

**Maximum Permissible Exposure Report**

For

Control Technology China Co., LTD**wireless module****Test Model: 52205**

Prepared for : Control Technology China Co., LTD
Address : No.98 Jianpeng Rd, Jiuting Town, Songjiang District, Shanghai 201615

Prepared by : Shenzhen LCS Compliance Testing Laboratory Ltd.
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Date of receipt of test sample : December 17, 2024
Number of tested samples : 2
Sample No. : A241118011-1, A241118011-2
Serial number : Prototype
Date of Test : December 17, 2024 ~ February 14, 2025
Date of Report : February 17, 2025



**Maximum Permissible Exposure Report****Report Reference No. : LCSA11194100EG**

Date of Issue..... : February 17, 2025

Testing Laboratory Name..... : Shenzhen LCS Compliance Testing Laboratory Ltd.

Address..... : 101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China

Testing Location/ Procedure..... : Full application of Harmonised standards ■
Partial application of Harmonised standards □
Other standard testing method □**Applicant's Name..... : Control Technology China Co., LTD**

Address..... : No.98 Jianpeng Rd, Jiuting Town, Songjiang District, Shanghai 201615

Test Specification

Standard..... : FCC CFR 47 part1 1.1310; FCC CFR 47 part2 2.1091

Test Report Form No..... : TRF-4-E-147 A/0

TRF Originator..... : Shenzhen LCS Compliance Testing Laboratory Ltd.

Master TRF..... : Dated 2011-03

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EUT Description..... : wireless module

Trade Mark..... : N/A

Test Model..... : 52205

Ratings..... : Input: DC 3.7V By Battery

Result : Positive**Compiled by:**

Li Huan/ Administrator

Supervised by:

Jack Liu/ Technique principal

Approved by:

Gavin Liang/ Manager





1. Product Information

Applicant	: Control Technology China Co., LTD
Address	: No.98 Jianpeng Rd, Jiuting Town, Songjiang District, Shanghai 201615
EUT	: wireless module
Test Model	: 52205
Ratings	: Input: DC 3.7V By Battery
Hardware Version	: /
Software Version	: /
WIFI(2.4G Band):	
Frequency Range	: 2412MHz~2462MHz
Channel Spacing	: 5MHz
Channel Number	: 11 Channels for 20MHz bandwidth (2412~2462MHz) 7 Channels for 40MHz bandwidth (2422~2452MHz)
Modulation Type	: IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Description	: PCB Antenna, 4.16dBi(Max.)
WIFI(5.2G Band):	
Frequency Range	: 5180MHz~5240MHz
Channel Number	: 4 Channels for 20MHz bandwidth(5180MHz~5240MHz)
Modulation Type	: IEEE 802.11a/n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Description	: Ceramic Antenna, 2.6dBi(Max.)
WIFI(5.3G Band):	
Frequency Range	: 5260MHz~5320MHz
Channel Number	: 4 Channels for 20MHz bandwidth(5260MHz~5320MHz)
Modulation Type	: IEEE 802.11a/n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Description	: Ceramic Antenna, 2.6dBi(Max.)
WIFI(5.5G Band):	
Frequency Range	: 5500MHz~5700MHz
Channel Number	: 11 Channels for 20MHz bandwidth(5500MHz~5700MHz)
Modulation Type	: IEEE 802.11a/n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Description	: Ceramic Antenna, 2.6dBi(Max.)
WIFI(5.8G Band)	
Frequency Range	: 5745MHz~5825MHz





Channel Number	: 5 channels for 20MHz bandwidth(5745MHz~5825MHz)
Modulation Type	: IEEE 802.11a/n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Description	: Ceramic Antenna, 2.6dBi(Max.)
2.4G	
Frequency Range	: 2450MHz
Channel Number	: 1 Channel
Modulation Type	: FSK
Antenna Description	: FPC Antenna, 3.2dBi(Max.)
Exposure category	: General population/uncontrolled environment
EUT Type	: Production Unit
Device Type	: Mobile Device
Date of Test	: December 17, 2024 ~ February 14, 2025
Date of Report	: February 17, 2025





2. Evaluation Method

Systems operating under the provisions of FCC 47 CFR 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.

