



FCC PART 15.249 TEST REPORT

On Behalf of

LEDVANCE LLC

200 Ballardvale Street Wilmington, MA 01887

FCC ID: 2AKGT-63870

**Model: UDL2155/R4/500DM/MERGE/92750LED/REM/5WY-WT,
63870, 63870X, LEDMD4500ST9SC3WH**

February 27, 2024


This Report Concerns: <input checked="" type="checkbox"/> Original Report	Equipment Type: LED MICRODISK 4"
Test Engineer: LBi Li / <i>LBi Li</i>	
Report Number: QCT24BR-1266E-01	
Test Date: February 21~23, 2024	
Reviewed By: Gordon Tan / <i>Gordon Tan</i>	
Approved By: Kendy Wang / <i>Kendy Wang</i>	
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	4
1.3 Test Facility	5
1.4 Measurement Uncertainty	5
2. SUMMARY OF TEST RESULTS	6
3. LIST OF TEST AND MEASUREMENT INSTRUMENTS	7
3.1 Conducted Emission Test	7
3.2 Radiated Emission Test	7
3.3 RF Conducted test	8
4. ANTENNA REQUIREMENT	9
5. CONDUCTED EMISSIONS	10
5.1 Applicable Standard	10
5.2 Limit	10
5.3 Test setup	10
5.4 EMI Test Receiver Setup	10
5.5 Test procedure	10
5.6 Test Data	10
6. RADIATED EMISSION METHOD	13
6.1 Applicable Standard	13
6.2 Limit	13
6.3 Receiver setup	13
6.4 Test setup	13
6.5 Test Procedure	14
6.6 Test Data	15
7. 20DB OCCUPY BANDWIDTH	19
7.1 Applicable Standard	19
7.2 Limit	19
7.3 Test setup	19
7.4 Test Data	19



1. GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

EUT Description	LED MICRODISK 4"
Model No.	UDL2155/R4/500DM/MERGE/92750LED/REM/5WY-WT, 63870, 63870X, LEDMD4500ST9SC3WH
Tested Model	UDL2155/R4/500DM/MERGE/92750LED/REM/5WY-WT
Sample(s) Status	Engineer sample
Operation Frequency:	2402MHz
Channel numbers:	1
Modulation type:	GFSK
Antenna Type:	PCB Antenna
Antenna gain*1:	-4.5dBi
Power supply:	AC 120V/60Hz
Trade Mark:	Ledvance, Sylvania, Patriot
Applicant	LEDVANCE LLC
Address	200 Ballardvale Street Wilmington, MA 01887
Manufacturer	LEDVANCE LLC
Address	200 Ballardvale Street Wilmington, MA 01887
Sample No.	Y24B1266E01WC

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 Support Equipment

N/A

1.2.2 Test mode and voltage

Transmitting mode: Keep the EUT in continuously transmitting.

Test voltage: AC 120V/60Hz



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	$\pm 1.42 \times 10^{-4}\%$
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	Pass
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 Conducted Emission Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal.Due
1	EMI Test Receiver	R&S	ESIB 7	2277573376	2023.03.21	2024.03.20
2	Artificial Mains Network	SCHWARZBECK	NSLK8126	8126200	2023.03.21	2024.03.20
3	PULSE LIMITER	R&S	ESH3-Z2	100058	2023.03.21	2024.03.20
4	EMITEST RECEIVER	ROHDE & SCHWARZ	ESCS30	834115/014	2023.03.21	2024.03.20

