TEST REPORT

Report Number: 105649210MPK-001
Project Number: G105649210, G105759787
Original Issue Date: May 17, 2024
Revision Date: June 6, 2024

Testing performed on the
RF Remote Transmitter
Model Number: 6006041

to

FCC Part 15 Subpart C (15.231)

For

Lamplight Farms, Inc.

Test Performed by:	**Test Authorized by:**
Intertek 1365 Adams Court Menlo Park, CA 94025 USA	Lamplight Farms, Inc. W140 N4900 Lilly Road Menomonee Falls, WI 53051 USA

Prepared by: Kenneth Tutor **Date:** May 17, 2024

Reviewed by: Minh Ly **Date:** May 17, 2024

Revision 1.1

Date: June 06, 2024

Kenneth Tutor

Reviewed by: Aaron Chang **Date:** June 06, 2024

Report No. 105649210MPK-001	
Equipment Under Test:	RF Remote Transmitter
Model Number:	6006041
Applicant:	Lamplight Farms, Inc.
Contact:	Ben Yu
Address:	W140 N4900 Lilly Road Menomonee Falls, WI 53051
Country:	USA
Tel. Number:	+1 (262) 345-4764
Email:	byu@lamplight.com
Applicable Regulation:	FCC Part 15 Subpart C (15.231)
Date of Test:	March 04, 2024 to May 09, 2024

We attest to the accuracy of this report:

Kenneth Tutor
EMC Engineer

Minh Ly
EMC Team Leader

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1.0 Summary of Tests

TEST	REFERENCE	RESULTS
Transmitter Field Strength	15.231 (b) & 15.205	Complies
Bandwidth	15.231 (c)	Complies
Deactivation Testing	15.231 (a)(1)	Complies
Line Conducted Emissions	15.207	Not applicable[1]
Antenna Requirement	15.203	Complies2

1 EUT is powered by two AAA battery.
2 The EUT utilizes an internal Antenna

2.0 General Description

2.1 Product Description

Lamplight Farms, Inc. supplied the following description of the EUT:

The EUT is a remote transmitter that can be use with AC powered PTC heating assembly with on/off switching relay and E26 screw base for repellent.

Overview of the EUT

Applicant name & address	Lamplight Farms, Inc. W140 N4900 Lilly Road Menomonee Falls, WI 53051
Contact info / Email	Ben Yu / byu@lamplight.com
Model	6006041
Serial	MPK2405130940-001
Operating Frequency	433.8 MHz
Number of Channels	1
Type of Modulation	ASK Modulation
Antenna Type/ Gain	Internal Antenna, -1.62dBi

EUT receive date: March 01, 2024
EUT receive condition: The pre-production version of the EUT was received in good condition with no apparent damage. As declared by the Applicant, it is identical to the production units.
Test start date: March 04, 2024
Test completion date: May 09, 2024

2.2 Related Submittal(s) Grants

None

2.3 Test Methodology

Radiated tests were performed at an antenna to EUT distance of 10 meters, unless stated otherwise in this test report. All other measurements were made in accordance with the procedures in part 2 of CFR 47, ANSI C63.10: 2013.

2.4 Test Facility

The radiated emission test site and conducted measurement facility used to collect the data is 10m semi-anechoic chamber located in Menlo Park, California. This test facility and site measurement data have been fully placed on file with the FCC.

2.5 Measurement Uncertainty

Compliance with the limits was based on the results of the measurements and doesn't take into account the measurement uncertainty.

Estimated Measurement Uncertainty

Measurement	Expanded Uncertainty (k=2)		
	0.15 MHz – 1 GHz	**1 GHz – 2.5 GHz**	**> 2.5 GHz**
RF Power and Power Density – antenna conducted	-	0.7 dB	-
Unwanted emissions - antenna conducted	1.1 dB	1.3 dB	1.9 dB
Bandwidth – antenna conducted	-	30 Hz	-

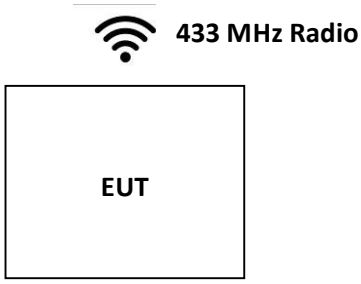
Measurement	Expanded Uncertainty (k=2)		
	0.15 MHz – 30MHz	**30 MHz – 1 GHz**	**1 GHz – 18 GHz**
Radiated emissions	-	4.7	5.1 dB
AC mains conducted emissions	2.1 dB	-	-

3.0 System Test Configuration

3.1 EUT Photo

3.2 Block Diagram of Test Setup

The diagram shown below details of the EUT. For specific layout, refer to the test configuration photograph in the relevant section of this report.



