

TEST REPORT

Applicant: nFore Technology Co., Ltd.
Address: 5F., No.31, Ln. 258, Ruiguang Rd. Neihu Dist.,
Taipei City 114, Taiwan
Equipment Type: NF3510PQ
Model Name: NF3510PQ (refer section 2.4)
Brand Name: nFore
FCC ID: W3GNF3510PQ
Test Standard: 47 CFR Part 2.1091
(refer section 3.1)
Test Date: Sep. 01, 2022 - Sep. 22, 2022
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ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

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Revision History

Version	Issue Date	Revisions Content
<u>Rev. 01</u>	<u>Oct. 31, 2022</u>	<u>Initial Issue</u>
<u>Rev. 02</u>	<u>Nov. 09, 2022</u>	<u>Updated Section 5.1 Output Power, Section 5.2 Tune-up power and Section 5.3 RF Exposure Evaluation Result.</u>

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1 GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	<input checked="" type="checkbox"/> Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
	<input type="checkbox"/> 1/F, Building B, Ganghongji High-tech Intelligent Industrial Park, No. 1008, Songbai Road, Yangguang Community, Xili Sub-district, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	nFore Technology Co., Ltd.
Address	5F., No.31, Ln. 258, Ruiguang Rd. Neihu Dist., Taipei City 114, Taiwan

2.2 Manufacturer Information

Manufacturer	nFore Technology Co., Ltd.
Address	5F., No.31, Ln. 258, Ruiguang Rd. Neihu Dist., Taipei City 114, Taiwan

2.3 Factory Information

Factory	nFore Technology Co., Ltd.
Address	No.9, Dapumeiyuanqu 9th Rd., Dalin Township, Chiayi County 622, Taiwan

2.4 General Description for Equipment under Test (EUT)

EUT Name	NF3510PQ
Model Name Under Test	NF3510PQ
Series Model Name	NF3507TPQ, NF3509PQ, NF3512PQ, NF3513TPQ, NF3514PQ, NF3515PQ, NF3516PQ
Description of Model name differentiation	All models are same with electrical parameters and internal circuit structure, but only differ in model name. (this information provided by the customer)
Hardware Version	1.2
Software Version	1.0
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Ancillary Equipment

Note: Not applicable.

2.6 Technical Information

Network and Wireless connectivity	Bluetooth (BR+EDR+BLE) WIFI 802.11a, 802.11b, 802.11g, 802.11n, 802.11ac and 802.11ax U-NII-1/3
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The requirement for the following technical information of the EUT was tested in this report:

Operating Mode	2.4G WLAN, 5G WLAN, Bluetooth	
Frequency Range	802.11b/g/n(HT20/HT40)	2412 MHz ~ 2462 MHz
	802.11ax(HE20/HE40)	2412 MHz ~ 2462 MHz
	802.11a/n(HT20/HT40)	5150 MHz ~ 5250 MHz
	/ac(VHT20/VHT40/VHT80)	5725 MHz ~ 5850 MHz
	802.11 ax(HE20/HE40/HE80)	5150 MHz ~ 5250 MHz
		5725 MHz ~ 5850 MHz
	Bluetooth	2402 MHz ~ 2480 MHz
Antenna Type	WLAN: External Antenna Bluetooth: External Antenna	
Hotspot Function	N/A	
Exposure Category	General Population/Uncontrolled Exposure	
EUT Stage	Mobile Device	

3 SUMMARY OF TEST RESULT

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 2.1091	Radiofrequency radiation exposure evaluation: mobile devices
2	KDB 447498 D04 v01	447498 D04 Interim General RF Exposure Guidance v01

4 DEVICE CATEGORY AND LEVELS LIMITS

Mobile Device:

CFR Title 47 §2.1091(b)

(b) For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons.

FCC KDB 447498 D04 General RF Exposure Guidance v01 Limit

Evaluation of compliance with the exposure limits in § 1.1310 is necessary if the ERP of the device is greater than ERP_{20cm} in Formula (B.1) [repeated from § 2.1091(c)(1) and § 1.1307(b)(1)(i)(B)].

$$P_{th} \text{ (mW)} = ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases} \quad (\text{B.1})$$

If the ERP is not easily obtained, then the available maximum time-averaged power may be used (i. e., without consideration of ERP only if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole.

SAR-based exemptions are constant at separation distances between 20 cm and 40 cm to avoid discontinuities in the threshold when transitioning between SAR-based and MPE-based exemption criteria at 40 cm, considering the importance of reflections.

The SAR-based exemption formula of § 1.1307(b)(3)(i)(B), repeated here as Formula (B.2), applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power or effective radiated power (ERP), whichever is greater, of less than or equal to the threshold P_{th} (mW).

This method shall only be used at separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by Formula (B.2).

$$P_{\text{th}} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases} \quad (\text{B. 2})$$

where

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

and f is in GHz, d is the separation distance (cm), and $ERP_{20 \text{ cm}}$ is per Formula (B.1).
The example values shown in Table B.2 are for illustration only.

