



RADIO EXPOSURE TEST REPORT

FCC ID : 2ADZRBGW321

Equipment : BGW320-505

Brand Name : NOKIA

Model Name : BGW320-505

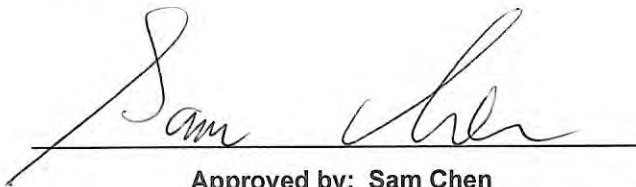
Applicant : Nokia Shanghai Bell Co. Ltd.
No. 388, Ningqiao Rd. Pilot Free Trade Zone
Shanghai , China 201206

Manufacturer : Nokia Shanghai Bell Co. Ltd.
No. 388, Ningqiao Rd. Pilot Free Trade Zone
Shanghai , China 201206

Standard : 47 CFR Part 2.1091

The product was received on Jun. 27, 2022, and testing was started from Jun. 28, 2022 and completed on Jul. 19, 2022. We, Sporton International Inc. Hsinchu Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in 47 CFR Part 2.1091 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. Hsinchu Laboratory, the test report shall not be reproduced except in full.



Approved by: Sam Chen

Sporton International Inc. Hsinchu Laboratory

No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)



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Photographs of EUT v01



History of this test report

TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-A1_1 Ver1.1

Page Number : 3 of 10
Issued Date : Nov. 09, 2022
Report Version : 01



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
2	-	Exposure evaluation	PASS	-

Declaration of Conformity:

1. The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results.
2. The measurement uncertainty please refer to report "Measurement Uncertainty".

Comments and Explanations:

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.

Reviewed by: Sam Chen

Report Producer: Vicky Huang



1 General Description

1.1 EUT General Information

RF General Information			
Evaluation Mode	Frequency Range (MHz)	Operating Frequency (MHz)	Modulation Type
2.4GHz WLAN	2400-2483.5	2412-2462	802.11b: DSSS (DBPSK, DQPSK, CCK) 802.11g/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) VHT: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
5GHz WLAN	5150-5250 5250-5350 5470-5725 5725-5850	5180-5250 5250-5320 5500-5720 5745-5825	802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)

1.2 Antenna Information

Ant.	Port		Brand	Model Name	Antenna Type	Connector	Gain (dBi)
	2.4GHz	5GHz					
1	4	1	Airgain	N2430ARJYW Rev A-PK1-L-G1X165BUR2	PCB	I-PEX	Note 1
2	3	2	Airgain	N2430ARHYN Rev A-PK1-L-Y1X140BUR2	PCB	I-PEX	
3	2	3	Airgain	N2435ARHYN Rev A-PK1-L-B1X155BU	PCB	I-PEX	
4	1	4	Airgain	N2420ARHYW Rev A-PK1-L-A1X195BU	PCB	I-PEX	
5	-	1	Airgain	N5X20QSYN Rev A-PK1-L-B50UR2	PCB	I-PEX	
6	-	2	Airgain	N5X20QSYE Rev A-PK1-L-A55UR2	PCB	I-PEX	
7	-	3	Airgain	N5X20QSYN Rev A-PK1-L-Y1X190BU	PCB	I-PEX	
8	-	4	Airgain	N5X20QSYE Rev A-PK1-L-G1X160BU	PCB	I-PEX	
9	-	-	Airgain	N5X20HGHC Rev A-PK1-L-R1X1058U	PCB	I-PEX	



Note1:

Ant.	Antenna Gain (dBi)				
	WLAN 2.4GHz	WLAN 5GHz			
		UNII 1	UNII 2A	UNII 2C	UNII 3
1	2.7	2.45	2.78	-	-
2	4.27	3.45	2.83	-	-
3	3.57	2.34	2.4	-	-
4	2.86	2.92	3.38	-	-
5	-	-	-	2.16	2.63
6	-	-	-	2.5	3.69
7	-	-	-	3.24	2.05
8	-	-	-	2.18	2.44
9	-	3.9	3.4	4.6	4.2

Ant.	Directional Gain (dBi)														
	WLAN 2.4GHz			WLAN 5GHz											
	2.45GHz			5.2GHz			5.3GHz			5.6GHz			5.785GHz		
	4T1S	4T2S	4T4S	4T1S	4T2S	4T4S	4T1S	4T2S	4T4S	4T1S	4T2S	4T4S	4T1S	4T2S	4T4S
1	5.01	4.27	4.27	4.16	3.45	3.45	3.61	3.38	3.38	-	-	-	-	-	-
2															
3															
4															
5	-	-	-	-	-	-	-	-	-	4.32	3.24	3.24	4.21	3.69	3.69
6															
7															
8															

Note 2: The above information(excepting antenna 1~8 gain) was declared by manufacturer.