3.3 Justification

For radiated emission measurements the EUT is placed on a non-conductive table. The EUT was configured to continuously transmit. EUT was investigated in X/Y/Z orientation, the worse case data is presented.

3.4 Software Exercise Program

None

3.5 Mode of Operation during test

The RF Remote Transmitter was set up to continuously transmit at 433.8MHz.

3.6 Modifications required for Compliance.

No modifications were made by the manufacturer to bring the EUT into compliance.

3.7 Additions, deviations, and exclusions from standards

No additions, deviations or exclusion have been made from standard.

4.0 Measurement Results

4.1 Field Strength of fundamental and Spurious Emissions.

4.1.1 Requirement

§ 15.231(b) In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	[1]1,250 to 3,750	[1]125 to 375
174-260	3,750	375
260-470	[1]3,750 to 12,500	[1]375 to 1,250
Above 470	12,500	1,250

[1]Linear interpolations.

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

4.1.2 Procedure

Radiated Measurements Below 30 MHz

During the test the EUT is rotated and the measuring antenna angles are varied during the search for maximum signal level.

Radiated emissions are taken at ten meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Measurements for below 30 MHz were made at 10 meters. Data results below are corrected for distance back to 30 meters.

Radiated Measurements Above 30 MHz

During the test the EUT is rotated and the measuring antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at ten meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Measurements for above 30 MHz were made at 10 meters.

Radiated emission measurements were performed from 9kHz to 1 GHz.
Analyzer resolution is:

200Hz or greater for 9kHz to 150kHz
9 kHz or greater for 150kHz to 30 MHz
120 kHz or greater for 30MHz to 1000 MHz
For those frequencies quasi-peak detector applies

Data includes the worst-case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation is as follows:

FS = RA + AF + CF – AG – DCF

Where FS = Field Strength in dB (μV/m)

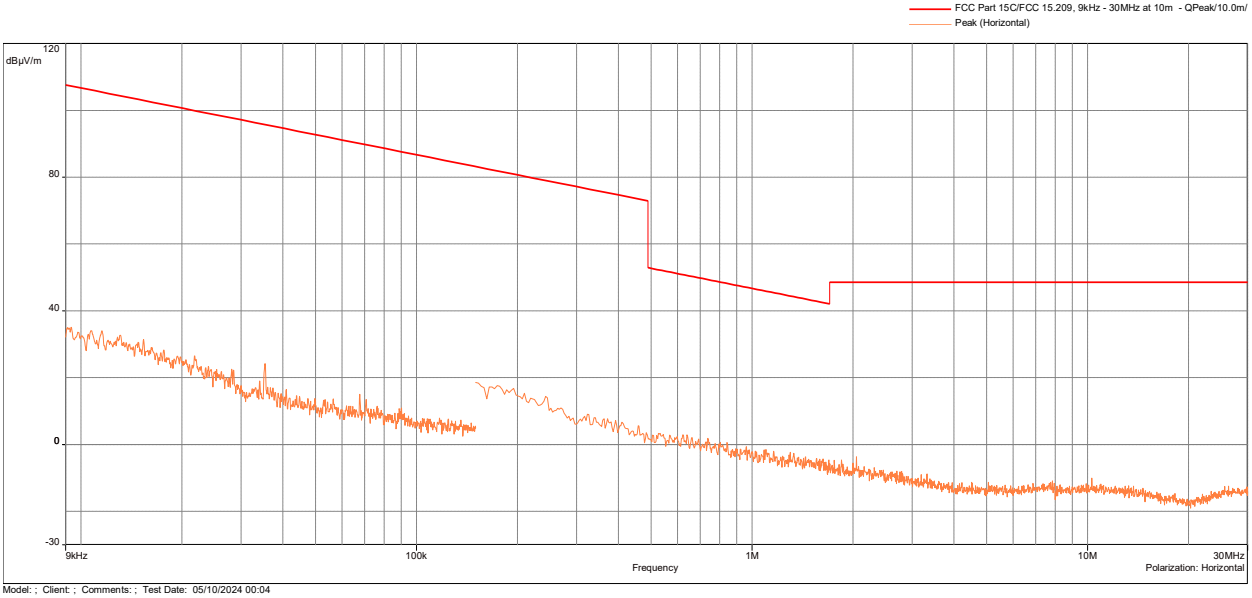
RA = Receiver Amplitude (including preamplifier) in dB (μV)
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB (1/m)
AG = Amplifier Gain in dB
DCF = Distance Correction Factor

