

Test Report Number:	LCZE24080109	Total Page(s): 21
Applicant Name:	Zhongshan excellent lighting factory	
Applicant Address:	No. 5, Xinmao Industrial Avenue, Henglan Town, Zhongshan City	
Test item:	Remote Controller	
Model / Type Reference:	347-3407	
Brand name:	VAXCEL, Luminex, Patriot lighting, Dualux, Excellent	
FCC ID:	2BK5L-3407	
Date of Issue:	2024-09-20	
Testing Laboratory:	LCTECH Guangdong Testing Services Co., Ltd. 2/F., Technology and Enterprise Development Center, Guangyuan Road, Xiaolan, Zhongshan, Guangdong, China	
Test Specification:	FCC 47 CFR Part 15 Subpart C: Section 15.231	
Test Result:	Passed	
Compiled by:	Reviewed by:	
2024-09-20 Rex He <i>Rex He</i>	2024-09-20 Tension Li <i>Tension Li</i>	
<i>Date Name Signature</i>	<i>Date Name Signature</i>	
Remark:		
N/A		
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1 Summary of Test Results

Description of Test Item	Standard	Result
Antenna Requirement	FCC Part 15 Subpart C: 15.203	PASS
AC Power Line Conducted Emission	FCC Part 15 Subpart C: 15.207	N/A
Field Strength of The Fundamental Signal	FCC Part 15 Subpart C: 15.231(b)	PASS
Spurious Emission	FCC Part 15 Subpart C: 15.231(b)/15.209	PASS
20 dB Bandwidth	FCC Part 15 Subpart C: 15.231(c)	PASS
Dwell Time	FCC Part 15 Subpart C: 15.231(a)	PASS
Note: N/A is an abbreviation for Not Applicable, and means this item is not applicable for this device.		

2. General test information

2.1 Description of EUT

Product Name	: Remote Controller
Model Number	: 347-3407
EUT function description	: Please reference user manual of this device
Power supply	: DC 3.0V
FCC ID	: 2BK5L-3407
Operation frequency	: 433.92 MHz
Modulation	: ASK
Antenna Type	: PCB antenna
Antenna Gain	: 0dBi
Date of Receipt	: 2024/09/09

Remark:

1. Antenna gain information provided by the customer
2. The relevant information of the sample is provided by the entrusting company, and the laboratory is not responsible for its authenticity.

2.2 Testing

Date of receipt of test item : 2024-09-09

Date (s) of performance of tests : 2024-09-18 to 2024-09-20

2.3 Test environment conditions

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

Temperature range:	15-35°C
Humidity range:	20-75%
Pressure range:	98-101kPa

2.4 Test laboratory

LCTECH Guangdong Testing Services Co., Ltd.

Add: 2/F., Technology and Enterprise Development Center, Guangyuan Road, Xiaolan, Zhongshan, Guangdong, China

Test Sites: 1/F., Building I, Technology and Enterprise Development Center, Guangyuan Road, Xiaolan, Zhongshan, Guangdong, China

2.5 Measurement uncertainty

Test Item	Uncertainty
Uncertainty for Conduction emission test	3.74dB
Uncertainty for Radiation Emission test(30MHZ-1GHZ)	4.92dB
Uncertainty for Radiation Emission test (Above 1GHz)	4.23dB

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

3 Equipment list

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (yyyy-mm-dd)	Cal.Due date (yyyy-mm-dd)
Radiated Emission (30 MHz–1000 MHz)						☒
1	EMI Test Receiver	R&S	ESCI 7	100965	2024-06-26	2025-06-25
2	Log-periodic Dipole Antenna	Schwarzbeck	VULB 9162	058	2022-07-03	2025-07-02
3	3m Semi-anechoic	Zhongshuo Electronics	9mx6mx6m	N/A	2021-12-14	2024-12-13
4	RF Cable	R&S	R01	10403	2023-12-12	2024-12-11
5	EMI Test Software	AUDIX	E3	Version No: 6.111221a	N/A	N/A
Disturbance Voltage						☒
6	EMI Test Receiver	Rohde&Schwarz	ESCI	100939	2023-12-12	2024-12-11
7	Artificial Mains Network	Rohde&Schwarz	ENV216	3560655012	2024-06-26	2025-06-25
8	Shield Room	Rongxiang	8X5X3.5	992276296	2022-07-01	2025-06-30
9	Conducted Emission Test Software	FALA	EZ-EMC	Version No: LCTECH-03A	N/A	N/A
Radiated Emission (Above 1 GHz)						☒
10	EMI Test Receiver	R&S	ESCI 7	100965	2024-06-26	2025-06-25
11	Log-periodic Dipole Antenna	Schwarzbeck	VULB 9162	058	2022-07-03	2025-07-02
12	3m Semi-anechoic	Zhongshuo Electronics	9mx6mx6m	N/A	2021-12-14	2024-12-13
13	RF Cable	R&S	R01	10403	2023-12-12	2024-12-11
14	CDNE	KeHuan	KH3663E	36630822	2024-06-26	2025-06-25
15	Doppelsteg Breitband Hornantenne Double Ridge Broadband Horn	Schwarzbeck	BBHA 9120 D	N/A	2023-12-19	2024-12-18
16	Signal Analyzer	Keysight	N9020A	SER MY52220373	2023-12-12	2024-12-11
17	Pre-amplifier	sinancidian	COP-01G18G-45dB	N/A	2023-12-12	2024-12-11

