

Maximum Permissible Exposure Caculation

On Behalf of

NEXXT SOLUTIONS

3505 N.W 107TH AVE. MIAMI, Florida 33178, United States

Product Name:	Wireless Router
Model/Type No.:	ARN02304U8
FCC ID Number:	FCC ID:X4AMP300
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TABLE OF CONTENTS

1 - GENERAL INFORMATION	3
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
1.2 OBJECTIVE	4
1.3 GENERAL DESCRIPTION OF TEST	4
1.4 HUMAN EXPOSURE ASSESSMENT RESULTS	5



1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Applicant:	NEXXT SOLUTIONS
Address of Applicant:	3505 N.W 107TH AVE. MIAMI, Florida 33178, United States
Manufacturer 1:	YICHEN (Shenzhen) Technology Co., Ltd.
Address of manufacturer:	6th Building, YASEN Industrial Park, Chengxin Road 8, Baolong Industrial Estate, Longgang District, Shenzhen, China.

General Description of E.U.T

Items	Description
EUT Description:	Wireless Router
Model No.:	ARN02304U8
Trade Mark:	NEXXT
Frequency Band:	IEEE 802.11b : 2412MHz~2462MHz; IEEE 802.11g : 2412MHz~2462MHz; IEEE 802.11n HT20 : 2412MHz~2462MHz; IEEE 802.11n HT40 : 2422MHz~2452MHz
Channel Spacing:	IEEE 802.11b : 5MHz IEEE 802.11g : 5MHz IEEE 802.11n HT20 : 5MHz IEEE 802.11n HT40 : 5MHz
Number of Channels:	IEEE 802.11b : 11 Channels; IEEE 802.11g : 11 Channels; IEEE 802.11n HT20 : 11 Channels; IEEE 802.11n HT40 : 7 Channels;
Transmit Data Rate:	maximum of 150Mbps
Type of Modulation:	IEEE 802.11b: CCK IEEE 802.11g: OFDM IEEE 802.11n HT20: OFDM IEEE 802.11n HT40: OFDM
Antenna Type:	2.4GHz 5dBi WIFI Dipole ANTENNA
Antenna Gain:	Chain1: 5dBi Chain2: 5dBi
Power Rating:	Input: AC 100-240V 0.3mA 50~60Hz Output: DC 5V 1000mA

Remark: * The test data gathered are from the production sample provided by the manufacturer.

1.2 Objective

The objective of the following report is used to demonstrate that EUT operated in a manner that ensures the public is not exposed to radio frequency energy levels in excess of the relative provisions of FCC 47CFR Part 1.1310

1.3 General Description of Test

Items	Description
EUT Frequency band	<input type="checkbox"/> FHSS: 2.400GHz ~ 2.483GHz <input checked="" type="checkbox"/> WLAN: 2.400GHz ~ 2.483GHz <input type="checkbox"/> WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz <input type="checkbox"/> WLAN: 5.745GHz ~ 5825GHz <input type="checkbox"/> Others: _____
Device category	<input type="checkbox"/> Portable (<20cm separation) <input type="checkbox"/> Mobile (>20cm separation) <input checked="" type="checkbox"/> Others Fixed location (>20cm separation)
Exposure classification	<input type="checkbox"/> Occupational/Controlled exposure ($S = 5\text{mW/cm}^2$) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure ($S=1\text{mW/cm}^2$) <input type="checkbox"/> Others: _____
Antenna diversity	<input type="checkbox"/> Single antenna <input checked="" type="checkbox"/> Multiple antennas: <ul style="list-style-type: none"> <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input type="checkbox"/> Tx/Rx diversity
Max. output power	The total peak power 21.13dBm (0.1297W)
Antenna gain (Max)	5dBi (Numeric gain:3.16)
Evaluation applied	<input checked="" type="checkbox"/> MPE Evaluation <input type="checkbox"/> SAR Evaluation

Note:

1. The maximum output is 21.13dBm at IEEE 802.11b mode 2437MHz (with 3.16 numeric antenna gain.)
2. For mobile or fixed location transmitters, no SAR consideration applied. The minimum separation generally be used is at least 20 cm, even if the calculations indicate that the MPE distance would be lesser.

1.4 Human Exposure Assessment Results

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 Exposure				
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
300–1,500 .....	.....	.....	f/300	6
1,500–100,000 .....	.....	.....	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
300–1,500 .....	.....	.....	f/1500	30
1,500–100,000 .....	.....	.....	1.0	30

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

Calculation

$$\text{Given } E = \frac{\sqrt{30 \times P \times G}}{d} \quad \& \quad S = \frac{E^2}{3770}$$

Where E = Field Strength in Volts / meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power Density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{3770 d^2}$$

Changing to units of mW and cm, using:

$$P (\text{mW}) = P (\text{W}) / 1000 \text{ and}$$

$$d (\text{cm}) = 100 * d (\text{m})$$

Yields

$$S = \frac{30 \times (P/1000) \times G}{3770 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2} \quad \text{Equation 1}$$

Where d = distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power Density in mW / cm²

EUT parameter (data from the separate report)	
Given	Where G: numerical gain of transmitting antenna; TP: Transmitted power in watt; d: distance from the transmitting antenna in meter
$E = \frac{\sqrt{30 \times P \times G}}{d}$ & $S = \frac{E^2}{3770}$	
Max average output power in Watt (TP)	21.13dBm (0.1297W)
Antenna gain (G)	5dBi (Numeric gain:3.16)
Exposure classification	$S=1\text{mW/cm}^2$
Minimum distance in meter (d) (from transmitting structure to the human body)	20cm (0.2m)
Yields	
$S = \frac{30 \times P \times G}{3770 \times d^2}$, P=0.1297W, G=3.16, d=0.2 $S=0.082\text{mW/cm}^2$	
Conclusion: $S=0.082\text{mW/cm}^2$ is significant lower than the FCC 47CFR Part 1.1310 Limit 1mW/cm^2 . (For mobile or fixed location transmitters, the maximum power density is 1.0 mW / cm^2 even if the calculation indicates that the power density would be larger.)	