Note: FS was measured with loop antenna below 30MHz

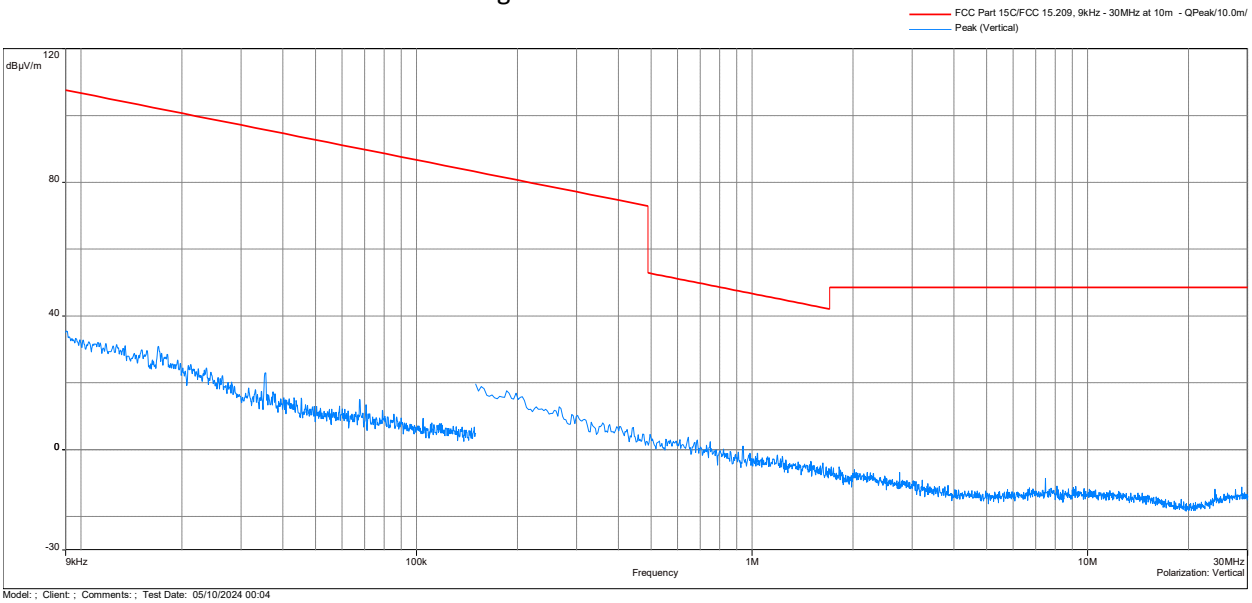
4.1.3 Test Results

Radiated Spurious Emissions from 9 kHz to 30MHz, EUT Upright (X-Axis)