4 Test Results

4.1 Antenna requirement

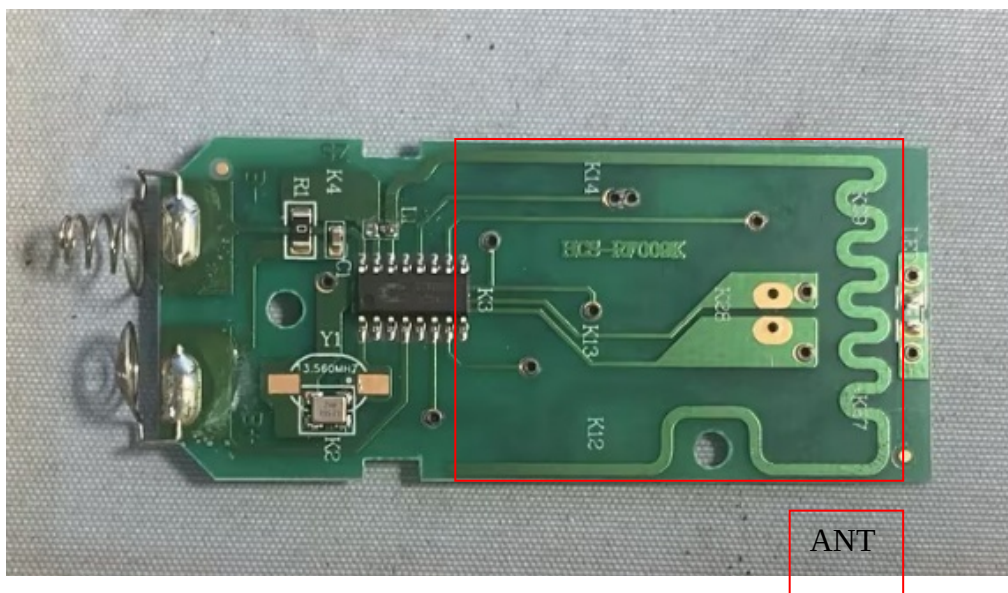
Standard requirement:

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.

E.U.T Antenna:

The antenna is PCB antenna. It comply with the standard requirement.



4.2 Radiated Emission

Limit:

Field Strength of the Fundamental Signal

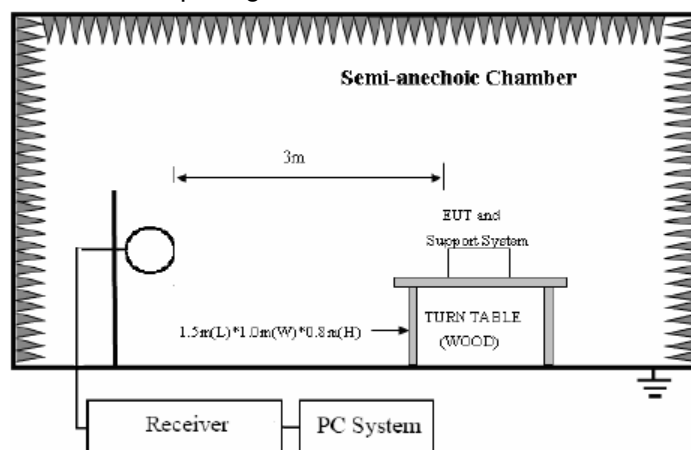
Fundamental Frequency MHz	Field Strength of Fundamental (dB μ V/m @ 3m)	Field Strength of Harmonics and Spurious Emissions (dB μ V/m @ 3 m)
40.66 to 40.70	67.04	47.04
70 to 130	61.94	41.94
130 to 174	61.94 to 71.48**	41.94 to 51.48**
174 to 260	71.48	51.48
260 to 470	71.48 to 81.94**	51.48 to 61.94**
Above 470	81.94	61.94

