

**Shenzhen CTA Testing Technology Co., Ltd.**

Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, China

RF Exposure evaluation**Report Reference No. : CTA24101702005****FCC ID. : 2BGZJ-CUBESLIM**

Compiled by

(position+printed name+signature): File administrators Jinghua Xiao

Supervised by

(position+printed name+signature): Test Engineer Lushan Kong

Approved by

(position+printed name+signature) : Manager Eric Wang



Date of issue : Sep.26, 2024

Representative Laboratory Name

..... :

Shenzhen CTA Testing Technology Co., Ltd.

Address

Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, China

Applicant's name..... :**SHENZHEN MOREJOY INNOVATION TECHNOLOGY CO.,LTD**

Address

1907A6K, International Culture Building, No. 3039, Shennan Middle Road, Funan Community, Futian Street, Futian District, Shenzhen, China

Test specification

Standard : 47CFR §1.1310 Basis and purpose
47CFR §2.1091 Radiofrequency radiation exposure evaluation:
mobile devices

TRF Originator : Shenzhen Global Test Service Co.,Ltd.

Master TRF : Dated 2014-12

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Test item description**Projector**

Trade Mark : Morejoy

Manufacturer : SHENZHEN MOREJOY INNOVATION TECHNOLOGY CO.,LTD

Model/Type reference : CUBE SLIM

Listed Models : N/A

Hardware Version : N/A

Software Version : N/A

Rating : AC100-240V, 1.5A, 50/60Hz

Result : **PASS**

TEST REPORT

Test Report No. :	CTA24101702005	Sep.26, 2024
		Date of issue

Equipment under Test : Projector

Model /Type : CUBE SLIM

Listed model : N/A

Applicant : **SHENZHEN MOREJOY INNOVATION TECHNOLOGY CO.,LTD**

Address : 1907A6K, International Culture Building, No. 3039, Shennan Middle Road, Funan Community, Futian Street, Futian District, Shenzhen, China

Manufacturer : **SHENZHEN MOREJOY INNOVATION TECHNOLOGY CO.,LTD**

Address : 1907A6K, International Culture Building, No. 3039, Shennan Middle Road, Funan Community, Futian Street, Futian District, Shenzhen, China

Test Result:	PASS
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The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1. SUMMARY

1.1 EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

○ - supplied by the lab

●	N/A	M/N:	N/A
		Manufacturer:	N/A

1.2 Product Description

Product Name:	Projector
Trade Mark:	Morejoy
Model/Type reference:	CUBE SLIM
List Model:	N/A
Model Declaration	N/A
Power supply:	AC100-240V, 1.5A, 50/60Hz
Hardware Version	N/A
Software Version	N/A
Sample ID	CTA241017020-S0001-1# & CTA241017020-S0001-2#
Bluetooth	
Frequency Range	2402MHz ~ 2480MHz
Channel Number	79 channels for Bluetooth (DSS) 40 channels for Bluetooth (DTS)
Channel Spacing	1MHz for Bluetooth (DSS) 2MHz for Bluetooth (DTS)
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8DPSK for Bluetooth (DSS) GFSK for Bluetooth (DTS)
Antenna Description	PCB Antenna, -0.58 dBi(Max.)
2.4GWLAN	
WLAN Operation frequency	IEEE 802.11b:2412-2462MHz IEEE 802.11g:2412-2462MHz IEEE 802.11n HT20:2412-2462MHz
WLAN Modulation Type	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK)
Channel number:	13 Channel for IEEE 802.11b/g/n(HT20)
Channel separation:	5MHz
WIFI(5.2G/5.8G Band)	
WLAN Operation frequency	5180-5240MHz/ 5745MHz to 5825MHz
WLAN Modulation Type	IEEE 802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11ac VHT20: OFDM (256QAM, 64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ac VHT40: OFDM (256QAM, 64QAM, 16QAM, QPSK, BPSK)
Channel number:	4 Channels for 20MHz bandwidth(5180-5240MHz) 5 channels for 20MHz bandwidth(5745-5825MHz) 2 channels for 40MHz bandwidth(5190~5230MHz) 2 channels for 40MHz bandwidth(5755~5795MHz)

Antenna Description	Internal Antenna, 2.13 dBi(Max.) for 2.4G WLAN and 2.00 dBi(Max.) for 5G WLAN.
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2. TEST ENVIRONMENT

2.1 Address of the test laboratory

Shenzhen CTA Testing Technology Co., Ltd.

Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, China

2.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 517856 Designation Number: CN1318

Shenzhen CTA Testing Technology Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

CAB identifier is CN0127. Industry Canada Registration Number. is 27890.

Shenzhen CTA Testing Technology Co., Ltd. has been listed on the Innovation, Science and Economic Development Canada list of test facilities recognized to perform electromagnetic emissions measurements.

A2LA-Lab Cert. No.: 6534.01

Shenzhen CTA Testing Technology Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010.

2.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

2.4 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the Shenzhen CTA Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen CTA Testing Technology Co., Ltd. :

Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.57 dB	(1)

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3. METHOD OF MEASUREMENT

3.1 Applicable Standard

According to §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.

According to §1.1310 and §2.1091 RF exposure is calculated.

KDB447498 D01 General RF Exposure Guidance v06: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies

3.2 Requirement

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 KDB447498 D01 General RF Exposure Guidance v06 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 modeled 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.

3.3 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/Controlled 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

3.4 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

As declared by the Applicant, the EUT transmits with the maximum source-based Duty Cycle of 100%-see the User manual, and the EUT is a wireless device used in a mobile application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum mobile separation distance, $r = 20\text{cm}$, as well as the gain of the used antenna is -0.58dBi & 2.13dBi & 2.00dBi for BT&WLAN, and the power drift from Turn-up Procedure provide by manufacturer as following states, the RF power density can be obtained.

3.5 Antenna Information

CUBE SLIM can only use antennas certificated as follows provided by manufacturer;

Internal Identification	Antenna Identification in Internal photos	Antenna type and antenna number	Operate frequency band	Maximum antenna gain
Antenna 0	BT	PCB Antenna	2.4 – 2.5 GHz	-0.58 dBi(Max.) for 2.4G band
Antenna 1	WLAN	Internal Antenna	2.4 – 2.5 GHz 5.0 – 6.0 GHz	2.13 dBi(Max.) for 2.4G band 2.0 dBi(Max.) for 5G band

4. Conducted Power Results

Bluetooth

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
GFSK	0	2402	-1.57
	39	2441	-0.13
	78	2480	-0.28
$\pi/4$ DQPSK	0	2402	-0.94
	39	2441	0.37
	78	2480	0.22
8DPSK	0	2402	-0.56
	39	2440	0.88
	78	2480	0.81
GFSK(BT LE)	0	2402	-1.80
	19	2440	-0.56
	39	2480	-0.49

2.4GWLAN

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
802.11b	01	2412	13.96
	06	2437	15.34
	11	2462	14.85
802.11g	01	2412	15.76
	06	2437	16.23
	11	2462	16.14
802.11n(HT20)	01	2412	15.68
	06	2437	15.88
	11	2462	15.63

5.2GWLAN

Mode	Channel	Frequency (MHz)	Average Conducted Output Power (dBm)
802.11a	36	5180	7.98
	40	5200	7.99
	48	5240	8.35
802.11n20	36	5180	8.29
	40	5200	7.28
	48	5240	7.72
802.11n40	38	5190	7.73
	46	5230	7.90
802.11ac20	36	5180	7.57
	40	5200	8.57
	48	5240	8.39
802.11ac40	38	5190	7.35
	46	5230	7.75

5.8GWLAN

Mode	Channel	Frequency (MHz)	Average Conducted Output Power (dBm)
802.11a	149	5745	9.54
	157	5785	8.63
	165	5825	8.48
802.11n20	149	5745	9.90
	157	5785	9.00
	165	5825	9.80
802.11n40	151	5755	9.01
	159	5795	8.37
802.11ac20	149	5745	9.48
	157	5785	8.63
	165	5825	8.92
802.11ac40	151	5755	8.82
	159	5795	8.10

5. Manufacturing Tolerance

Bluetooth			
GFSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	-1.00	0	0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
$\pi/4$ DQPSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	0	0	0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
8DPSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	0	0	0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
GFSK BT LE (Peak)			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	-1.00	0	0

2.4GWLAN			
IEEE 802.11b (Peak)			
Channel	Channel 01	Channel 06	Channel 11
Target (dBm)	13.00	15.00	14.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11g (Peak)			
Channel	Channel 01	Channel 06	Channel 11
Target (dBm)	15.00	16.00	16.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Peak)			
Channel	Channel 01	Channel 06	Channel 11
Target (dBm)	15.00	15.00	15.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0

