



FCC PART 15.249 TEST REPORT

On Behalf of

Dongguan Co-lighting Optoelectronics Technology Co., Ltd.

F7, No.5 Lianzihu Road, Qishi Town, DONGGUAN CITY, Guangdong 523500 China

FCC ID: 2BKQT-RC01

Model: RC01

September 14, 2024

This Report Concerns: ☒ Original Report	Equipment Type: 2.4G remote control
Test Engineer: LBi Li / LBi Li	
Report Number: QCT24HR-1963E-01	
Test Date: August 22, 2024 ~ September 14, 2024	
Reviewed By: Gordon Tan / Gordon Tan	
Approved By: Kendy Wang / Kendy Wang	
Prepared By: Shenzhen QC Testing Laboratory Co., Ltd. East of 1/F., Building E, Xinghong Science Park, No.111, Shuiku Road, Fenghuanggang, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China Tel: 0755-23008269 Fax: 0755-23726780	



Table of Contents

1. GENERAL INFORMATION.....	4
1.1 Product Description for Equipment under Test (EUT)	4
1.2 System Test Configuration.....	5
1.3 Test Facility.....	6
1.4 Measurement Uncertainty.....	6
2. SUMMARY OF TEST RESULTS	7
3. LIST OF TEST AND MEASUREMENT INSTRUMENTS	8
3.1 Radiated Emission Test	8
3.2 RF Conducted test.....	8
4. ANTENNA REQUIREMENT.....	9
5. RADIATED EMISSION METHOD.....	10
5.1 Applicable Standard.....	10
5.2 Limit.....	10
5.3 Receiver setup.....	10
5.4 Test setup.....	10
5.5 Test Procedure.....	11
5.6 Test Data.....	12
6. 20DB OCCUPY BANDWIDTH.....	17
6.1 Applicable Standard.....	17
6.2 Limit.....	17
6.3 Test setup.....	17
6.4 Test Data.....	17



Revision History of This Test Report

[illegible]



1. GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

EUT Description	2.4G remote control
Model No.	RC01
Tested Model	RC01
Sample(s) Status	Engineer sample
Operation Frequency:	2405~2437MHz
Channel numbers:	3
Modulation type:	GFSK
Antenna Type:	PCB antenna
Antenna gain* ¹ :	2.15dBi
Power supply:	DC 3V (Powered by 2*1.5V AAA battery)
Trade Mark:	N/A
Applicant	Dongguan Co-lighting Optoelectronics Technology Co., Ltd.
Address	F7, No.5 Lianzihu Road, Qishi Town, DONGGUAN CITY, Guangdong 523500 China
Manufacturer	Dongguan Co-lighting Optoelectronics Technology Co., Ltd.
Address	F7, No.5 Lianzihu Road, Qishi Town, DONGGUAN CITY, Guangdong 523500 China
Sample No.	Y24H1963E01WC

Note: *¹This information provided by Manufacturer, SZ QC Lab is not responsible for the accuracy of this information.



1.2 System Test Configuration

1.2.1 C Channel List

Operation Frequency each of channel					
Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2405MHz	2	2421MHz	3	2437MHz

Note: In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency	Channel	Frequency
The lowest channel	2405MHz	The middle channel	2421MHz
The Highest channel	2437MHz		

1.2.2 Support Equipment

N/A

1.2.3 Test mode and voltage

Transmitting mode: Keep the EUT in continuously transmitting.

Test voltage: DC 3V



1.3 Test Facility

Test Firm : Shenzhen QC Testing Laboratory Co., Ltd.

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19. The testing quality system of our laboratory meets with ISO/IEC-17025 requirements. This approval result is accepted by MRA of APLAC.

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

CNAS – Registration No.: L8464

The EMC Laboratory has been accredited by CNAS, and in compliance with ISO/IEC 17025:2017 General Requirements for testing Laboratories.

A2LA Certificate Number: 6759.01

The EMC Laboratory has been accredited by A2LA, and in compliance with ISO/IEC 17025:2017 General Requirements for testing Laboratories.

FCC Registration Number: 561109

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission.

IC Registration Number: 29628

CAB identifier: CN0141

The EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada.