Conducted Emission Measurement Software: TS

3.2 Radiated Emission Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal.Due
1.	Spectrum Analyzer	ROHDE&SCHWARZ	FSV 40	101458	2023.04.12	2024.04.11
2.	Loop Antenna	EMCO	6502	2133	2022.07.23	2024.07.22
3.	Logarithmic compound broadband Antenna	SCKWARZBECK	VULB9168	VULB9168-1-588	2023.04.01	2025.03.31
4.	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB 7	2277573376	2023.04.12	2024.04.11
5.	EMI Test Receiver	R&S	ESPI	101131	2023.03.21	2024.03.20
6.	Horn Antenna	SCHWARZBECK	BBHA9120D	02069	2023.04.01	2025.03.31
7.	Horn Antenna	COM-MW	ZLB7-18-40G-950	12221225	2023.01.12	2025.01.09
8.	Amplifier	R&S	BBV9721	9721-031	2023.03.21	2024.03.20
9.	Amplifier	HPX	BP-01G-18G	210902	2023.03.21	2024.03.20
10.	Pre-amplifier	COM-MW	DLAN-18000-40000-02	10229104	2023.03.21	2024.03.20
11.	966 Chamber	ZhongYu Electron	9*6*6	/	2022.07.25	2025.07.24

Radiated Emission Measurement Software: EZ_EMC



3.3 RF Conducted test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal.Due
1.	Wideband Radio Communication Tester	Rohde & Schwarz	CW500	151583	2023.03.21	2024.03.20
2.	Spectrum Analyzer	ROHDE & SCHWARZ	FSV 40	101458	2023.04.12	2024.04.11
3.	Signal Generator	Agilent	N5182A	MY50141563	2023.03.21	2024.03.20
4.	RF Automatic Test System	MW	MW100-RFCB/ MW100-PSB	MW2007004	2023.03.21	2024.03.20

RF Conducted Measurement Software: MTS 8310



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 -4.5dBi, reference to the Internal Photos for details.

5. Conducted Emissions

5.1 Applicable Standard

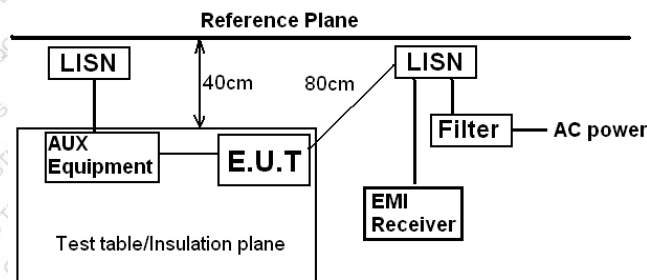
FCC Part15 C Section 15.207

5.2 Limit

Frequency range (MHz)	Limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

Note *: The level decreases linearly with the logarithm of the frequency.

5.3 Test setup



Remark
 E.U.T: Equipment Under Test
 LISN: Line Impedance Stabilization Network
 Test table height=0.8m

5.4 EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.
 RBW=9 kHz, VBW=30 kHz, Sweep time=auto

5.5 Test procedure

1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.
2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).
3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