In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.

In accordance with KDB447498D01 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modelled or measured field strengths or power density, is ≤ 1.0 . The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

3. Limit

3. 1 Refer Evaluation Method

[ANSI C95.1-2019](#): IEEE Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300 GHz

[FCC KDB publication 447498 D01 General 1 RF Exposure Guidance v06](#): Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

[FCC CFR 47 part1 1.1310](#): Radiofrequency radiation exposure limits.

[FCC CFR 47 part2 2.1091](#): Radiofrequency radiation exposure evaluation: mobile devices.

3. 2 Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
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 – 1500	/	/	f/300	6
1500 – 100,000	/	/	5	6

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Uncontrolled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 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

F=frequency in MHz

*=Plane-wave equivalent power density





4. MPE Calculation Method

Predication of MPE limit at a given distance
Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S=PG/4\pi R^2$$

Where: S=power density

P=power input to antenna

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

R=distance to the center of radiation of the antenna

5. Antenna Information

EUT can only use antennas certificated as follows provided by manufacturer;

Internal/ External Identification	Antenna type and antenna number	Operate frequency band	Maximum antenna gain	Notes
Internal	PCB Antenna	2400MHz ~ 2500MHz	2.4GWIFI: 4.16dBi	2.4GWIFI Antenna
Internal	Ceramic Antenna	5000MHz ~ 6000MHz	5GWIFI: 2.6dBi	5GWIFI Antenna
Internal	FPC Antenna	2400MHz ~ 2500MHz	2.4G: 3.2dBi	2.4G Antenna

6. Conducted Power

[2.4G WIFI]

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
11B	1	2412	15.28
	6	2437	15.03
	11	2462	15.78
11G	1	2412	14.88
	6	2437	14.81
	11	2462	14.55
11N20 SISO	1	2412	13.29
	6	2437	13.08
	11	2462	12.95
11N40 SISO	3	2422	12.68
	6	2437	12
	9	2452	12.5

[5.2G WIFI]

Mode	Channel	Frequency (MHz)	Max Conducted Power(dBm)
11A	36	5180	13.07
	40	5200	12.87
	48	5240	12.82
11N20 SISO	36	5180	11.79
	40	5200	11.75
	48	5240	11.25





[5.3G WIFI]

Mode	Channel	Frequency (MHz)	Max Conducted Power(dBm)
IEEE 802.11a	52	5260	12.57
	60	5280	12.54
	64	5320	12.53
IEEE 802.11n HT20	52	5260	11.76
	60	5280	11.71
	64	5320	11.55

[5.5G WIFI]

Mode	Channel	Frequency (MHz)	Max Conducted Power(dBm)
11A	100	5500	12.35
	116	5580	12.76
	140	5700	12.85
11N20 SISO	100	5500	11.65
	116	5580	11.17
	140	5700	11.31

[5.8G WIFI]

Mode	Channel	Frequency (MHz)	Max Conducted Power(dBm)
11A	149	5745	12.4
	157	5785	12.93
	165	5825	12.71
11N20 SISO	149	5745	11.23
	157	5785	11.34
	165	5825	11.08





7. Manufacturing Tolerance

[2.4G WIFI]

11B (Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	15.0	15.0	15.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11G (Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	14.0	14.0	14.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11N20 (Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	13.0	13.0	12.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11N40 (Peak)			
Channel	Channel 3	Channel 6	Channel 9
Target (dBm)	12.0	12.0	12.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0

[5.2G WIFI]

11A (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	13.0	12.0	12.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11N20 (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	11.0	11.0	11.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0

[5.3G WIFI]