1.4 Measurement Uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	$\pm 1.42 \times 10^{-1}$
RF output power, conducted	$\pm 1.06\text{dB}$
Power Spectral Density, conducted	$\pm 1.06\text{dB}$
Unwanted Emissions, conducted	$\pm 2.51\text{dB}$
AC Power Line Conducted Emission	$\pm 1.80\text{dB}$
Radiated Spurious Emission test (9kHz-30MHz)	$\pm 2.66\text{dB}$
Radiated Spurious Emission test (30MHz-1000MHz)	$\pm 4.04\text{dB}$
Radiated Spurious Emission test (1000MHz-18000MHz)	$\pm 4.70\text{ dB}$
Radiated Spurious Emission test (18GHz-40GHz)	$\pm 4.80\text{dB}$
Temperature	$\pm 0.8^{\circ}\text{C}$
Humidity	$\pm 3.2\%$
DC and low frequency voltages	$\pm 0.1\%$
Time	$\pm 5\%$
Duty cycle	$\pm 5\%$

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



2. Summary of Test Results

Test Item	Section	Result
Antenna Requirement	15.203	Pass
Conduction Emission	15.207	Not Applicable
Radiated Emissions	15.205, 15.209, 15.249	Pass
20dB Bandwidth	15.215 (c)	Pass

Note: 1. Pass: The EUT complies with the essential requirements in the standard.
2. Test according to ANSI C63.10:2013
3.. All indications of Pass/Fail in this report are opinions expressed by Shenzhen QC Testing Laboratory Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only.



3. List of Test and Measurement Instruments

3.1 Radiated Emission Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal.Due
1.	EMI Test Receiver	R&S	ESIB 7	2277573376	2024.03.14	2025.03.13
2.	EMI Test Receiver	ESPI3	ESPI3	101131	2024.03.14	2025.03.13
3.	Spectrum Analyzer	Rohde&Schwarz	FSV 40	101458	2024.03.14	2025.03.13
4.	TRILOG Broadband Test-Antenna	SCHWARZBECK	VULB9168	VULB9168-588	2023.04.01	2025.03.31
5.	Loop Antenna	EMCO	6502	2133	2023.03.18	2025.03.17
6.	horn antenna	SCHWARZBECK	BBHA9120D	2069	2023.04.01	2025.03.31
7.	Horn Antenna	COM-MW	ZLB7-18-40G-950	12221225	2023.01.12	2025.01.09
8.	Pre-amplifier	MITEQ	TTA0001-18	2063645	2024.03.27	2025.03.26
9.	Pre-amplifier	COM-MW	DLAN-18000-40000-02	10229104	2024.03.14	2025.03.13
10.	966 Camber	ZhongYU	9*6*6	/	2023.05.08	2026.05.07

Radiated Emission Measurement Software: EZ EMC Ver QCT03A2 RE+

3.2 RF Conducted test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal.Due
1.	Wideband Radio Communication Tester	Rohde & Schwarz	CW500	151583	2024.03.14	2025.03.13
2.	Spectrum Analyzer	ROHDE&SCHWARZ	FSV 40	101458	2024.03.14	2025.03.13
3.	Signal Generator	Agilent	N5182A	MY50141563	2024.03.14	2025.03.13
4.	RF Automatic Test System	MW	MW100-RFCB/ MW100-PSB	MW2007004	2024.03.14	2025.03.13

RF Conducted Measurement Software: MTS 8310 Ver 2.0.0.0



4. Antenna requirement

Standard requirement: FCC Part15 C Section 15.203

15.203 requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

EUT Antenna: The antenna is PCB Antenna, the best case gain of the antenna is 2.15dBi, reference to the Internal Photos for details.

5. Radiated Emission Method

5.1 Applicable Standard

FCC Part15 C Section 15.249

5.2 Limit

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

As per FCC Section 15.249

(c) Field strength limits are specified at a distance of 3 meters.