5.2GWLAN

IEEE 802.11a (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	7.00	7.00	8.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	8.00	7.00	7.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT40 (Average)			
Channel	Channel 38	Channel 46	/
Target (dBm)	7.00	7.00	/
Tolerance $\pm$ (dB)	1.0	1.0	/
IEEE 802.11ac VHT20 (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	7.00	8.00	8.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac VHT40 (Average)			
Channel	Channel 38	Channel 46	/
Target (dBm)	7.00	7.00	/
Tolerance $\pm$ (dB)	1.0	1.0	/

5.8GWLAN

IEEE 802.11a (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	9.00	8.00	8.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	9.00	9.00	9.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT40 (Average)			
Channel	Channel 151	Channel 159	/
Target (dBm)	9.00	8.00	/
Tolerance $\pm$ (dB)	1.0	1.0	/
IEEE 802.11ac VHT20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	9.00	8.00	8.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac VHT40 (Average)			
Channel	Channel 151	Channel 159	/
Target (dBm)	8.00	8.00	/
Tolerance $\pm$ (dB)	1.0	1.0	/

6. Measurement Results

6.1 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.

BT

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW				
GFSK	1.00	1.2589	-0.58	0.8750	0.0002	1.0000
$\pi/4$ DQPSK	1.00	1.2589	-0.58	0.8750	0.0002	1.0000
8DPSK	1.00	1.2589	-0.58	0.8750	0.0002	1.0000
GFSK (BT LE)	1.00	1.2589	-0.58	0.8750	0.0002	1.0000

2.4GWLAN

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW				
802.11b	16.00	39.8107	2.13	1.6331	0.0129	1.0000
802.11g	17.00	50.1187	2.13	1.6331	0.0163	1.0000
802.11n(HT20)	16.00	39.8107	2.13	1.6331	0.0129	1.0000

5.2GWLAN

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW				
802.11a	9.00	7.9433	2.00	1.5849	0.0025	1.0000
802.11n20	9.00	7.9433	2.00	1.5849	0.0025	1.0000
802.11n40	8.00	6.3096	2.00	1.5849	0.0020	1.0000
802.11ac20	9.00	7.9433	2.00	1.5849	0.0025	1.0000
802.11ac40	8.00	6.3096	2.00	1.5849	0.0020	1.0000

5.8GWLAN

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW				
802.11a	10.00	10.0000	2.0	1.5849	0.0032	1.0000
802.11n20	10.00	10.0000	2.0	1.5849	0.0032	1.0000
802.11n40	10.00	10.0000	2.0	1.5849	0.0032	1.0000
802.11ac20	10.00	10.0000	2.0	1.5849	0.0032	1.0000
802.11ac40	9.00	7.9433	2.0	1.5849	0.0025	1.0000

Remark:

1. Output power including tune-up tolerance;
2. MPE evaluate distance is 20cm from user manual provide by manufacturer;

6.2 Simultaneous Transmission MPE

The sample support one Bluetooth chip and one WLAN modular and one Bluetooth antenna, and one WLAN antennas, WLAN not support MIMO, Need consider simultaneous transmission ;

According to KDB447498 D01 General RF Exposure Guidance v06 for Transmitters used in mobile exposure conditions for simultaneous transmission operations;

$\sum$ of MPE ratios ≤ 1.0

6.2.1 Summary simultaneous transmission information

Modulation Type	Work Frequency Band	Transmit Antenna		Antenna 0, Antenna 1 Synchronization transmits
		Antenna 0	Antenna 1	
BT	2.4GHz	Yes	No	Yes
WLAN	2.4GHz	No	Yes	Yes
WLAN	5GHz	No	Yes	Yes
		Antenna 0	Antenna 1	2.4GHzWLAN + 5GHzWLAN Synchronization transmits
WLAN	2.4GHz	No	Yes	No
WLAN	5GHz	No	Yes	No

6.2.2 Summary simultaneous transmission results

Maximum Simultaneous transmission MPE Ratios for **BT,2.4GWLAN**

Maximum MPE ratio BT	Maximum MPE ratio 2.4GWLAN	$\sum$ MPE ratios	Limit	Results
0.0002	0.0163	0.0165	1.0	PASS

7. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure and SAR Exclusion Threshold per KDB447498 D01 General RF Exposure Guidance v06, No SAR is required.

.....End of Report.....