Spurious Emission

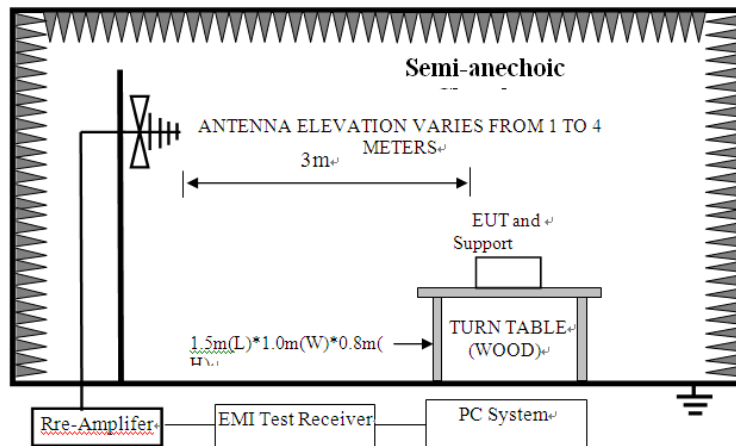
Frequency range (MHz)	Standard requirement	Limit(dB μ V/m)	
		Peak	Average
433.92	FCC Part 15 Subpart C: 15.231(a)	100.83	80.83

Test Connection Diagram

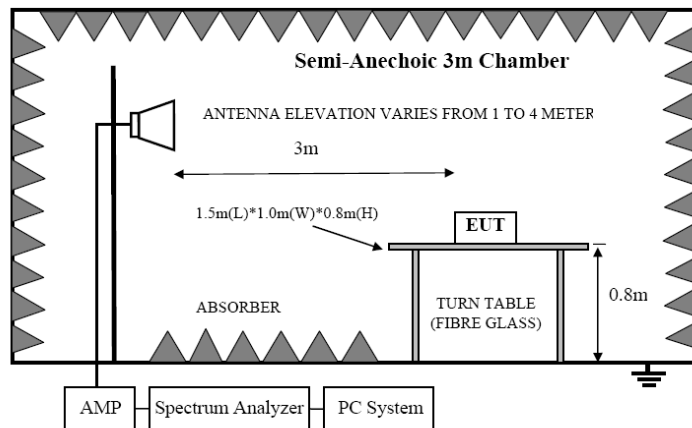
In 3m Anechoic Chamber Test Setup Diagram for 9KHz-30MHz



In 3m Anechoic Chamber Test Setup Diagram for below 1GHz



In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



Test Procedure

(1) 9 kHz to 30 MHz emissions:

For testing performed with the loop antenna. The lowest of the loop was positioned 1 m above the ground and positioned with its plane vertical at the special distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane.

(2) 30 MHz to 1 GHz emissions:

For testing performed with the bi-log type antenna. The measurement is performed with the EUT rotated 360°, the antenna height scanned between 1m and 4m, and the antenna rotated to repeat the measurement for both the horizontal and vertical antenna polarizations.

(3) 1 GHz to 40 GHz emissions:

Test site with RF absorbing material covering the ground plane that met the site validation criterion called out in CISPR 16-1-4:2010 was used to perform radiated emission test above 1 GHz.

For testing performed with the horn antenna. The measurement is performed with the EUT rotated 360°, the antenna height scanned between 1m and 4m, and the antenna rotated to repeat the measurement for both the horizontal and vertical antenna polarizations.

Test Result:

Field Strength of the Fundamental Signal:

Polarization	Frequency (MHz)	Reading (dBuV)	Correction Factor(dB)	Cable Loss (dB)	PK value (dBuV/m)	PK limit (dBuV/m)	Margin (dB)
Horizontal	433.92	53.09	16.16	3.18	72.43	100.83	-28.40
Vertical	433.92	47.10	16.16	3.18	66.44	100.83	-34.39

Polarization	Frequency (MHz)	PK value (dBuV/m)	Average Factor(dB)	AV value (dBuV/m)	AV limit (dBuV/m)	Margin (dB)
Horizontal	433.92	72.43	-8.38	64.05	80.83	-16.78
Vertical	433.92	66.44	-8.38	58.06	80.83	-22.77

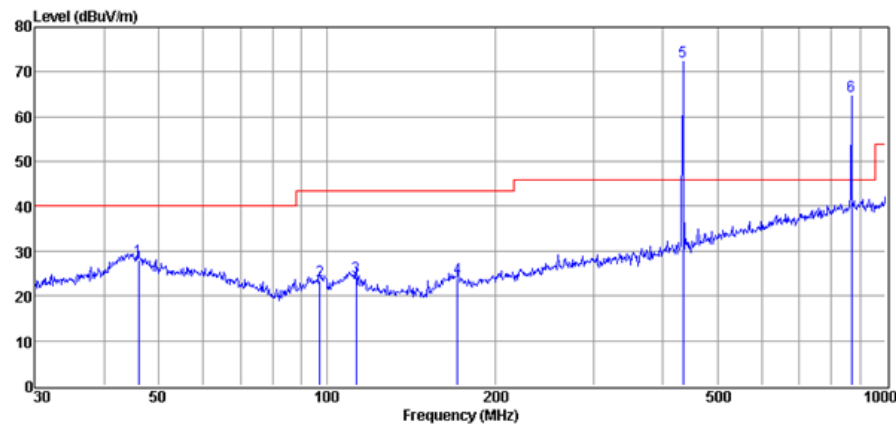
Spurious Emission:

9 kHz~30 MHz Field Strength of Unwanted Emissions. Peak or Quasi-Peak measurement:

The measurements with active loop antenna were lower than 20dB below the average limit, so the test data were not recorded in the test report.

