FCC Maximum Permissible Exposure (MPE) Report

Report Number	:	**68.912.24.0029.01A**	Date of Issue:	2024-09-30
Model	:	**WL432-DB**		
Product Type	:	IoT Gateway		
Applicant	:	Suzhou Inovance Technology Co., Ltd.		
Address	:	No. 52, Tian E Dang Road, Wuzhong District, 215104，Suzhou City, Jiangsu Province, P.R. China		
Manufacturer	:	Suzhou Inovance Technology Co., Ltd.		
Address	:	No. 52, Tian E Dang Road, Wuzhong District, 215104，Suzhou City, Jiangsu Province, P.R. China		
Test Result	:	■ **Positive** ☐ **Negative**		
Total pages including Appendices	:	**8**		

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2 Details about the Test Laboratory

Details about the Test Laboratory
Test Site 1

Company name:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch Building 12&13, Zhiheng Wisdomland Business Park, Guankou Erlu, Nantou, Nanshan District, Shenzhen, 518052 China
FCC Designation Number:	CN5009
FCC Registration No.:	514049
Telephone:	86 755 8828 6998
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3 Description of the Equipment Under Test

Product:	IoT Gateway
Model no.:	WL432-DB
FCC ID:	2BKRZ-WL432EG25G-T
Ratings:	DC 12-24V, 800mA
RF Transmission Frequency:	2412MHz-2462MHz
No. of Operated Channel:	11 for 802.11b/g/n20 9 for n40
Modulation:	802.11b: CCK, DSSS 802.11g/n20/n40: BPSK, QPSK, 16-QAM, 64-QAM
Antenna Type:	Linear antenna
Antenna Gain:	2.53 dBi
Description of the EUT:	The EUT is a IoT Gateway supports 2.4GHz Wi-Fi and GSM/WCDMA/LTE function, the GSM/WCDMA/LTE module has been approved under FCC ID: 2BKRZ-WL432EG25G, grant date: September 30, 2024.

NOTE 1: The above EUT's information is declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

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4 General Information

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Project Engineer	Date	Name	Signature
Approved By	2024-09-23	Laurent Yuan	
Project Manager	Date	Name	Signature

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5 RF Exposure Requirements

An estimation of MPE in this application for product is used to ensure if it complies with the rules of the standard in the regulation list above.

Maximum permissible exposure (MPE) refers to the RF energy that is acceptable for human exposure. It is broken down into two categories, Occupational/controlled and General population/uncontrolled.

Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

A rough estimation of the expected exposure in power flux density on a given point can be made with the following equation:

$$S = \frac{P \times G}{4 \times \pi \times R^2}$$

Where:

S = power density

P = power input to the antenna

G = numeric gain of the antenna in the direction of interest relative to an isotropic radiator

R= distance to the centre of radiation of the antenna

EIRP = P*G

The antenna of the product, under normal use condition is at least 20 cm away from the body of the user. Warning statement to the user for keeping at least 20cm separation distance and the prohibition of operating to a person has been printed on the user's manual. Therefore, the S of the device is calculated with R=20cm, and if it is below the limit S, then we can conclude the device complies with the rules.

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6 FCC MPE Limits

According to subpart 15.247(i)and subpart §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

We analysis if it complies with the limits for General population/uncontrolled exposure. The FCC MPE limits for field strength and power density are given in 47CFR 1.1310(Table below) and KDB447498 D01 v06. These limits are generally based on recommended exposure guidelines published by the National Council on Radiation Protection and Measurements (NCRP), and also partly based on guidelines recommended by the American National Standards Institute (ANSI) in Section 4.1 of ANSI/IEEE C95.1.

(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 (minute)$\|E\|^2$,$\|H\|^2$ or S
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30
f=frequency in MHz			*Plane-wave equivalent power density	

Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in a host device is ≤ 1.0

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7 RF Exposure Evaluation (FCC)

7.1 Calculation of Power Density for Single Transmission

Mode	EIRP (dBm)	EIRP (mW)	R (cm)	S (mW/cm^2)	Limit (mW/cm^2)	MPE Ratio
2.4GHz Wi-Fi	21.01	126.18	20	0.02510	1.0	2.51%
GSM	32.67	1849.3	20	0.36791	1.0	36.79%

7.2 Calculation of Simultaneous Transmission

In order to ensure compliance with the EMF for a controlled environment, the sum of the ratios of the power density to the corresponding EMF should not exceed unity. That is

$$\sum_i \frac{S_i}{S_{Limit,i}} \le 1$$

The product also has multiple transmitters. The simultaneous transmission possibilities are as below:

No.	Simultaneous Tx Combination	MPE Ratio	Limit
1	2.4GHz Wi-Fi + GSM	39.30%	1.0

7.3 Conclusion

According to the table above, the calculated power density S is below the limit value of 1 mW/cm^2, therefore, the product complies with the requirements.

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