



RADIO EXPOSURE TEST REPORT

FCC ID : NKRATTCGW450
Equipment : 5G Residential Gateway
Brand Name : WNC
Model Name : CGW450-400
Applicant : Wistron NeWeb Corp.
20 Park Avenue II, Hsinchu Science Park, Hsinchu 308,
Taiwan, R.O.C
Manufacturer : NEWEB VIET NAM CO., LTD.
Land Lot CN01, Dong Van III Industrial zone, Dong Van
Ward, Duy Tien Town, Ha Nam Province, VietNam
Standard : 47 CFR Part 2.1091

The product was received on Aug. 01, 2022, and testing was started from Aug. 03, 2022 and completed on Mar. 15, 2023. 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

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History of this test report

TEL : 886-3-656-9065
FAX : 886-3-656-9085
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Summary of Test Result

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

Note: Reference to Sporton Project No.: 280117-01.

Conformity Assessment Condition:

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacture who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. The measurement uncertainty please refer to each test result in the chapter "Measurement Uncertainty".

Disclaimer:

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Sam Chen

Report Producer: Sandy Chuang

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) 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) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)

Evaluation Mode		Uplink Frequency Range (MHz)	Downlink Frequency Range (MHz)	Modulation Type
4G Band (LTE)	Band 2	1850~1910	1930~1990	QPSK, 16QAM, 64QAM, 256QAM
	Band 5	824~849	869~894	
	Band 12	698~716	729~746	
	Band 14	788~798	758~768	
	Band 30	2305~2315	2350~2360	
	Band 66	1710~1780	2110~2200	
Evaluation Mode		Uplink Frequency Range (MHz)	Downlink Frequency Range (MHz)	DFT-s-OFDM (PI/2 BPSK / QPSK / 16QAM / 64QAM / 256QAM)
5G Band (NR)	n2	1850~1910	1930~1990	
	n5	824~849	869~894	
	n12	698~716	729~746	
	n30	2305~2315	2350~2360	
	n66	1710~1780	2110~2200	
	n77	3450~3550	3450~3550	
		3700~3980	3700~3980	


1.1.1 Antenna Information

Ant.	Port		Brand	Model Name	Antenna Type	Connector	Modes of Operation
	2.4GHz	5GHz					
1	1	1	WNC	48XKAC42	Dipole	I-PEX	WLAN 2.4GHz, 5GHz UNII 1~3
2	2	2	WNC	48XKAC3F	Dipole	I-PEX	
3	3	3	WNC	48XKAC45	Dipole	I-PEX	
4	4	4	WNC	48XKAC46	Dipole	I-PEX	
5	-	5	WNC	48XKAC3H	Dipole	I-PEX	WLAN 5GHz UNII 2C
6	-	-	WNC	48XKAC3L	Dipole	I-PEX	WWAN full band
7	-	-	WNC	48XKAC3P	Dipole	I-PEX	
8	-	-	WNC	48XKAC3R	Dipole	I-PEX	
9	-	-	WNC	48XKAC3X	Dipole	I-PEX	WWAN dual band
10	-	-	WNC	48XKAC3J	Dipole	I-PEX	
11	-	-	WNC	48XKAC3K	Dipole	I-PEX	
12	-	-	WNC	48XKAC3Y	Dipole	I-PEX	WWAN single band
13	-	-	WNC	48XKAC3Z	Dipole	I-PEX	

Note 1: <WLAN Antenna Gain>

Ant.	Antenna Gain (dBi)				
	2.4GHz	5GHz UNII 1	5GHz UNII 2A	5GHz UNII 2C	5GHz UNII 3
1	4.48	4.76	4.98	5.04	4.67
2	3.97	2.47	3.56	5.02	5.63
3	3.69	3.02	3.54	4.16	4.1
4	2.02	2.2	3.17	4.01	3.22
5	-	-	-	4.54	-

<Directional Gain>

Directional Gain (dBi)					
Item	2.4GHz	5GHz UNII 1	5GHz UNII 2A	5GHz UNII 2C	5GHz UNII 3
4T1S	6.22	5.96	6.11	5.91	6.41

<WWAN Antenna Gain>

Antenna Gain (dBi)									
Freq.	700 MHz	780 MHz	850 MHz	1800 MHz	2100 MHz	2300 MHz	3300 MHz	4200 MHz	
6	1.7	2.1	3.8	2.8	2.6	5.6	5.0	2.2	
7	2.2	2.8	0.9	3.9	2.4	3.9	4.5	3.4	
Freq.	1800 MHz		2100 MHz		2300 MHz		3300 MHz		4200 MHz
8	4.1		3.2		3.3		2.8		3.1
9	3.3		4.1		4.2		3.6		3.5
10	2.8		3.6		2.7		5.2		4.5
Freq.	3300 MHz					4200 MHz			
11	4.2					3.6			
12	4.2					3.7			
13	3.0					3.0			



Note1: The above information (except Ant.1~4 antenna gain) was declared by manufacturer.

Note2: WLAN 2.4GHz/5GHz directional gain is measured which follows the procedure of KDB 662911 D03.

Note3: **For WLAN 2.4GHz function:**

For IEEE 802.11 b/g/n/VHT/ax (4TX/4RX):

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

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

For WLAN 5GHz function:

For IEEE 802.11a/n/ac/ax (4TX/5RX that it includes 1RX for UNII 2C):

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

Port 1, Port 2, Port 3, Port 4 and Port 5 could transmit/receive simultaneously.



1.2 Accessories

Accessories			
Equipment Name	Brand Name	Model Name	Rating
AC Adapter	AT&T	EPS72R0-16	INPUT: 120V~1.8A, 60Hz OUTPUT: 12V, 6A, 72W

1.3 Table for Certified WWAN Module Information

Brand Name	Model Name	FCC ID	Bands
WNC	IMQC	NKRIMQC	4G Band (LTE): B2/B5/B12/B14/B30/B66 5G Band (NR): n2/n5/n12/n30/n66/n77(3450~3550MHz)/n77(3700~3980MHz)

Note: The above information was declared by manufacturer.

1.4 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.

1.5 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



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 89 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	6.22	29.51	35.73	0.26	35.99	3.97192	89	0.03990	1.00000
5.2G;D1D	5.96	29.88	35.84	0.15	35.99	3.97192	89	0.03990	1.00000
5.3G;D1D	6.11	23.85	29.96	0.03	29.99	0.99770	89	0.01002	1.00000
5.6G;D1D	5.91	23.95	29.86	0.13	29.99	0.99770	89	0.01002	1.00000
5.8G;D1D	6.41	29.53	35.94	0.05	35.99	3.97192	89	0.03990	1.00000
LTE Band 5	3.80	35.30	39.10	0.50	39.60	9.12011	89	0.09162	0.54980

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
824.7	0.0579	0.89	39.61	37.46	5.572	8.362	Complies
2412	0.0198		35.99	33.84	2.421	15.208	Complies
5745	0.0083		35.99	33.84	2.421	15.208	Complies

Simultaneous Transmission Analysis Mode:

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
824.7	0.89	39.61	37.46	5.572	8.362	0.98	<= 1
2412		35.99	33.84	2.421	15.208		
5745		35.99	33.84	2.421	15.208		

Note: The above antenna gain (except Ant.1~4) was declared by manufacturer.

————THE END————