

Test report No:  
24B0779R-RF-US-P20V01

## FCC EXPOSURE TEST REPORT

Product Name	Cat4 indoor CPE
Trademark	Smawave
Model and /or type reference	SRD221-b
FCC ID	2AU8HSRD221-B
Applicant's name / address	Shanghai Smawave Technology Co. ,Ltd 2/F, Building 8, 1001 North Qinzhou Road, Xuhui District, Shanghai, China
Test method requested, standard	FCC 47CFR §2.1091
Verdict Summary	IN COMPLIANCE
Documented By (name / position & signature)	Tim Cao / Project Manager 
Approved by (name / position & signature)	Jack Zhang / Manager 
Date of issue	2024-12-25
Report Version	V1.0
Report template No	Template_FCC-MPE-RF-V1.0

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## COMPETENCES AND GUARANTEES

DEKRA is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated in the report and it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

DEKRA is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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## GENERAL CONDITIONS

Test Location	No. 99, Hongye Road, Suzhou Industrial Park Suzhou, 215006, P.R. China
Date(receive sample)	Nov. 25, 2024
Date (start test)	Nov. 30, 2024
Date (finish test)	Dec. 25, 2024

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or Competent Authorities.
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## ENVIRONMENTAL CONDITIONS

The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment. The climatic conditions during the tests were within the following limits:

Ambient temperature	15 °C – 35 °C
Relative Humidity air	30% - 60%

If explicitly required in the basic standard or applied product / product family standard the climatic values are recorded and documented separately in this test report.

## POSSIBLE TEST CASE VERDICTS

Test case does not apply to test object	N/A
Test object does meet requirement	P (Pass) / PASS
Test object does not meet requirement	F (Fail) / FAIL
Not measured	N/M

## ABBREVIATIONS

For the purposes of the present document, the following abbreviations apply:

EUT	: Equipment Under Test
QP	: Quasi-Peak
CAV	: CISPR Average
AV	: Average
CDN	: Coupling Decoupling Network
SAC	: Semi-Anechoic Chamber
OATS	: Open Area Test Site
BW	: Bandwidth
AM	: Amplitude Modulation
PM	: Pulse Modulation
HCP	: Horizontal Coupling Plane
VCP	: Vertical Coupling Plane
$U_N$	: Nominal voltage
$T_x$	: Transmitter
$R_x$	: Receiver
N/A	: Not Applicable
N/M	: Not Measured

## DOCUMENT HISTORY

Report No.	Version	Description	Issued Date
2B0779R-RF-US-P20V01	V1.0	Initial issue of report.	2024-12-25

## REMARKS AND COMMENTS

1. The equipment under test (EUT) does meet the essential requirements of the stated standard(s)/test(s).
2. These test results on a sample of the device are for the purpose of demonstrating Compliance with FCC 47CFR §2.1091.
3. The measurement result is considered in conformance with the requirement if it is within the prescribed limit, It is not necessary to account the uncertainty associated with the measurement result.
4. The test results relate only to the samples tested.
5. The test report shall not be reproduced without the written approval of DEKRA Testing and Certification (Suzhou) Co., Ltd.
6. This report will not be used for social proof function in China market.
7. DEKRA declines any responsibility with the following test data provided by customer that may affect the validity of result:
  - Chapter 1.1 General Description of the Item(s);
  - Chapter 1.2 Antenna Informaion;

## 1 GENERAL INFORMATION

### 1.1 General Description of the Item(s)

Product Name..... :	Cat4 indoor CPE
Model No. .... :	SRD221-b
Trademark. .... :	Smawave
FCC ID ..... :	2AU8HSRD221-B
Hardware Version ..... :	V1.0
Software Version ..... :	STX1160_V1.0.1
Manufacturer ..... :	Shanghai Smawave Technology Co. ,Ltd
Manufacturer Address..... :	2/F, Building 8, 1001 North Qinzhou Road , Xuhui District, Shanghai, China
Factory ..... :	Shanghai Smawave Technology Co. ,Ltd
Factory address..... :	2/F, Building 8, 1001 North Qinzhou Road , Xuhui District, Shanghai, China
Operating temperature..... :	-10℃~45℃

Wireless specifiction ..... :	LTE	
Module ..... :	GCM6201NA	
Support Band(s) ..... :	FDD LTE Band 24 / 54	
Frequency Range ..... :	FDD LTE Band 24	1627.5-1637.5 MHz, 1646.5-1656.5 MHz
	FDD LTE Band 54	1670-1675 MHz
Channel Bandwidth(MHz) ..... :	FDD LTE Band 24	5 MHz / 10 MHz
	FDD LTE Band 54	1.4 MHz / 3 MHz / 5 MHz
Type of Modulation ..... :	QPSK, 16QAM	

