RF Exposure Evaluation Report

Report No.: RWAY202300013C

Applicant: Shenzhen AI-LINK Network Co., LTD

Address: 524 room, 4D Building of Shenzhen Nanshan District Software Industry Base, Guangdong Province, China

Product Name: 5.8GHz Radio Unit

Product Model: RU1606

Multiple Models: N/A

Trade Mark: N/A

FCC ID: 2BDQJ-RU1606

Standards: 47 CFR §1.1307
KDB 447498 D04 Interim General RF Exposure Guidance v01

Test Date: 204-01-29

Test Result: Complied

Report Date: 2024-02-06

Reviewed by: Abel Chen

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Revision History

Version No.	Issued Date	Description
00	2024-02-06	*Original*

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1 General Information

1.1 Client Information

Applicant:	Shenzhen AI-LINK Network Co., LTD
Address:	524 room, 4D Building of Shenzhen Nanshan District Software Industry Base, Guangdong Province, China
Manufacturer:	Shenzhen AI-LINK Network Co., LTD
Address:	524 room, 4D Building of Shenzhen Nanshan District Software Industry Base, Guangdong Province, China

1.2 Product Description of EUT

The EUT is 5.8GHz Radio Unit that contains 5G WLAN radios

Sample Serial Number	A-4 (assigned by WATC)
Sample Received Date	2023-12-13
Sample Status	Good Condition
Frequency Range	NR n46: 5725 MHz - 5850MHz
Maximum Conducted Output Power	5725 MHz - 5850MHz: 14.77dBm
Modulation Technology	CP-OFDM (QPSK,16QAM,64QAM,256QAM)
Antenna Gain#	15dBi
Spatial Streams	MIMO (4TX, 4RX)
Power Supply	DC 48V
Operating temperature#	-40 deg.C to +55 deg.C
Adapter Information	N/A
Modification	Sample No Modification by the test lab

1.3 Laboratory Location

World Alliance Testing and Certification (Shenzhen) Co., Ltd

No. 1002, East Block, Laobing Building, Xingye Road 3012, Xixiang street, Bao'an District, Shenzhen, Guangdong, People's Republic of China

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The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 463912, the FCC Designation No. : CN5040.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0160.

2 RF Exposure Evaluation

2.1 Standard

According to §1.1307(b)(3)(i), For single RF sources (i.e., any single fixed RF source, mobile device, or portable device, as defined in paragraph (b)(2) of this section): A single RF source is exempt if:

(A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(ii)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);

(B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold Pth (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). Pth is given by:

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

Where

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

and

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

d = the separation distance (cm);

(C) Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least λ/2π, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of λ/4 or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

Table 1 to § 1.1307(b)(3)(i)(C)—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^2f.
1,500–100,000	19.2R^2.

According to §1.1307(b)(3)(ii), For multiple RF sources: Multiple RF sources are exempt if:

(A) The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required). This exemption may not be used in conjunction with other exemption criteria other than those is paragraph (b)(3)(i)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(i)(A).

(B) (B) in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^{a} \frac{P_i}{P_{th,i}} + \sum_{j=1}^{b} \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^{c} \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

2.2 Result

Single RF source:

Option B:

Radio	Frequency (MHz)	Distance (mm)	P_{th} (mW)	Maximum Conducted Power including Tune-up Tolerance (dBm)	Antenna Gain (dBi)	The Greater of Conducted Power or ERP		Result Option B
						dBm	mW	
5G NR-U N46	5725-5850	200	3060	15.0	21.0	33.85	2427	exempt

Note: The Maximum Conducted Power including Tune-up Tolerance was declared by manufacturer.

The device has 4 antennas and support 4TX4RX MIMO mode, according to KDB 662911 D01 Multiple Transmitter Output v02r01, for In-Band Measurements:

Directional gain = $G_{ANT} + 10\log(N_{ANT})$ dBi

$G_{ANT}=15dBi$, $N_{ANT}=4$

Directional gain=15+10log(4)=21dBi

Multiple RF sources transmission simultaneously consider:

N/A

Result: Complied

---End of Report---