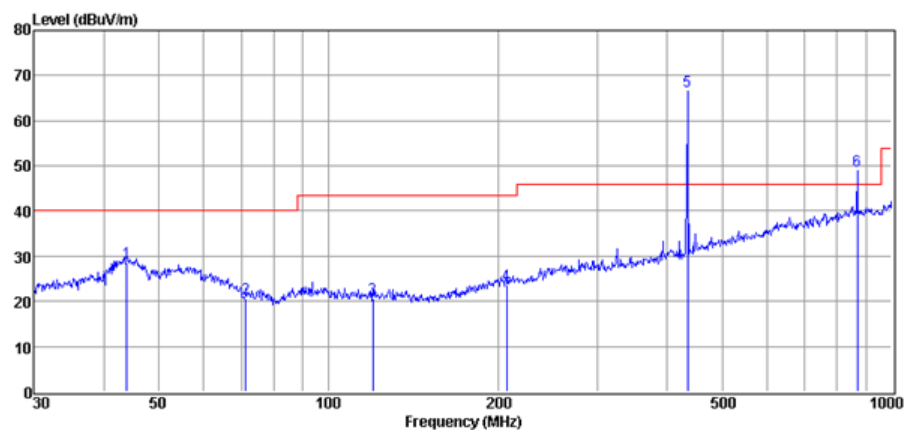
30 MHz~1 GHz Field Strength of Unwanted Emissions. Peak or Quasi-Peak measurement:

Horizontal:



Item (Mark)	Freq (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	46.02	11.45	15.99	0.00	0.65	28.09	40.00	-11.91	QP	HORIZONTAL
2	97.12	11.36	11.21	0.00	0.82	23.39	43.50	-20.11	QP	HORIZONTAL
3	112.92	11.72	11.42	0.00	1.04	24.18	43.50	-19.32	QP	HORIZONTAL
4	171.39	11.70	10.78	0.00	1.43	23.91	43.50	-19.59	QP	HORIZONTAL
5	433.92	53.09	16.16	0.00	3.18	72.43	100.83	-28.40	Peak	HORIZONTAL
6	867.84	37.10	22.97	0.00	4.41	64.48	80.83	-16.35	Peak	HORIZONTAL

Vertical:



Item (Mark)	Freq (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	43.81	11.02	16.78	0.00	0.68	28.48	40.00	-11.52	QP	VERTICAL
2	71.33	10.53	9.49	0.00	0.68	20.70	40.00	-19.30	QP	VERTICAL
3	119.86	10.91	8.80	0.00	1.02	20.73	43.50	-22.77	QP	VERTICAL
4	207.12	10.97	10.91	0.00	1.65	23.53	43.50	-19.97	QP	VERTICAL
5	433.92	47.10	16.16	0.00	3.18	66.44	100.83	-34.39	Peak	VERTICAL
6	869.13	21.55	22.97	0.00	4.41	48.93	80.83	-31.90	Peak	VERTICAL

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Add: 2/F., Technology and Enterprise Development Center,
Guangyuan Road, Xiaolan, Zhongshan, Guangdong, China