Table B.2—Example Power Thresholds (mW)

Frequency (MHz)	Distance (mm)										
		5	10	15	20	25	30	35	40	45	50
300		39	65	88	110	129	148	166	184	201	217
450		22	44	67	89	112	135	158	180	203	226
835		9	25	44	66	90	116	145	175	207	240
1900		3	12	26	44	66	92	122	157	195	236
2450		3	10	22	38	59	83	111	143	179	219
3600		2	8	18	32	49	71	96	125	158	195
5800		1	6	14	25	40	58	80	106	136	169

5 ASSESSMENT RESULT

5.1 Output Power

Bluetooth	
Mode	BR/EDR/BLE
Conducted Power (dBm)	5.84
Antenna Gain (dBi)	1.91
EIRP (dBm)	7.75
Note: This report listed the maximal case power value, please refer to Report No. BL-SZ2280883-601&BL-SZ2280883-602 for more details.	

WLAN 2.4G	
Mode	802.11b/g/n(HT20/HT40)/ax(HE20/HE40)
Conducted Power (dBm)	24.29
Antenna Gain (dBi)	1.91
EIRP (dBm)	26.20
Note: This report listed the maximal case power value, please refer to Report No. BL-SZ2280883-603 for more details.	

WLAN 5G			
Mode	802.11a/n(HT20/HT40)/ac(VHT20/VHT40/VHT80)/ax(HE20/HE40/HE80)		
	Main Antenna	Aux. Antenna	MIMO
Conducted Power (dBm)	16.95	16.95	16.86
Antenna Gain (dBi)	4.50		
EIRP (dBm)	21.45	21.45	21.36
Note: This report listed the maximal case power value, please refer to Report No. BL-SZ2280883-604 for more details.			

5.2 Tune-up power

Mode	Conducted Power Range (dBm)	EIRP Range (dBm)	ERP Range (dBm)
Bluetooth	[5.00,6.00]	[7.00,8.00]	[4.85,5.85]
WIFI 2.4G	[23.00,25.00]	[26.00,27.00]	[23.85,24.85]
WIFI 5G Main Ant	[15.00,17.00]	[20.00,22.00]	[17.85,19.85]
WIFI 5G Aux. Ant	[15.00,17.00]	[20.00,22.00]	[17.85,19.85]
WIFI 5G MIMO	[15.00,17.00]	[20.00,22.00]	[17.85,19.85]
Note1: ERP= EIRP -2.15dB.			
Note2: According KDB 447498 D04, used the greater of maximum conducted power and ERP to compare with the threshold value Pth.			

5.3 RF Exposure Evaluation Result

Evolution mode	Maximum power (dBm)	Maximum power (mw)	Distance (cm)	Threshold Power (mW)	Power / Limit	Verdict
Bluetooth	6.00	3.98	20	3060.00	0.001	Pass
WIFI 2.4G	25.00	316.23	20	3060.00	0.103	Pass
WIFI 5G Main Ant	19.85	96.61	20	3060.00	0.032	Pass
WIFI 5G Aux. Ant	19.85	96.61	20	3060.00	0.032	Pass
WIFI 5G MIMO	19.85	96.61	20	3060.00	0.032	Pass

5.4 Collocated Power Calculation

Evolution mode	Frequency(MHz)	Power /Limit	$\Sigma(\text{Power / Limit})$ of Bluetooth + WIFI 5G	Verdict
Bluetooth	2402	0.001	0.033	Pass
WIFI 5G Main Ant	5150	0.032		
Evolution mode	Frequency(MHz)	Power /Limit	$\Sigma(\text{Power / Limit})$ of WIFI 2.4G + WIFI 5G	Verdict
WIFI 2.4G	2402	0.103	0.135	Pass
WIFI 5G Aux. Ant	5150	0.032		

Note:

1. $\Sigma(\text{Power / Limit})$: This is a summation of [(power for each transmitter/ antenna included in the simultaneous transmission)/ (corresponding Power limit)], for Bluetooth + WIFI 5G and WIFI 2.4G + WLAN 5G.
2. Both of the 2.4GHz/5GHz can transmit simultaneously, the formula of calculated the Power is $CP1 / LP1 + CP2 / LP2 + \dots \text{etc.} < 1$
 CP = Calculation power
 LP = Limit of power
3. Both of the Bluetooth and WIFI 2.4G can't transmit simultaneously at same time.
4. The worst-case situation is 0.135, which is less than "1". This confirmed that the device comply with FCC KDB 447498 D04 Power limit.
5. The DUT work frequency range used is 2400 MHz ~ 2483.5 MHz, 5150 MHz ~ 5250 MHz and 5725 MHz ~ 5850 MHz the result close to the limit by the above formula, so we select worst case power to calculate the exclusion power threshold.
6. More power list please refer to RF test report.

5.5 Conclusion

This EUT is deemed to comply with the reference level limits, therefore the basic restrictions are compliant with human exposure limits.

Statement

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