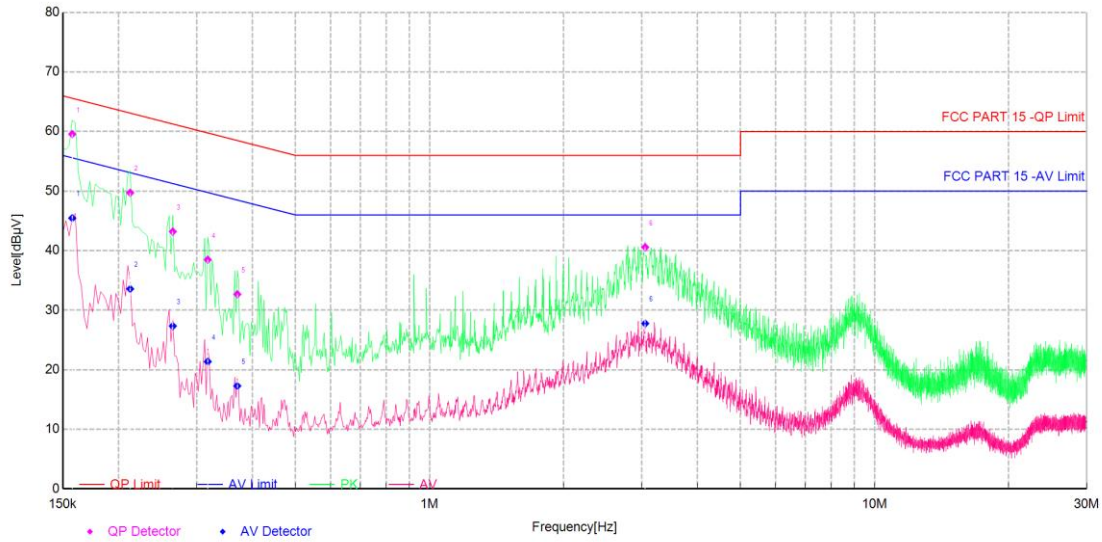
5.6 Test Data

Temperature	24°C	Humidity	53%
ATM Pressure	101.1kPa	Antenna Gain	-4.5dBi
Test by	LBi Li	Test result	PASS



Measurement data:

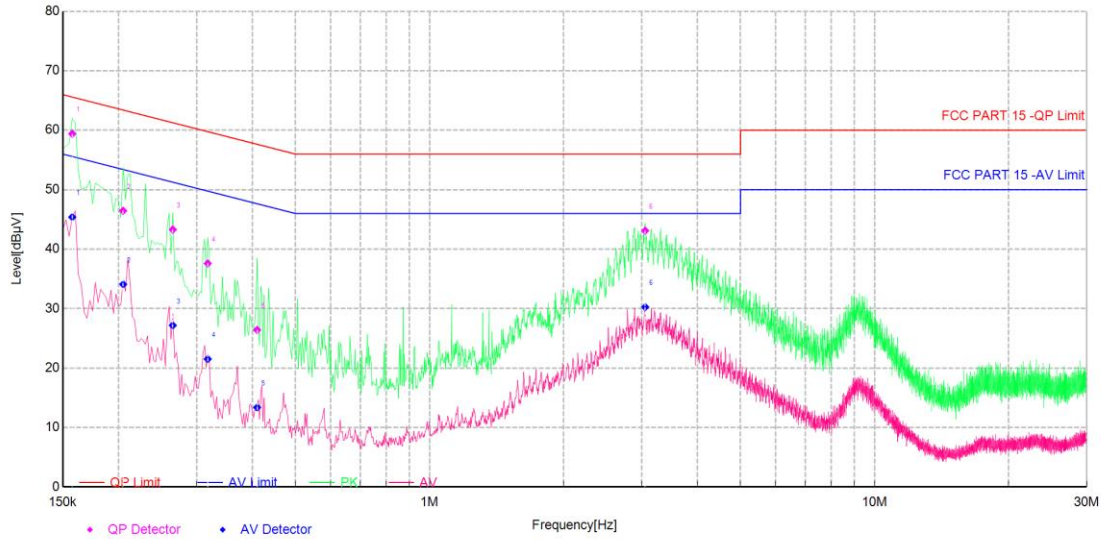
Line:



Final Data List										
NO.	Freq. [MHz]	Factor[dB]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Phase	Verdict
1	0.1575	10.05	59.57	65.59	6.02	45.46	55.59	10.13	L	PASS
2	0.2125	10.31	49.72	63.11	13.39	33.59	53.11	19.52	L	PASS
3	0.2650	10.44	43.21	61.27	18.06	27.35	51.27	23.92	L	PASS
4	0.3175	10.44	38.49	59.77	21.28	21.37	49.77	28.40	L	PASS
5	0.3700	10.18	32.68	58.50	25.82	17.29	48.50	31.21	L	PASS
6	3.0530	10.32	40.58	56.00	15.42	27.77	46.00	18.23	L	PASS



Neutral:



