.4GHz	29.78
WLAN 5GHz (5470 MHz - 5850 MHz)	29.91

Mode	Maximum Average Power (dBm)
	Ant.5+6+7+8
WLAN 6GHz	20.43

Note: This device has three sets of antennas, and their combinations, supported band, and maximum combined output power are as shown in the table above.



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 31 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 Non-Beamforming Mode>

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Average EIRP (dBm)	Average EIRP (mW)	Power Density at 31cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
WLAN5GHz Ant 1+2+3+4	5150	5.83	29.28	35.110	3243.396	0.269	1.000	0.269
WLAN2.4GHz Ant A+B+C+D	2412	5.83	29.99	35.820	3819.443	0.316	1.000	0.316
WLAN5GHz Ant A+B+C+D	5470	5.95	29.57	35.520	3564.511	0.295	1.000	0.295
WLAN6GHz Ant 5+6+7+8	6105	5.40	24.34	29.740	941.890	0.078	1.000	0.078

<WLAN SDM Mode>

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Average EIRP (dBm)	Average EIRP (mW)	Power Density at 31cm (W/m ²)	Limit (W/m ²)	Power Density / Limit
WLAN6GHz Ant 5+6+7+8	6105	1.04	28.88	29.920	981.748	0.081	1.000	0.081

<WLAN Beamforming Mode>

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Average EIRP (dBm)	Average EIRP (mW)	Power Density at 31cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
WLAN5GHz Ant 1+2+3+4	5150	5.83	28.37	34.200	2630.268	0.218	1.000	0.218
WLAN2.4GHz Ant A+B+C+D	2412	5.83	29.78	35.610	3639.150	0.301	1.000	0.301
WLAN5GHz Ant A+B+C+D	5470	5.95	29.91	35.860	3854.784	0.319	1.000	0.319
WLAN6GHz Ant 5+6+7+8	6105	5.40	20.43	25.830	382.825	0.032	1.000	0.032

Note:

1. For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band.
2. For WLAN 2.4GHz/5GHz/6GHz, 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.

**5.2. Collocated Power Density Calculation**

Maximum Ant 1+2+3+4 Power Density / Limit	Maximum Ant A+B+C+D Power Density / Limit	Maximum Ant 5+6+7+8 Power Density / Limit	Σ (Power Density / Limit) of Maximum (Ant 1+2+3+4) + Maximum (Ant A+B+C+D) + Maximum (Ant 5+6+7+8)
0.269	0.319	0.081	0.669

Note:

1. Σ (Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for (Ant 1+2+3+4) + (Ant A+B+C+D) + (Ant 5+6+7+8).
2. Considering all transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of all collocated transmitters is compliant.

Conclusion:

According to 47 CFR §2.1091, the equipment at least 31 cm to show compliance with the power density limit, the RF exposure analysis concludes that the RF Exposure is FCC compliant.

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