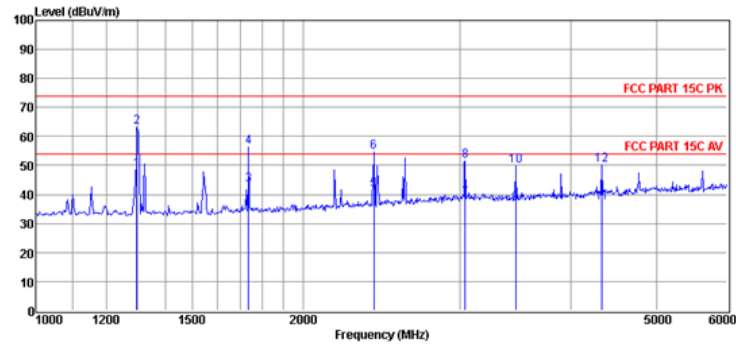
Tel: +86-760-22833366

Fax: +86-760-22833399

E-mail: Service@lccert.com

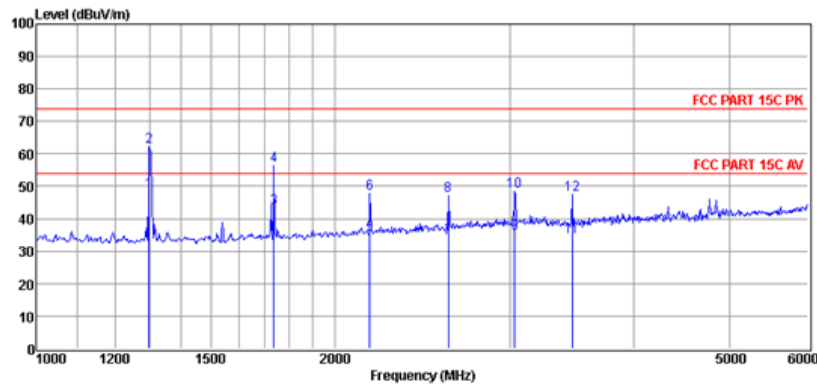
<http://www.lccert.com>

1 GHz~6 GHz Field Strength of Unwanted Emissions. Peak or Quasi-Peak measurement:
Horizontal:



Item (Mark)	Freq (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	1299.00	73.26	25.41	54.38	4.00	48.29	54.00	-5.71	Average	HORIZONTAL
2	1299.00	85.26	25.41	54.38	4.00	60.29	74.00	-13.71	Peak	HORIZONTAL
3	1736.48	67.51	26.01	54.14	4.00	43.38	54.00	-10.62	Average	HORIZONTAL
4	1736.48	80.51	26.01	54.14	4.00	56.38	74.00	-17.62	Peak	HORIZONTAL
5	2401.69	63.49	27.56	53.96	4.45	41.54	54.00	-12.46	Average	HORIZONTAL
6	2401.69	76.49	27.56	53.96	4.45	54.54	74.00	-19.46	Peak	HORIZONTAL
7	3042.51	58.07	29.36	53.89	5.00	38.54	54.00	-15.46	Average	HORIZONTAL
8	3042.51	71.07	29.36	53.89	5.00	51.54	74.00	-22.46	Peak	HORIZONTAL
9	3467.66	56.03	29.44	53.81	5.00	36.66	54.00	-17.34	Average	HORIZONTAL
10	3467.66	69.03	29.44	53.81	5.00	49.66	74.00	-24.34	Peak	HORIZONTAL
11	4338.16	54.35	31.33	53.54	5.00	37.14	54.00	-16.86	Average	HORIZONTAL
12	4338.16	67.35	31.33	53.54	5.00	50.14	74.00	-23.86	Peak	HORIZONTAL

Vertical:



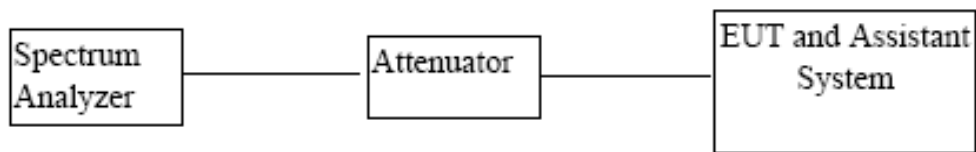
Item (Mark)	Freq (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	1299.00	73.32	25.41	54.38	4.00	48.35	54.00	-5.65	Average	VERTICAL
2	1299.00	85.32	25.41	54.38	4.00	60.35	74.00	-13.65	Peak	VERTICAL
3	1736.48	67.52	26.01	54.14	4.00	43.39	54.00	-10.61	Average	VERTICAL
4	1736.48	80.52	26.01	54.14	4.00	56.39	74.00	-17.61	Peak	VERTICAL
5	2168.51	57.66	27.02	53.98	4.20	34.90	54.00	-19.10	Average	VERTICAL
6	2168.51	70.66	27.02	53.98	4.20	47.90	74.00	-26.10	Peak	VERTICAL
7	2603.35	55.30	28.10	53.94	4.65	34.11	54.00	-19.89	Average	VERTICAL
8	2603.35	68.30	28.10	53.94	4.65	47.11	74.00	-26.89	Peak	VERTICAL
9	3037.06	54.84	29.36	53.89	5.00	35.31	54.00	-18.69	Average	VERTICAL
10	3037.06	67.84	29.36	53.89	5.00	48.31	74.00	-25.69	Peak	VERTICAL
11	3467.66	53.80	29.44	53.81	5.00	34.43	54.00	-19.57	Average	VERTICAL
12	3467.66	66.80	29.44	53.81	5.00	47.43	74.00	-26.57	Peak	VERTICAL

4.3 20 dB Bandwidth

Limit:

Frequency range (MHz)	Standard requirement	Limit
433.92	FCC Part 15 Subpart C: 15.231(c)	1.085MHz