11A (Average)			
Channel	Channel 52	Channel 60	Channel 64
Target (dBm)	12.0	12.0	12.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11N HT20 (Average)			
Channel	Channel 52	Channel 60	Channel 64
Target (dBm)	11.0	11.0	11.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0





[5.5G WIFI]

11A (Average)			
Channel	Channel 100	Channel 116	Channel 140
Target (dBm)	12.0	12.0	12.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11N HT20 (Average)			
Channel	Channel 100	Channel 116	Channel 140
Target (dBm)	11.0	11.0	11.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0

[5.8G WIFI]

11A (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	12.0	12.0	12.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11N20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	11.0	11.0	11.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0

For 2.4G:

TX frequency range: 2450MHz

Device category: Mobile Device (Distance: 20cm)

Max. Field Strength: 93.12dBuV/m @3m

 $EIRP = E - 104.8 + 20 \log D = 93.12 - 104.8 + 20 \log 3 = -2.14 \text{ dBm}$

Maximum Conducted Output Power: -2.14dBm

Turn-up: -2.0 $\pm$ 1



8. Measurement Results

8.1 Standalone MPE Evaluation

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, $r=20\text{cm}$, as well as the gain of the used antenna refer to antenna information, the RF power density can be obtained.

[2.4G WIFI]

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
IEEE 802.11b	16.0	39.8107	4.16	2.6062	0.0206	1.0000
IEEE 802.11g	15.0	31.6228	4.16	2.6062	0.0164	1.0000
IEEE 802.11n HT20	14.0	25.1189	4.16	2.6062	0.0130	1.0000
IEEE 802.11n HT40	13.0	19.9526	4.16	2.6062	0.0103	1.0000

[5.2G WIFI]

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
IEEE 802.11a	14.0	25.1189	2.6	1.8197	0.0091	1.0000
IEEE 802.11n HT20	12.0	15.8489	2.6	1.8197	0.0057	1.0000

[5.3G WIFI]

Band/Mode	RF output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
IEEE 802.11a	13.0	19.9526	2.6	1.8197	0.0072	1.0000
IEEE 802.11n HT20	12.0	15.8489	2.6	1.8197	0.0057	1.0000

[5.5G WIFI]

Band/Mode	RF output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
IEEE 802.11a	13.0	19.9526	2.6	1.8197	0.0072	1.0000
IEEE 802.11n HT20	12.0	15.8489	2.6	1.8197	0.0057	1.0000

[5.8G WIFI]

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
IEEE 802.11a	13.0	19.9526	2.6	1.8197	0.0072	1.0000
IEEE 802.11n HT20	12.0	15.8489	2.6	1.8197	0.0057	1.0000





[2.4G]

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm2)	MPE Limits (mW/cm2)
	dBm	mW				
GFSK	-1.0	0.7943	3.2	2.0893	0.0003	1.0000

Remark:

1. Output power including tune-up tolerance;
2. Output power was adjusted to duty cycle at 100% if measured duty cycle less than 98%;
3. MPE evaluate distance is 20cm from user manual provide by manufacturer.

8.2 Simultaneous Transmission MPE Evaluation

The EUT equipped with one 2.4GWIFI antenna and one 5GWIFI antenna and one 2.4G antenna. so need consider simultaneous transmission;
According to KDB447498 for Transmitters used in mobile exposure conditions for simultaneous transmission operations;
 Σ of MPE ratios ≤ 1.0

Mode	MPE Antenna_2.4GWIFI (mW/cm2)	MPE Antenna_5.2GWIFI (mW/cm2)	MPE Antenna_2.4G (mW/cm2)	Σ MPE ratios	Limit	Results
2.4GWIFI+5.2WIFI +2.4GWIFI	0.0206	0.0091	0.0003	0.0300	1.0	PASS

9. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

10. Description of Test Facility

NVLAP Accreditation Code is 600167-0.
FCC Designation Number is CN5024.
CAB identifier is CN0071.
CNAS Registration Number is L4595.
Test Firm Registration Number: 254912.

-----THE END OF REPORT-----



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