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

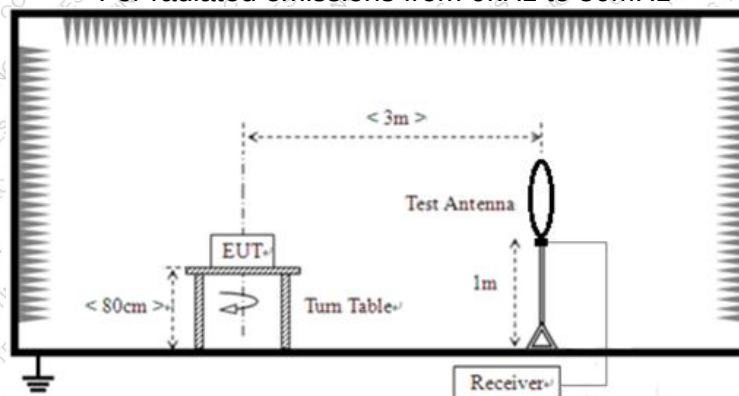
5.3 Receiver setup

Frequency	Detector	RBW	VBW	Value
9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
30MHz-1GHz	Quasi-peak	100KHz	300KHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

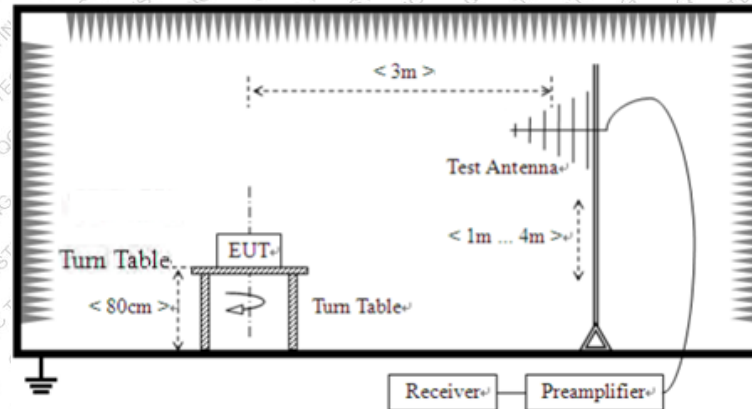
Remark: For the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission test in these three bands are based on measurements employing an average detector.

5.4 Test setup

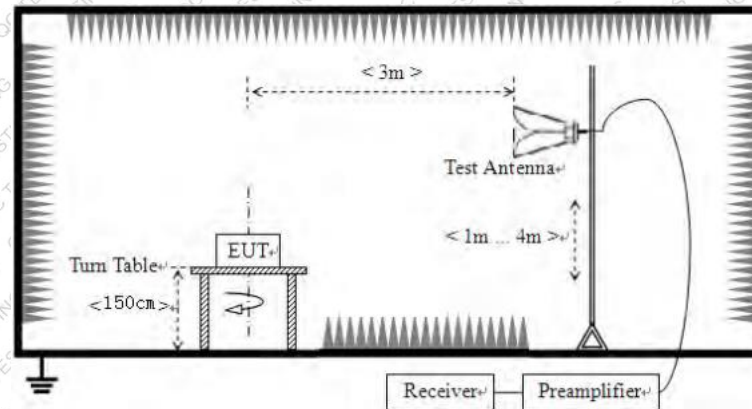
For radiated emissions from 9kHz to 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



5.5 Test Procedure

1. The EUT was placed on the top of a rotating table (0.8 meters for below 1GHz and 1.5 meters for above 1GHz) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.



5.6 Test Data

Temperature	26°C	Humidity	54%
ATM Pressure	101.1kPa	Antenna Gain	2.15dBi
Test by	LBi Li	Test result	PASS

Remarks:

Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.