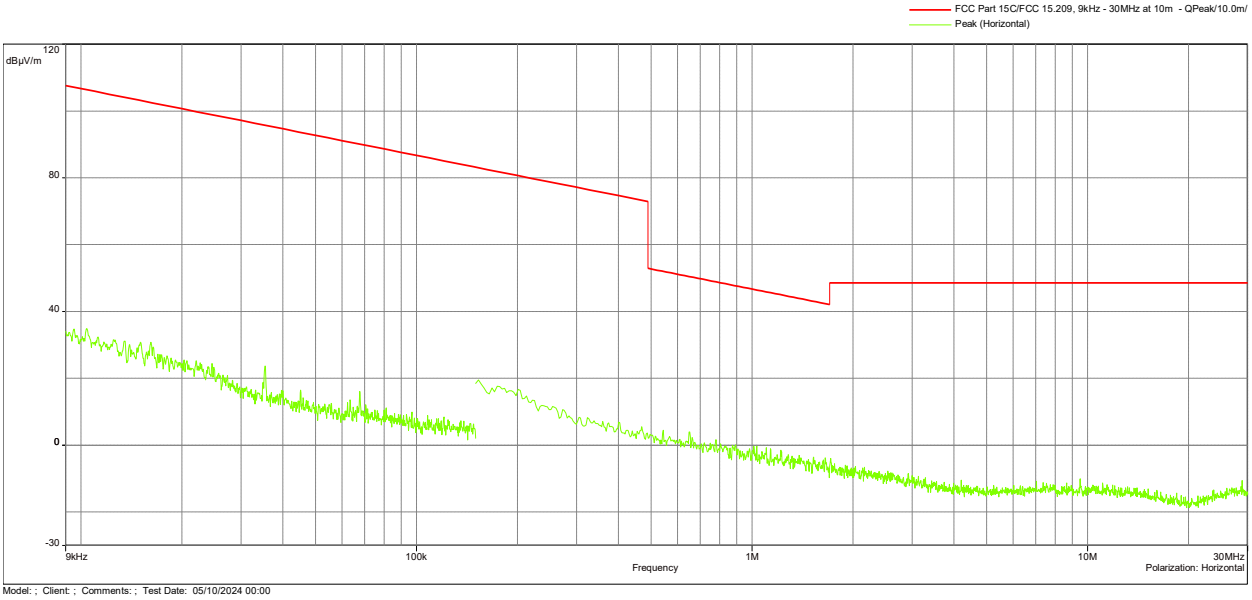
Receiving Antenna Coplanar Orientation



Receiving Antenna Coaxial Orientation



Receiving Antenna Horizontal Orientation



Field Strength (Peak)

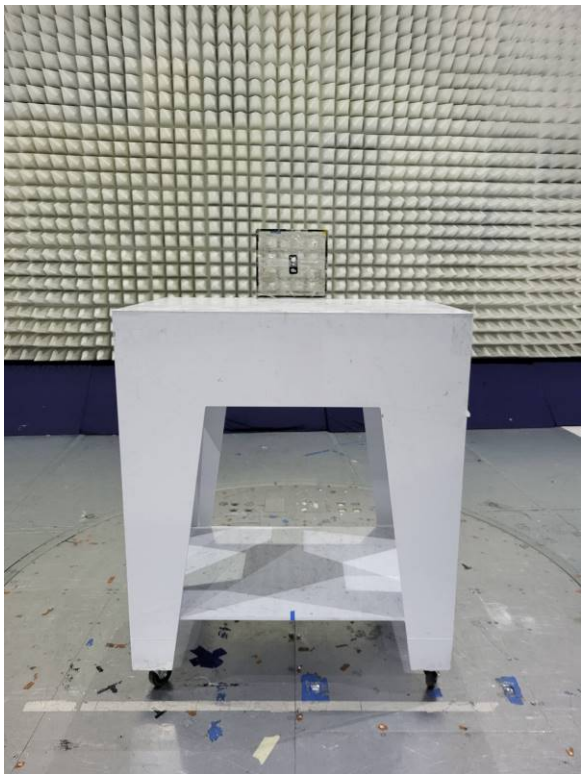
Frequency (MHz)	FS Peak dB(uV/m)	Lim Peak* dB(uV/m)	Peak Margin (dB)	Lim Ave** dB(uV/m)	Ave Margin (dB)	Polarity
433.876	65.96	100.82	-34.86	80.82	-14.86	Vertical
1301.467	39.58	74	-34.42	54	-14.42	Vertical
1734.967	37.82	80.82	-43.00	60.82	-23	Vertical
2169.600	40.66	80.82	-40.16	60.82	-20.16	Vertical
2603.100	43.31	80.82	-37.51	60.82	-17.51	Horizontal
2603.100	42.85	80.82	-37.97	60.82	-17.97	Vertical
3037.167	44.64	80.82	-36.18	60.82	-16.18	Vertical
3470.667	56.49	80.82	-24.33	60.82	-4.33	Horizontal
3905.300	50.48	74	-23.52	54	-3.52	Vertical
3905.300	52.78	74	-21.22	54	-1.22	Horizontal
4338.800	49.68	74	-24.32	54	-4.32	Vertical
4338.800	51.41	74	-22.59	54	-2.59	Horizontal

* The limits with 80.82 dBuV/m were used because these frequencies were not in the 15.205 restricted bands. Therefore, the peak limit of 20 dB below the fundamental was used.

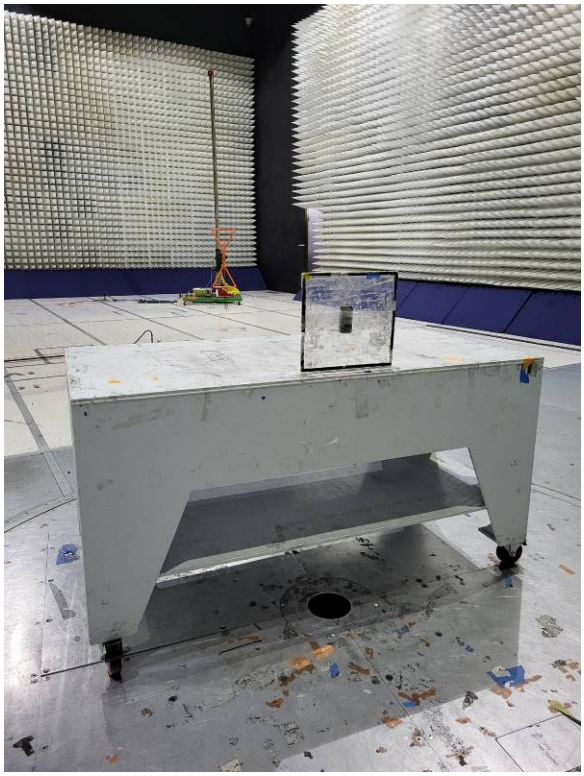
** The average limits of 60.82 dBuV/m were used because it is 20 dB below the peak limit of 80.82 dBuV/m.