Final Data List

NO.	Freq. [MHz]	Factor[dB]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Phase	Verdict
1	0.1575	10.04	59.41	65.59	6.18	45.40	55.59	10.19	N	PASS
2	0.2050	10.33	46.46	63.41	16.95	34.10	53.41	19.31	N	PASS
3	0.2650	10.42	43.30	61.27	17.97	27.19	51.27	24.08	N	PASS
4	0.3175	10.45	37.60	59.77	22.17	21.53	49.77	28.24	N	PASS
5	0.4100	10.40	26.42	57.65	31.23	13.39	47.65	34.26	N	PASS
6	3.0530	10.29	43.11	56.00	12.89	30.27	46.00	15.73	N	PASS

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.

6. Radiated Emission Method

6.1 Applicable Standard

FCC Part15 C Section 15.249

6.2 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.

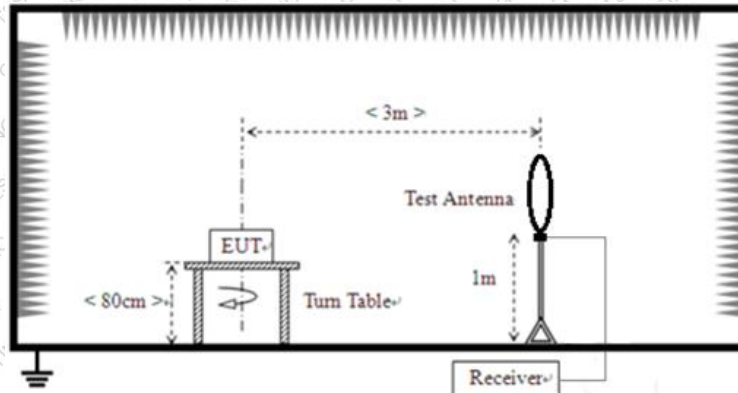
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

6.3 Receiver setup

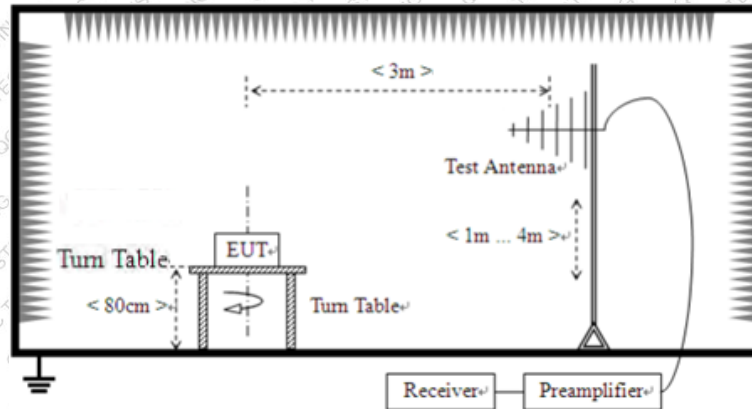
Frequency	Detector	RBW	VBW	Value
9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
30MHz-1GHz	Quasi-peak	100KHz	300KHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

6.4 Test setup

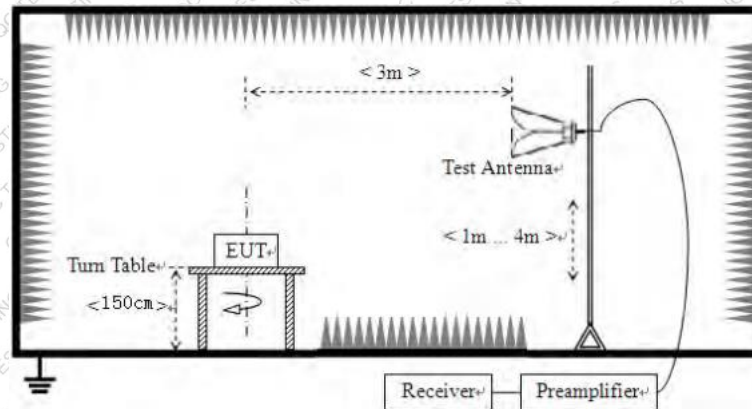
For radiated emissions from 9kHz to 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



6.5 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.