Wireless specification ..... :	LTE
Module ..... :	LBAD0XX1SC-DM
Support Band(s) ..... :	NTN Band 255
Frequency Range ..... :	NTN Band 255: 1626.7-1659.9 MHz
Channel Bandwidth(MHz) ..... :	3.75 kHz / 15 kHz
Type of Modulation ..... :	BPSK, QPSK

Wireless specification ..... :	WIFI
Operating frequency range(s)..... :	2412~2462MHz
Number of channel..... :	802.11b/g/n(20MHz) : 11 802.11n(40MHz) : 07
Type of Modulation & Data Rate ... :	DSSS, CCK, BPSK, QPSK, 16QAM, 64QAM, 256QAM

Rated power supply ..... :	Voltage and Frequency	
	<input type="checkbox"/>	AC: 220 - 240 V, 50/60 Hz
	<input type="checkbox"/>	AC: 100 - 240 V, 50/60 Hz
	<input checked="" type="checkbox"/>	Adapter:

Adapter Model .....	TPA259-18120-US	
	Input: 100-240V ~ 50/60Hz,0.6A Output: 12.0V / 1.5 A	
UPS Model .....	KFL-U02-5000	
	Input: 12.0V / 1.5 A Output: 12.0V / 1.5 A (Max)	
Mounting position.....	<input type="checkbox"/>	Tabletop equipment
	<input checked="" type="checkbox"/>	Wall/Ceiling mounted equipment
	<input type="checkbox"/>	Floor standing equipment
	<input type="checkbox"/>	Hand-held/Portable equipment
	<input type="checkbox"/>	Other:

## 1.2 Antenna Informaion

### WWAN LTE Band Antenna:

Antenna Delivery .....	<input checked="" type="checkbox"/>	1TX + 1RX		
	<input type="checkbox"/>	2TX + 2RX		
Antenna technology.....	<input checked="" type="checkbox"/>	SISO		
	<input type="checkbox"/>	MIMO		
Antenna Type.....	<input checked="" type="checkbox"/>	External	<input checked="" type="checkbox"/>	Dipole
			<input type="checkbox"/>	Fixed
	<input type="checkbox"/>	Internal	<input type="checkbox"/>	PCB
			<input type="checkbox"/>	Others.....
Antenna Gain .....	LTE Band 24: 3.24 dBi LTE Band 54: 3.24 dBi			

### WWAN NTN Band Antenna:

Antenna Delivery .....	<input checked="" type="checkbox"/>	1TX + 1RX		
	<input type="checkbox"/>	2TX + 2RX		
Antenna technology.....	<input checked="" type="checkbox"/>	SISO		
	<input type="checkbox"/>	MIMO		
Antenna Type.....	<input type="checkbox"/>	External	<input type="checkbox"/>	Dipole
			<input type="checkbox"/>	Fixed
	<input checked="" type="checkbox"/>	Internal	<input checked="" type="checkbox"/>	PCB
			<input type="checkbox"/>	Others.....
Antenna Gain .....	NTN Band 255: 1.97 dBi			

### WLAN Antenna:

Antenna Manufacture.....	TUYA			
Antenna Serial Number.....	T5-E1-IPEX Antenna			
Antenna Delivery .....	<input checked="" type="checkbox"/>	1TX + 1RX		
	<input checked="" type="checkbox"/>	2TX + 2RX		
	<input type="checkbox"/>	Others: .....		
Antenna Technology .....	<input checked="" type="checkbox"/>	SISO		
	<input checked="" type="checkbox"/>	MIMO	<input checked="" type="checkbox"/>	CDD
<input type="checkbox"/>	Beam-forming			
Antenna Type .....	<input type="checkbox"/>	External	<input type="checkbox"/>	Dipole
			<input type="checkbox"/>	PIFA
	<input checked="" type="checkbox"/>	Internal	<input checked="" type="checkbox"/>	PCB
			<input type="checkbox"/>	Others.....
Antenna Gain.....	Antenna 1 (dBi)		Antenna 2 (dBi)	
	3.15		2.66	

Note: The general description of the Item(s), antenna information in clause 1 are provided and confirmed by the client.

## 2. RF Exposure Evaluation

### 2.1. Limits: KDB 447498 D04 V01

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.