Test setup:



Test procedure:

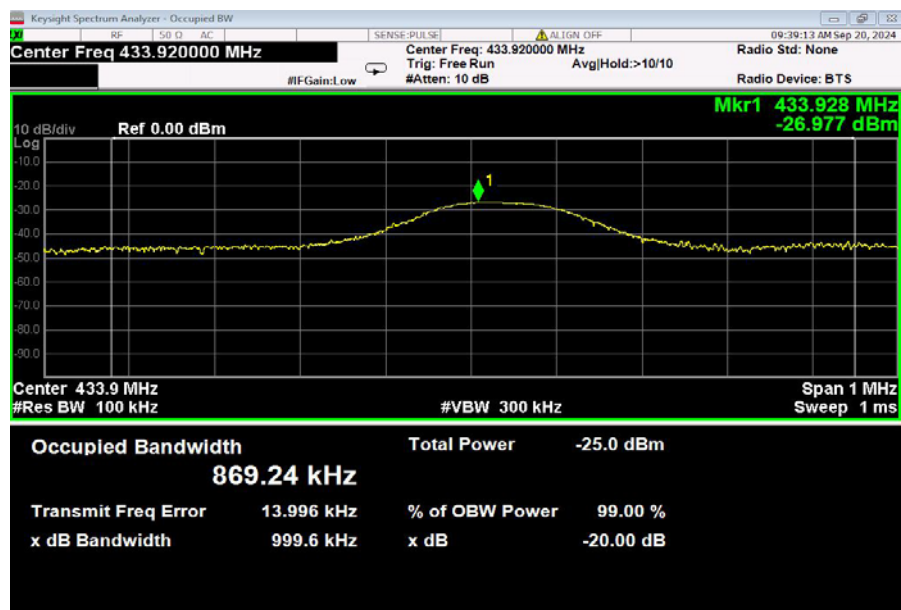
The useful radiated emission from the EUT was detected by the spectrum analyzer with peak detector. Record the 20 dB bandwidth of the carrier.

Test results:

Frequency (MHz)	Measured 20dB bandwidth (MHz)	Limit (MHz)	Result
433.92	0.9996	1.085	Pass

Remark:

The bandwidth limit is $433.92 \times 0.0025 = 1.085$ MHz.

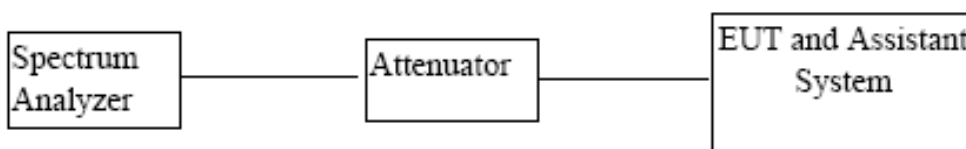


4.4 Dwell Time

Limit:

Frequency range (MHz)	Standard requirement	Limit
433.92	FCC Part 15 Subpart C: 15.231(a)	$\leq 5s$

Test setup:

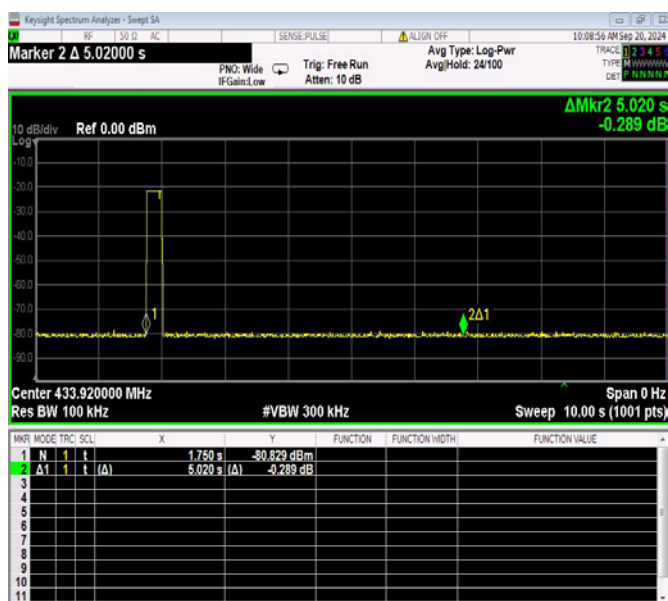


Test procedure:

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

Test results:

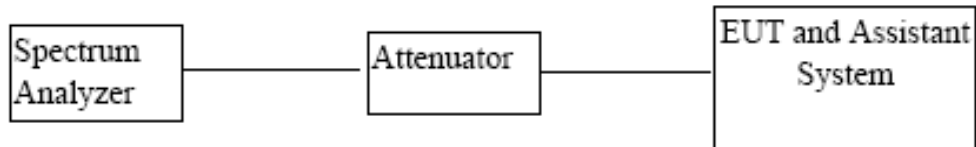
Frequency range (MHz)	Duration of each TX	Limit	Result
433.92	51.2ms	$\leq 5s$	pass



4.5 Duty Cycle

Limit: N/A

Test setup:



Test procedure:

- (1) Place the EUT on the table and set it in transmitting mode.
- (2) Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- (3) Set centre frequency of spectrum analyzer=operating frequency.
- (4) Set the spectrum analyzer as RBW=100kHz, VBW=100KHz, Span=0Hz, Adjust Sweep=100ms to obtain the "worst-case" pulse on time
- (5) Repeat above procedures until all frequency measured was complete.