Measurement data:

9 kHz ~ 30 MHz

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

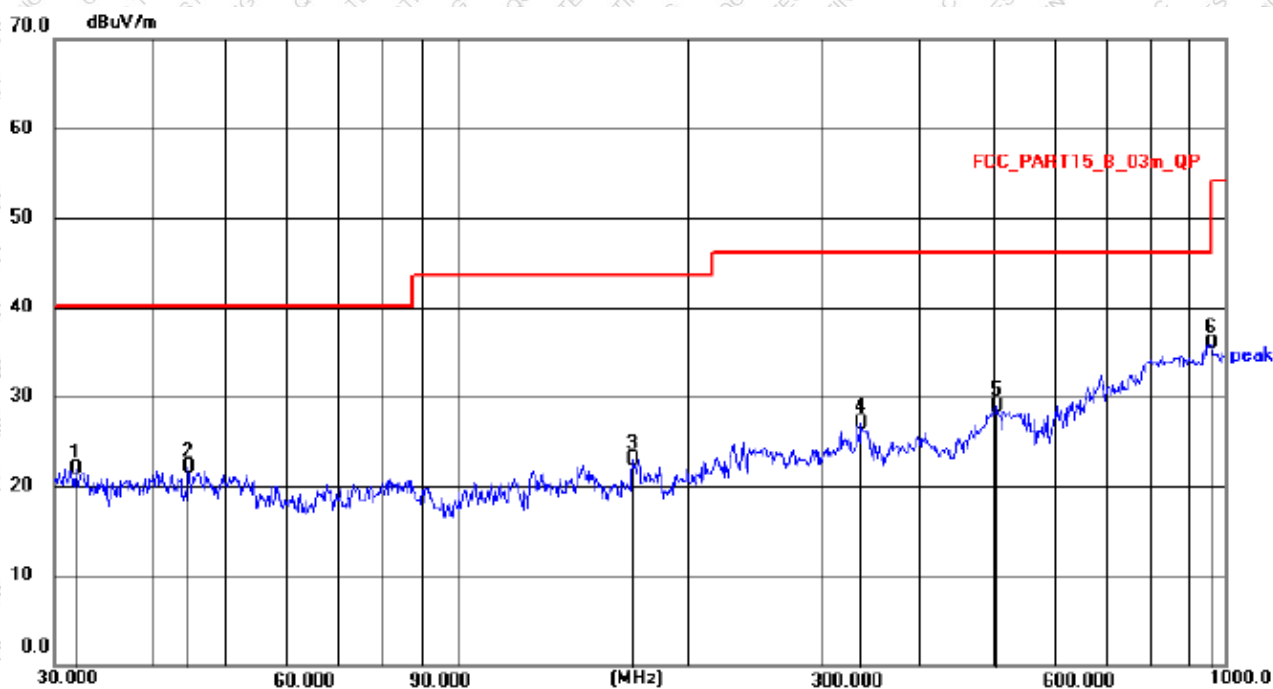


Measurement data:

Pre-scan all test modes, found worst case at GFSK 2405MHz, and so only show the test result of GFSK 2405MHz.

Below 1GHz:

Horizontal

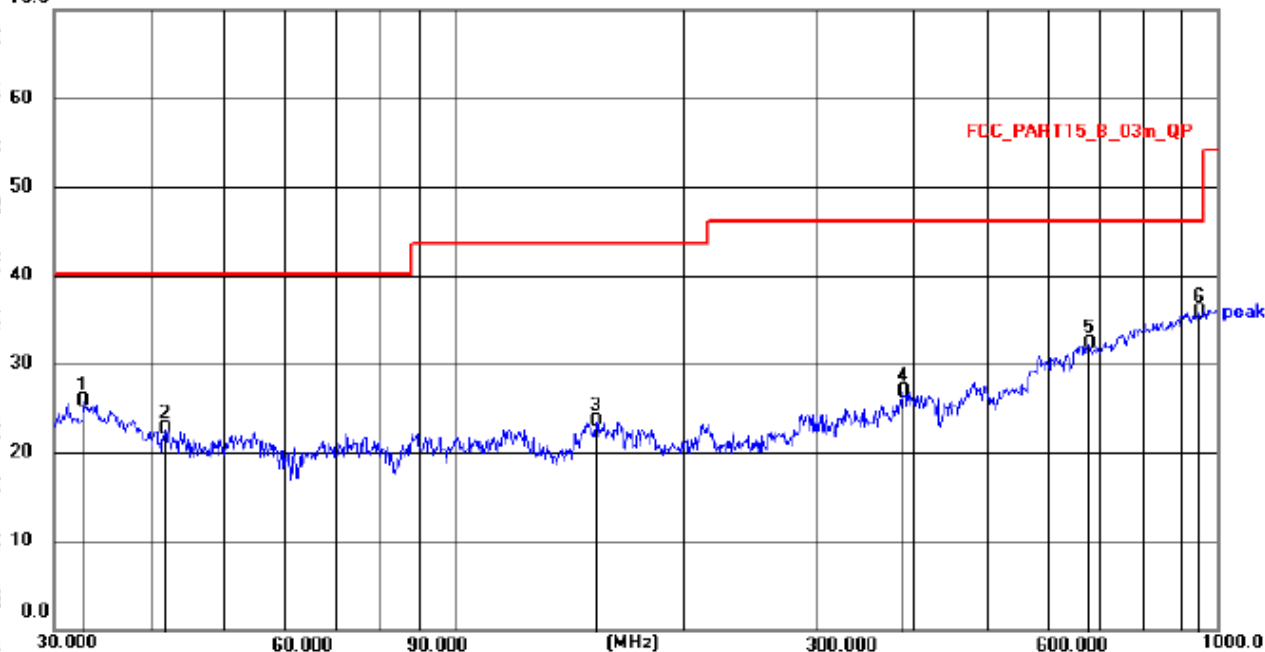


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	31.9542	8.70	13.27	21.97	40.00	18.03	QP
2	44.7433	7.48	14.72	22.20	40.00	17.80	QP
3	169.5988	9.47	13.62	23.09	43.50	20.41	QP
4	336.0350	11.25	15.73	26.98	46.00	19.02	QP
5 *	504.7062	8.85	20.10	28.95	46.00	17.05	QP
6	962.1621	9.16	26.83	35.99	54.00	18.01	QP



Vertical

70.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	32.7486	12.76	12.97	25.73	40.00	14.27	QP
2	41.8594	8.15	14.56	22.71	40.00	17.29	QP
3	153.7384	9.08	14.39	23.47	43.50	20.03	QP
4	387.9917	9.65	17.20	26.85	46.00	19.15	QP
5	679.9600	9.70	22.50	32.20	46.00	13.80	QP
6 *	945.4400	9.32	26.53	35.85	46.00	10.15	QP



Above 1G:

Test channel: Lowest channel

Frequency (MHz)	Read Level (dBμV)	polarization	Factor (dB/m)	Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector
2310	51.34	H	-11.46	39.88	74	34.12	peak
2310	51.70	V	-11.46	40.24	74	33.76	peak
2390	60.73	H	-11.16	49.57	74	24.43	peak
2390	56.62	H	-11.16	45.46	54	8.54	AVG
2390	58.37	V	-11.16	47.21	74	26.79	peak
2390	53.85	V	-11.16	42.69	54	11.31	AVG
2400	64.97	H	-11.12	53.85	74	20.15	peak
2400	60.49	H	-11.12	49.37	54	4.63	AVG
2400	59.37	V	-11.12	48.25	74	25.75	peak
2400	58.80	V	-11.12	47.68	54	6.32	AVG
4810	61.56	H	-5.96	55.60	74	18.40	peak
4810	56.28	H	-5.96	50.32	54	3.68	AVG
4810	61.10	V	-5.96	55.14	74	18.86	peak
4810	55.58	V	-5.96	49.62	54	4.38	AVG
7215	56.58	H	1.23	57.81	74	16.19	peak
7215	51.43	H	1.23	52.66	54	1.34	AVG
7215	55.98	V	1.23	57.21	74	16.79	peak
7215	51.25	V	1.23	52.48	54	1.52	AVG

Test channel: Middle channel

Frequency (MHz)	Read Level (dBμV)	polarization	Factor (dB/m)	Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector
4842	62.26	H	-5.88	56.38	74	17.62	peak
4842	57.94	H	-5.88	52.06	54	1.94	AVG
4842	61.75	V	-5.85	55.90	74	18.10	peak
4842	57.14	V	-5.85	51.29	54	2.71	AVG
7263	54.85	H	1.36	56.21	74	17.79	peak
7263	50.64	H	1.36	52.00	54	2.00	AVG
7263	55.21	V	1.36	56.57	74	17.43	peak
7263	50.35	V	1.36	51.71	54	2.29	AVG