6.6 Test Data

Temperature	25°C	Humidity	49%
ATM Pressure	101.1kPa	Antenna Gain	-4.5dBi
Test by	Charlie He	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.

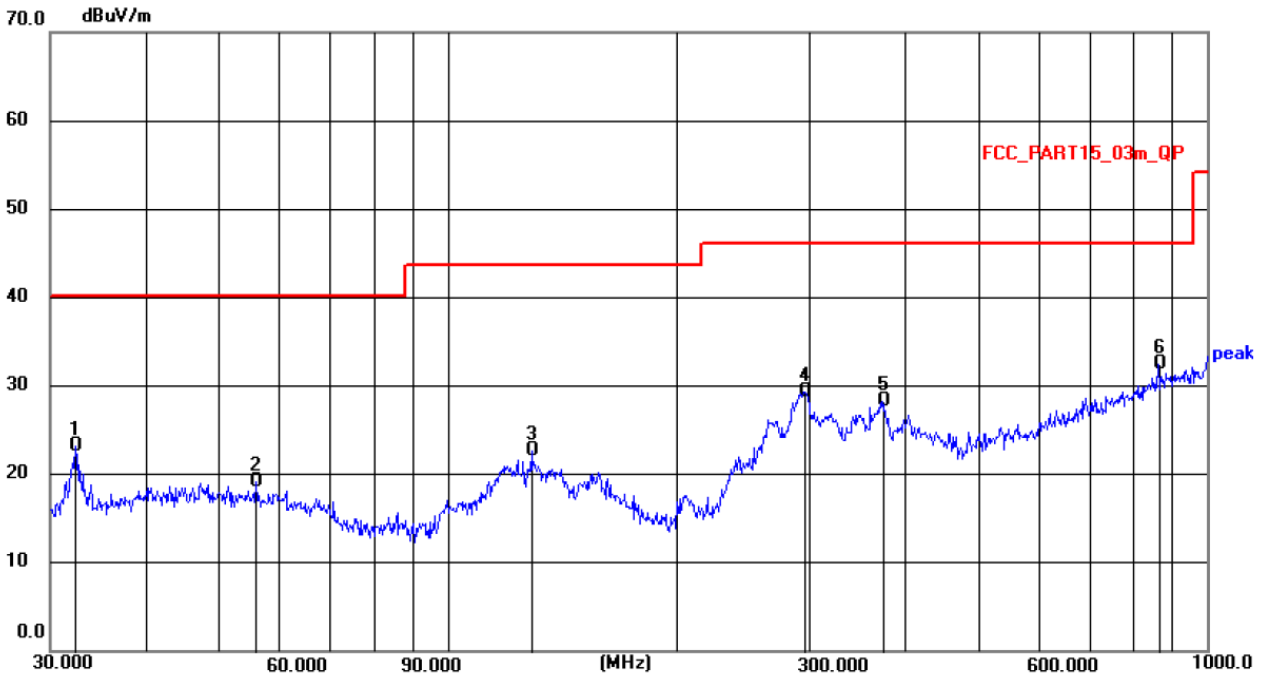
Measurement data:

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.