Test results:

Calculate Formula: Duty cycle factor = $20 \log(\text{Duty cycle})$
Duty cycle = on time / 0.1 seconds or period, whichever is less

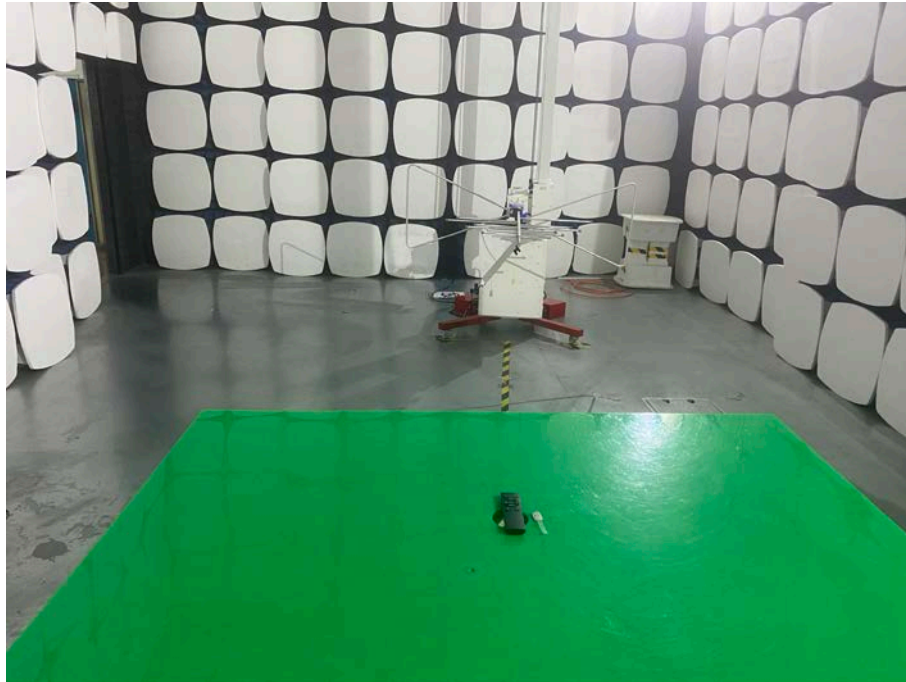
Test data:

T on time = 15.60(ms)
T period = 51.20(ms)
Duty cycle = $15.60 / 51.20 = 38.08\%$
Duty cycle factor = $20 \log(0.3808) = -8.38$

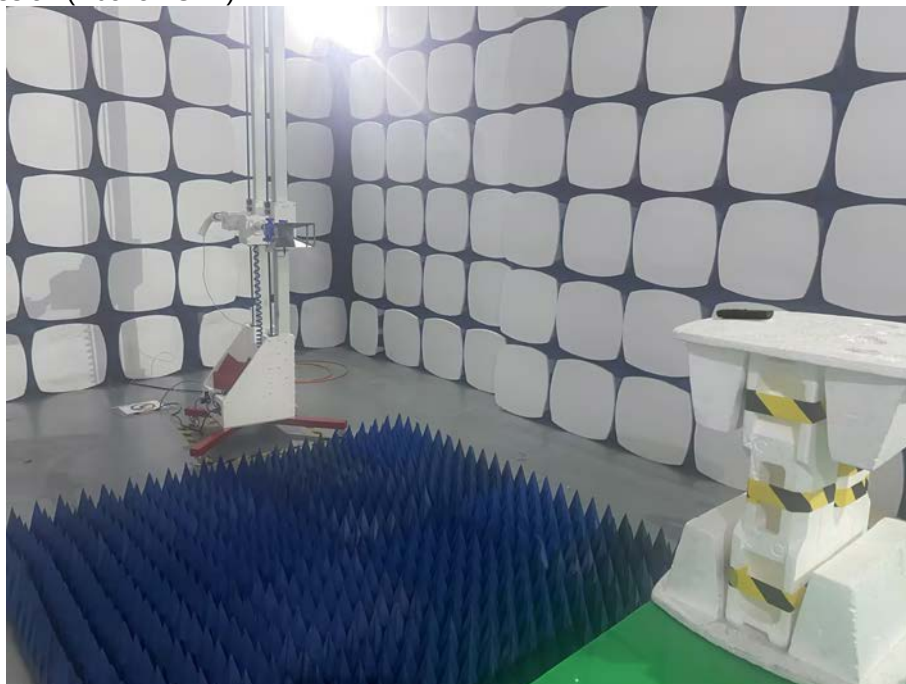


5 Test Setup Photo

Radiated Emission (30MHz-1GHz) :