Test channel: Highest channel

Frequency (MHz)	Read Level (dBμV)	polarization	Factor (dB/m)	Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector
2483.5	50.30	H	-10.81	39.49	74	34.51	peak
2483.5	50.83	V	-10.81	40.02	74	33.98	peak
2500	50.96	H	-10.75	40.21	74	33.79	peak
2500	50.73	V	-10.75	39.98	74	34.02	peak
4874	61.19	H	-5.73	55.46	74	18.54	peak
4874	56.84	H	-5.73	51.11	54	2.89	AVG
4874	62.54	V	-5.73	56.81	74	17.19	peak
4874	57.36	V	-5.73	51.63	54	2.37	AVG
7311	54.62	H	1.49	56.11	74	17.89	peak
7311	50.81	H	1.49	52.30	54	1.70	AVG
7311	54.85	V	1.49	56.34	74	17.66	peak
7311	50.52	V	1.49	52.01	54	1.99	AVG

Frequency (MHz)	Read Level (dBμV)	polarization	Factor (dB/m)	Peak value (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)
2405	99.82	H	-11.10	88.72	93.98	5.26
2405	98.66	V	-11.10	87.56	93.98	6.42
2421	99.39	H	-11.04	88.35	93.98	5.63
2421	98.28	V	-11.04	87.24	93.98	6.74
2437	99.26	H	-10.99	88.27	93.98	5.71
2437	97.81	V	-10.99	86.82	93.98	7.16

Remarks:

1. Level = Reading + Factor
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

6. 20dB Occupy Bandwidth

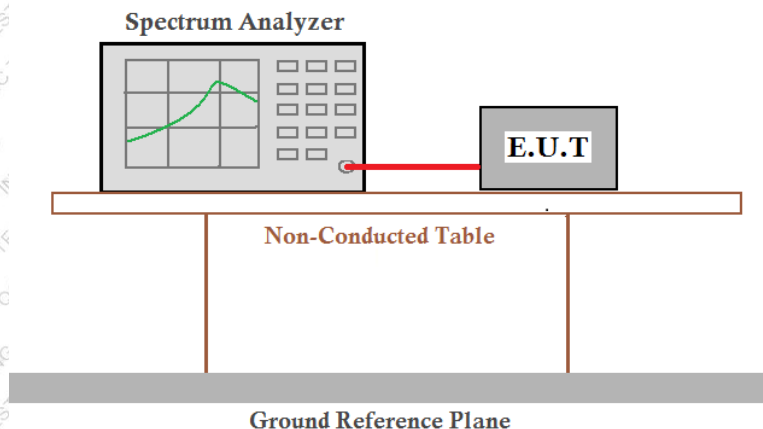
6.1 Applicable Standard

FCC Part15 C Section 15.215

6.2 Limit

N/A

6.3 Test setup



6.4 Test Data

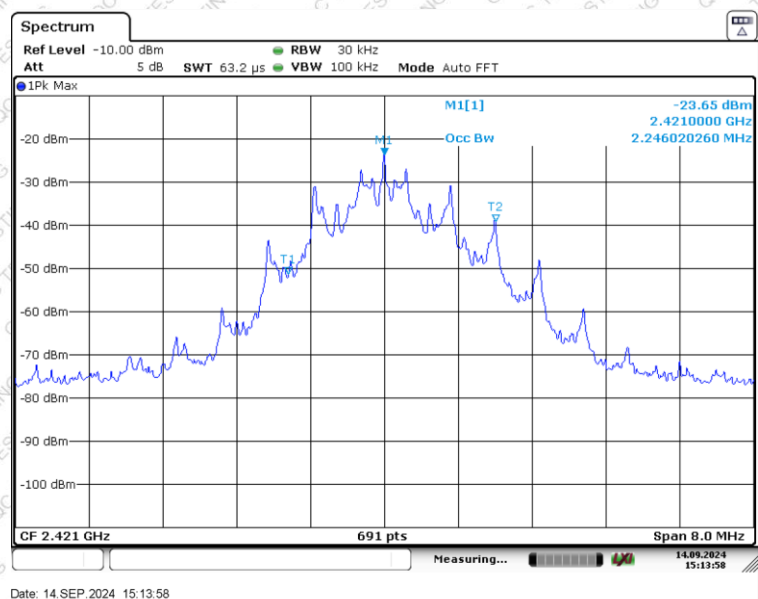
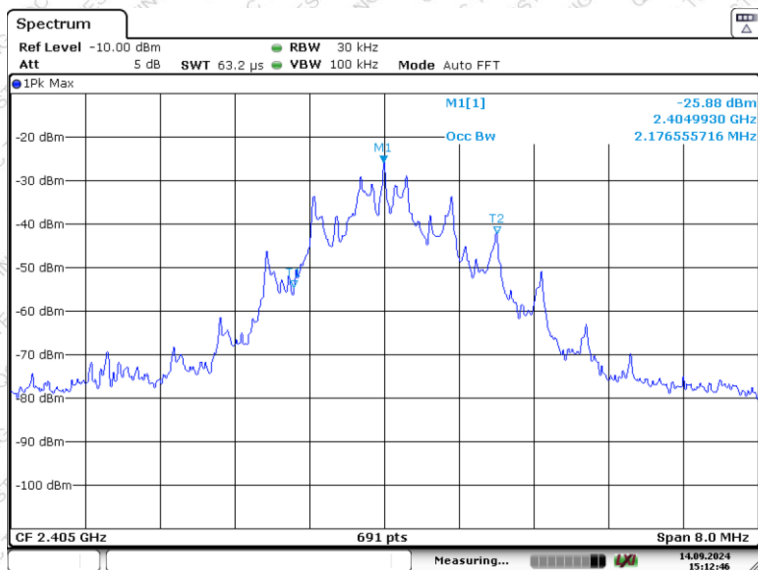
Temperature	24 °C	Humidity	52%
ATM Pressure	101.1kPa	Antenna Gain	2.15dBi
Test by	LBi Li	Test result	PASS

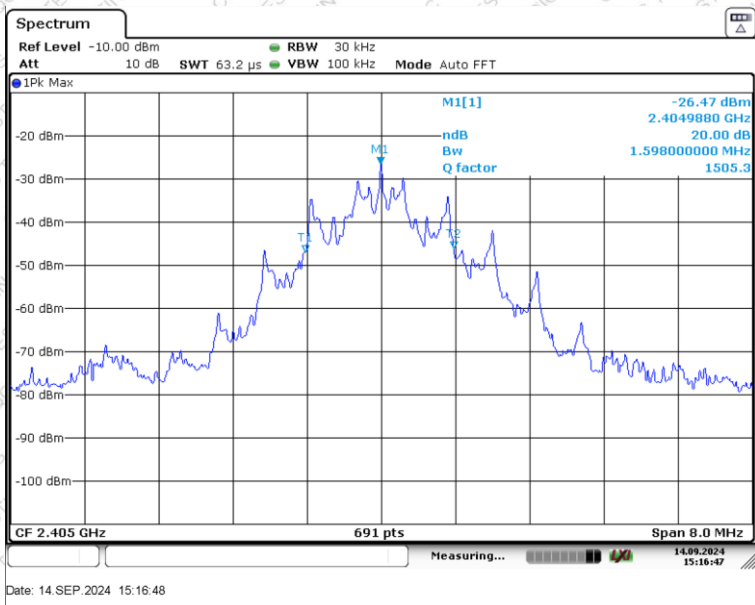
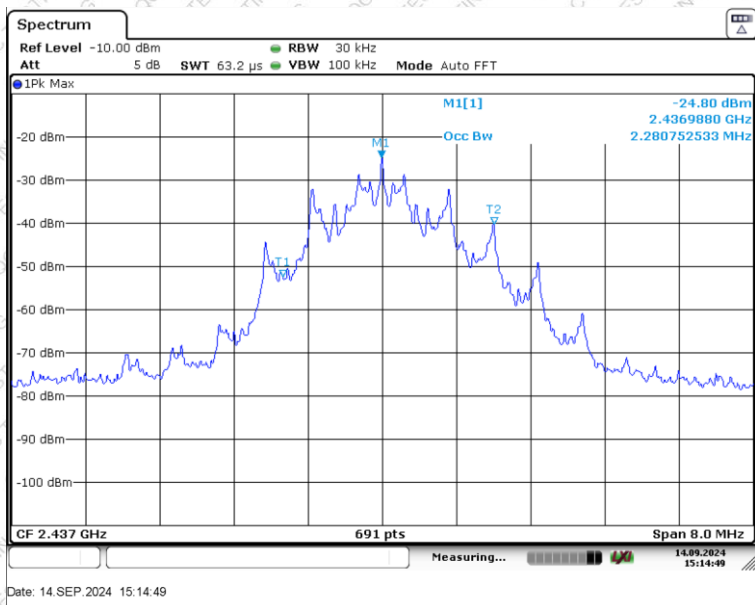
Please refer to following table and plots.