Below 1GHz:
Horizontal

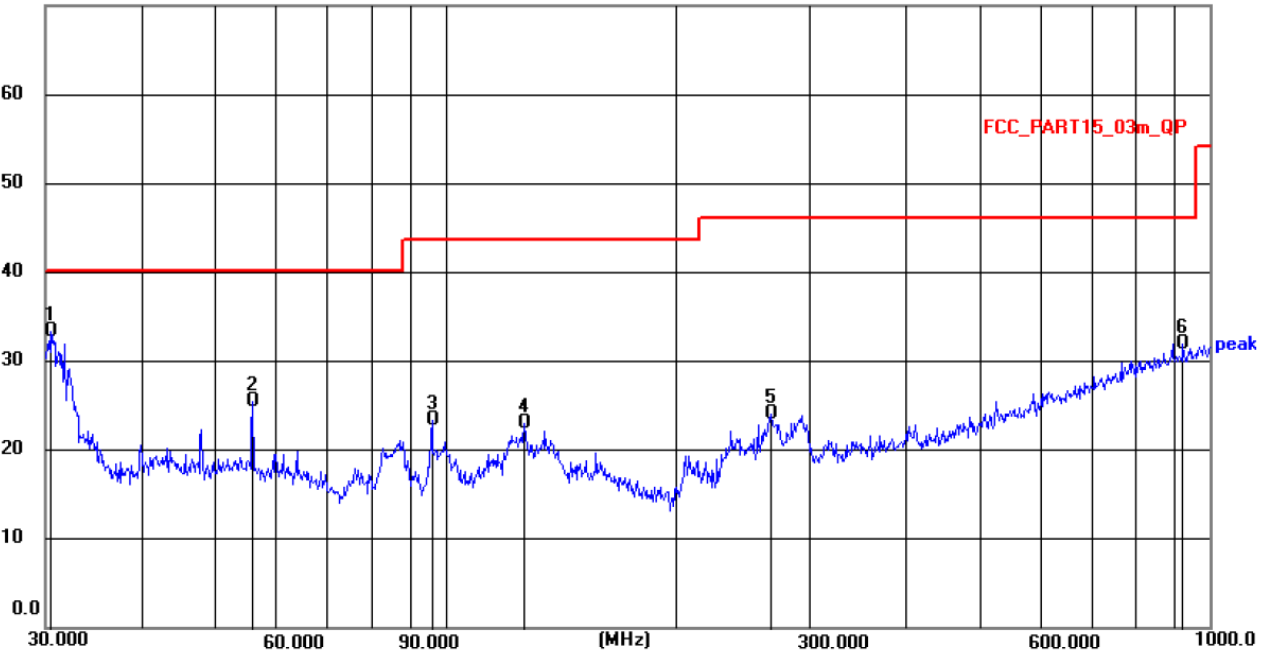


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	32.4059	9.88	13.32	23.20	40.00	16.80	QP
2	56.0007	4.93	14.19	19.12	40.00	20.88	QP
3	129.0146	8.77	13.92	22.69	43.50	20.81	QP
4	294.1137	14.83	14.53	29.36	46.00	16.64	QP
5	373.3112	11.38	16.94	28.32	46.00	17.68	QP
6 *	863.0562	6.64	25.77	32.41	46.00	13.59	QP



Vertical

70.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	30.4238	20.78	12.53	33.31	40.00	6.69	QP
2	56.0007	11.46	13.93	25.39	40.00	14.61	QP
3	96.0986	12.64	10.81	23.45	43.50	20.05	QP
4	126.7723	9.42	13.52	22.94	43.50	20.56	QP
5	266.6089	10.40	13.68	24.08	46.00	21.92	QP
6	922.5157	5.67	26.33	32.00	46.00	14.00	QP



Above 1G:

Frequency (MHz)	Read Level (dBμV)	polarization	Factor (dB/m)	Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector
1116.093	50.72	H	-15.35	35.37	74	38.63	peak
1600.262	51.12	H	-14.39	36.73	74	37.27	peak
1112.872	52.63	V	-15.55	37.08	74	36.92	peak
2310	45.25	H	-11.14	34.11	74	39.89	peak
2310	46.11	V	-11.16	34.95	74	39.05	peak
2390	45.67	H	-10.9	34.77	74	39.23	peak
2390	45.77	V	-10.96	34.81	74	39.19	peak
2400	46.84	H	-10.87	35.97	74	38.03	peak
2400	46.19	V	-10.93	35.26	74	38.74	peak
2483.5	46.39	H	-10.61	35.78	74	38.22	peak
2483.5	46.69	V	-10.71	35.98	74	38.02	peak
2500	45.93	H	-10.57	35.36	74	38.64	peak
2500	45.51	V	-10.67	34.84	74	39.16	peak
3202.259	54.79	H	-8.29	46.5	74	27.5	peak
3202.259	56.68	V	-8.11	48.57	74	25.43	peak
4804	46.57	H	-4.37	42.2	74	31.8	peak
4804	47.96	V	-4.51	43.45	74	30.55	peak