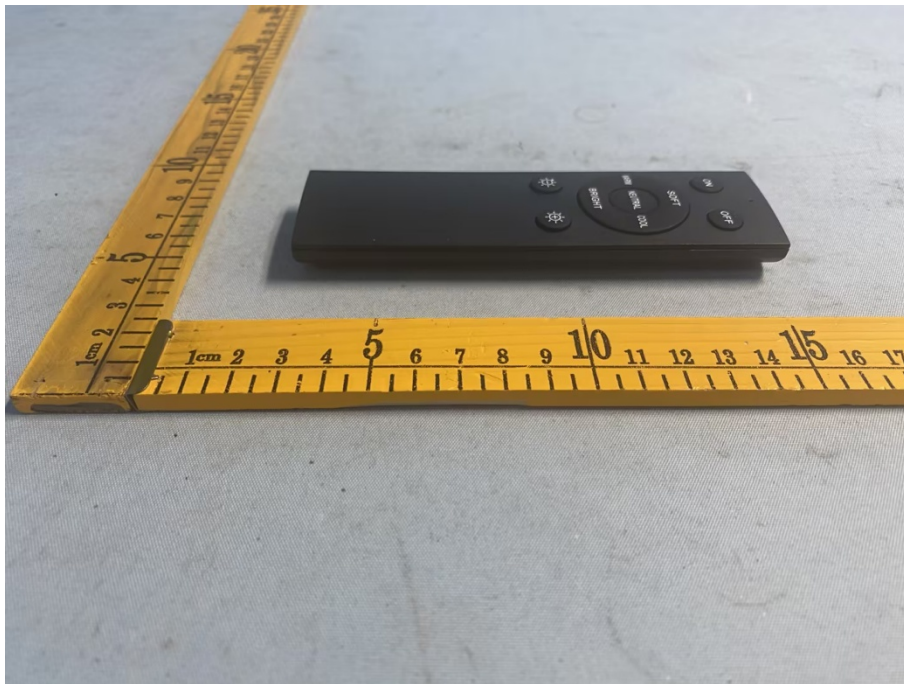


Radiated Emission (Above 1GHz) :



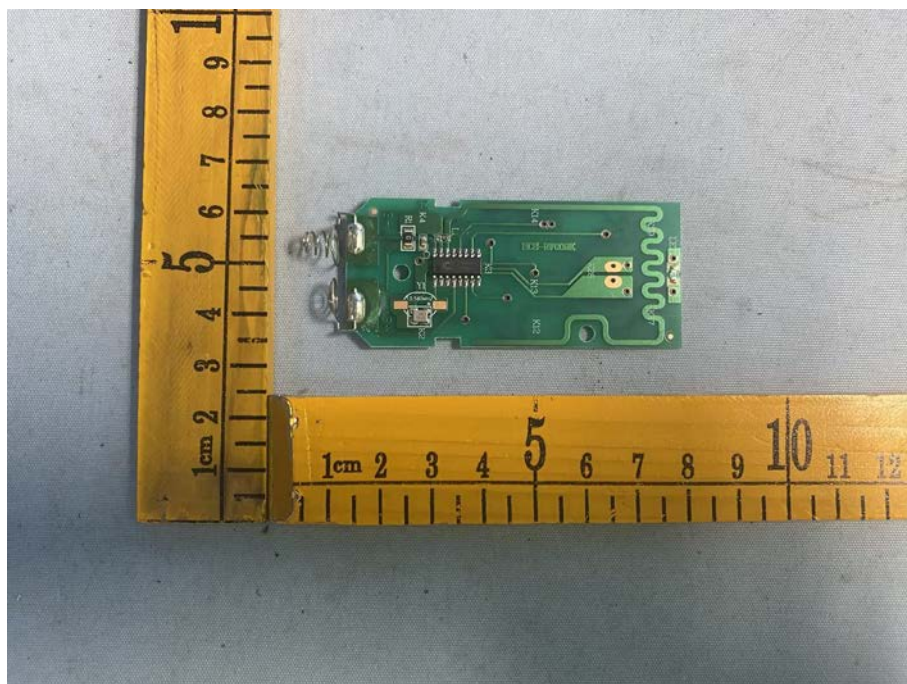
6 Test Setup of EUT











-----End of test report-----