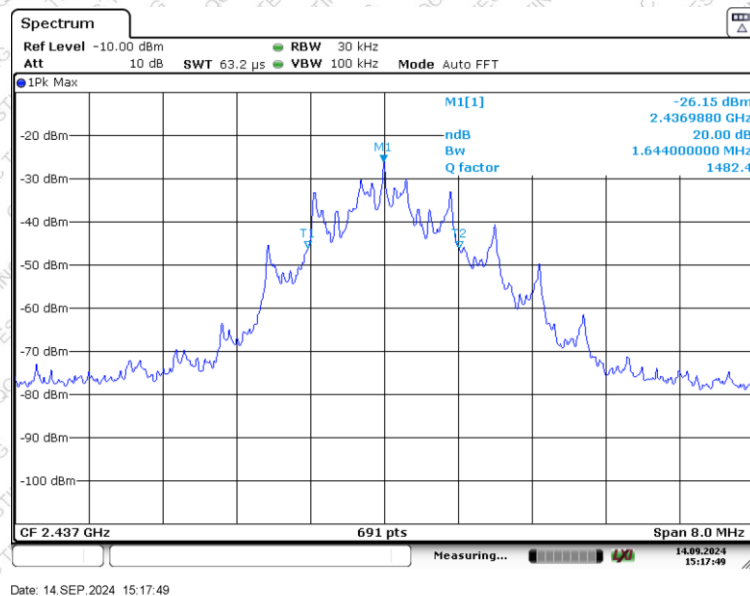
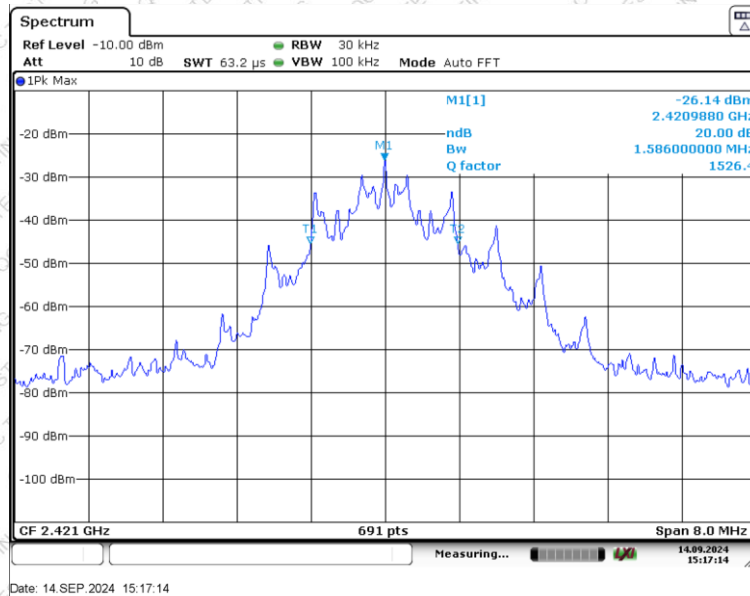


Test Frequency (MHz)	20dB bandwidth (MHz)	99% Occupied Bandwidth (MHz)
2405	1.598	2.177
2421	1.644	2.246
2437	1.586	2.281

Test plot as follows:







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