Devices operating in standalone mobile exposure conditions may contain a single transmitter or multiple transmitters that do not transmit simultaneously. A minimum test separation distance  $\geq 20$  cm is required between the antenna and radiating structures of the device and nearby persons to apply mobile device exposure limits. The distance must be fully supported by the operating and installation configurations of the transmitter and its antenna(s), according to the source-based time-averaged maximum power requirements of § 2.1091(d)(2). In cases where cable losses or other attenuations are applied to determine compliance, the most conservative operating configurations and exposure conditions must be evaluated. The minimum test separation distance required for a device to comply with mobile exposure conditions must be clearly identified in the installation and operating instructions, for all installation and exposure conditions, to enable users and installers to comply with RF exposure requirements. For mobile devices that have the potential to operate in portable device exposure conditions, similar to the configurations described in § 2.1091(d)(4), a KDB inquiry is required to determine the SAR test requirements for demonstrating compliance.

When the categorical exclusion provision of § 2.1091(c) applies, the minimum test separation distance may be estimated, when applicable, by simple calculations according to plane-wave equivalent conditions, to ensure the transmitter and its antenna(s) can operate in manners that meet or exceed the estimated distance. The source-based time-averaged maximum radiated power, according to the maximum antenna gain, must be applied to calculate the field strength and power density required to establish the minimum test separation distance. When the estimated test separation distance becomes overly conservative and does not support compliance, MPE measurement or computational modeling may be used to determine the required minimum separation distance.

According to FCC Part 1.1307, 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.

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 <sup>2</sup> )
0.3-1.34	614	1.63	(100)*
1.34-30	824/f	2.19/f	(180/f <sup>2</sup> )*
30-300	27.5	0.073	0.2
300-1500			f/1500
1500-100,000			1.0

**MPE calculation formula**

$$S = \frac{PG}{4\pi R^2}$$

P = output power (mW)

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

R = Separation distance between radiator and human body (cm)

## Simultaneous Transmission SAR Test Exemption with Respect to Multiple Exemption Criteria

Either SAR-based or MPE-based exemption may be considered for test exemption for fixed, mobile, or portable device exposure conditions; therefore, the contributions from each exemption in conjunction with the measured SAR (Evaluated<sub>k</sub> term) shall be used to determine exemption for simultaneous transmission according to Formula (C.1) [repeated from § 1.1307(b)(3)(ii)(B)].

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

- number of fixed, mobile, or portable RF sources claiming exemption using the § 1.1307(b)(3)(i)(B) formula for P<sub>th</sub>, including existing exempt transmitters and those being added.
- number of fixed, mobile, or portable RF sources claiming exemption using the applicable § 1.1307(b)(3)(i)(C) Table 1 formula for Threshold ERP, including existing exempt transmitters and those being added.
- number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance.

P<sub>i</sub> the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source i at a distance between 0.5 cm and 40 cm (inclusive).

P<sub>th,i</sub> the exemption threshold power (P<sub>th</sub>) according to the § 1.1307(b)(3)(i)(B) formula for fixed, mobile, or portable RF source i. ERP<sub>j</sub> the available maximum time-averaged power or the ERP, whichever is greater, of fixed, mobile, or portable RF source j. ERP<sub>th,j</sub> exemption threshold ERP for fixed, mobile, or portable RF source j, at a distance of at least λ/2π, according to the applicable § 1.1307(b)(3)(i)(C) Table 1 formula at the location in question.

Evaluated<sub>k</sub> the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation.

Exposure

Limit<sub>k</sub> either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable sources, as applicable

The sum of the ratios of the applicable terms for SAR-based, MPE-based and measured SAR or MPE shall be less than 1, to determine simultaneous transmission exposure compliance.

## 2.2. Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

The temperature and related humidity: 18°C and 78% RH.

## 2.3. Test Result of RF Exposure Evaluation

Mode	Frequency (MHz)	Maximum Conducted power Tune up (dBm)	Maximum Conducted power Tune up (mW)	Distance (mm)	Power Density (mW/cm <sup>2</sup> )	Limit of Power Density (mW/cm <sup>2</sup> )	P/P limit	Verdict
Band 24	1627.5~1637.5	19.70	93.33	20	0.0186	1.000	0.0186	PASS
Band 54	1670~1675	25.70	371.54	20	0.0739	1.000	0.0739	PASS
Band 255	1626.7~1659.9	25.00	316.23	20	0.0629	1.000	0.0629	PASS
WiFi 2.4G	2402~2462	22.00	158.49	20	0.0315	1.000	0.0315	PASS

## Simultaneous Transmission

Mode	Frequency (MHz)	P/P limit	(Power / Limit) of WWAN + WLAN	Verdict
Band 24	1627.5~1637.5	0.0186	0.1869	PASS
Band 54	1670~1675	0.0739		
Band 255	1626.7~1659.9	0.0629		
WiFi 2.4G	2402~2462	0.0315		

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

\_\_\_\_\_ The End \_\_\_\_\_