Note 3: The antenna 9 which has the receiving function only is used for zero wait.

Note 4: The EUT has nine antennas.

Note 5: The antenna 1~8 gain and directional gain are measured which follow the procedure of KDB 662911 D03

**For 2.4GHz function:****For IEEE 802.11b/g/n/VHT/ax (4TX/4RX):**

Port 1, Port 2, Port 3 and Port 4 can be use as transmitting/receiving antenna.

Port 1, Port 2, Port 3 and Port 4 could transmit/receive simultaneously.

For 5GHz function:**For IEEE 802.11a/n/ac/ax (4TX/4RX):**

Port 1, Port 2, Port 3 and Port 4 can be use as transmitting/receiving antenna.

Port 1, Port 2, Port 3 and Port 4 could transmit/receive simultaneously.

For 1RX:

Ant. 9 can be use as receiving antenna only

1.3 Accessories

Accessories			
Equipment Name	Brand Name	Model Name	Rating
Adapter	AT&T	EPS48R0-16	INPUT: 120V ~ 1.1A, 60Hz OUTPUT: 12V, 4A, 48W

1.4 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ 47 CFR Part 2.1091
- ♦ KDB 447498 D04 Interim General RF Exposure Guidance v01

The following reference test guidance is not within the scope of accreditation of TAF.

- ♦ 47 CFR Part 1.1307
- ♦ 47 CFR Part 1.1310

1.5 Testing Location

Testing Location Information	
Test Lab. : Sporton International Inc. Hsinchu Laboratory	
Hsinchu	ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)
(TAF: 3787)	TEL: 886-3-656-9065 FAX: 886-3-656-9085
	Test site Designation No. TW3787 with FCC.
	Conformity Assessment Body Identifier (CABID) TW3787 with ISCED.



2 Maximum Permissible Exposure

2.1 Limit of Maximum Permissible Exposure

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
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

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
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

Note: f = frequency in MHz ; *Plane-wave equivalent power density

2.2 MPE Calculation Method

The MPE was calculated at 54 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric field (V/m)

P = RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$



2.3 MPE Exemption

Option (A): 1.1307(b)(3)(i)(A): Available maximum time-averaged power is < 1 mW

Option (B): 1.1307(b)(3)(i)(B): Device operates between 300 MHz and 6 GHz and the maximum time-averaged power or effective radiated power (ERP), whichever is greater, <= P_{th}.

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

Option (C): 1.1307(b)(3)(i)(C): ERP is below a threshold calculated based on the distance

R between the person and the antenna / radiating structure, where $R > \lambda / 2 \pi$.

Single RF Sources Subject to Routine Environmental Evaluation	
RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$.
1.34-30	$3,450 R^2/f^2$.
30-300	$3.83 R^2$.
300-1,500	$0.0128 R^2 f$.
1,500-100,000	$19.2 R^2$.
Note: R is in meters, f is in MHz.	



2.4 Calculated Result and Limit

Exposure Environment: General Population / Uncontrolled Exposure

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm ²)	S Limit (mW/cm ²)
2.4G;D1D	5.01	29.98	34.99	0.50	35.49	3.53997	54	0.09661	1.00000
5.2G;D1D	4.16	29.59	33.75	0.50	34.25	2.66073	54	0.07261	1.00000
5.3G;D1D	3.61	23.95	27.56	0.50	28.06	0.63973	54	0.01746	1.00000
5.6G;D1D	4.32	23.96	28.28	0.50	28.78	0.75509	54	0.02061	1.00000
5.8G;D1D	4.21	29.83	34.04	0.50	34.54	2.84446	54	0.07763	1.00000

MPE Exemption Option C							
Frequency (MHz)	$\lambda/2\pi$ (m)	R (m)	Tune-up EIRP (dBm)	Tune-up ERP (dBm)	Tune-up ERP (W)	ERP Threshold (W)	MPE Exemption
2437	0.0196	0.54	35.49	33.34	2.158	5.599	Complies
5200	0.0092		34.25	32.10	1.622	5.599	Complies
5755	0.0083		34.54	32.39	1.734	5.599	Complies

Simultaneous Transmission Analysis Mode: WLAN 2.4GHz+ WLAN 5GHz UNII1~2A+5GHz UNII2C~3

Simultaneous Transmissions Option C							
Frequency (MHz)	R (m)	Tune-up EIRP (dBm)	Tune-up ERP (dBm)	Tune-up ERP (W)	ERP Threshold (W)	Simultaneous Transmissions	Simultaneous Transmissions Limit
2437	0.54	35.49	33.34	2.158	5.599	0.98	<= 1
5200		34.25	32.10	1.622	5.599		
5755		34.54	32.39	1.734	5.599		

————THE END————