Frequency (MHz)	Read Level (dBμV)	polarization	Factor (dB/m)	Peak value (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)
2402	90.38	H	-10.87	79.51	93.98	14.47
2402	80.34	V	-10.93	69.41	93.98	24.57

Remarks:

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

7. 20dB Occupy Bandwidth

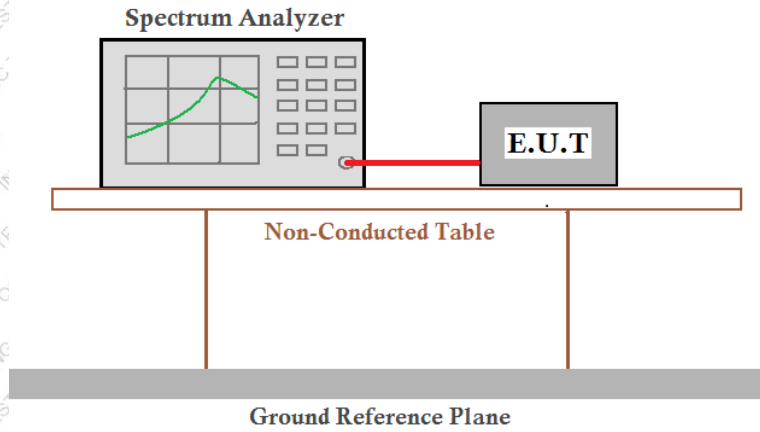
7.1 Applicable Standard

FCC Part15 C Section 15.215

7.2 Limit

N/A

7.3 Test setup



7.4 Test Data

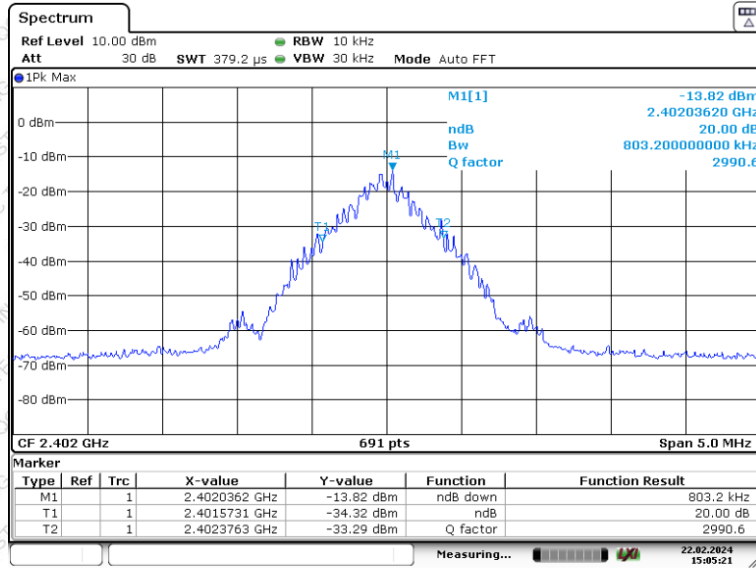
Temperature	23.5 °C	Humidity	48%
ATM Pressure	101.1kPa	Antenna Gain	-4.5dBi
Test by	LBi Li	Test result	PASS

Please refer to following table and plots.



Test Frequency (MHz)	20dB bandwidth (MHz)
2402	0.803

Test plot as follows:



Date: 22.FEB.2024 15:05:22

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