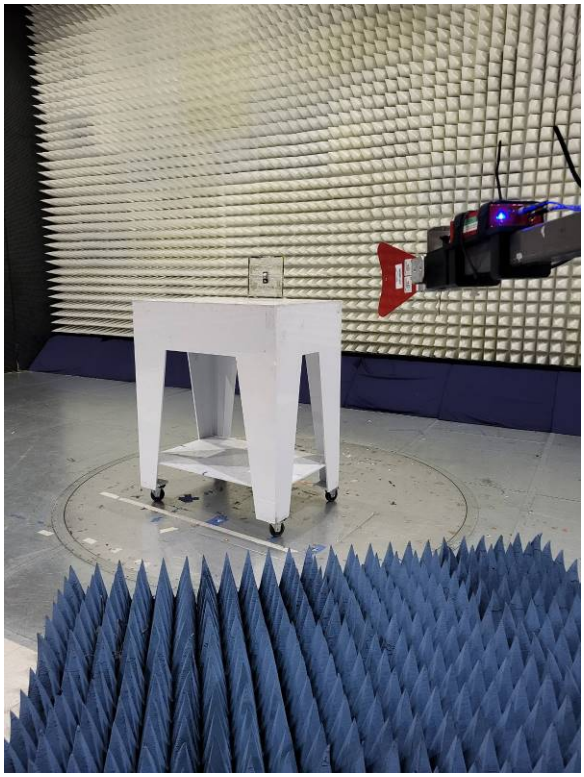
Note: The device was tested in all 3-axis. Only worst-case data is presented.

4.1.3 Test Configuration Photographs



4.2.3 Test Configuration Photographs (Continued)





4.2 Occupied Bandwidth

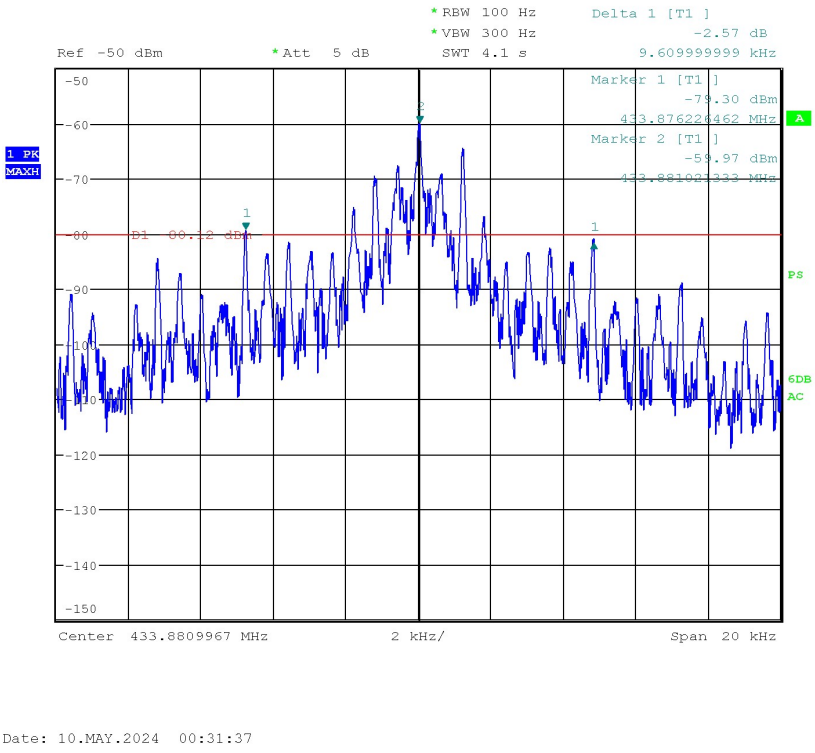
4.2.1 Requirement

Per §15.231(c), The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

4.2.2 Test Result

Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)	Result
433.881	9.610	1084.5	Pass

Note: Limit = 0.25% * Center Frequency = 0.25%*433.881MHz = 1084.5 kHz

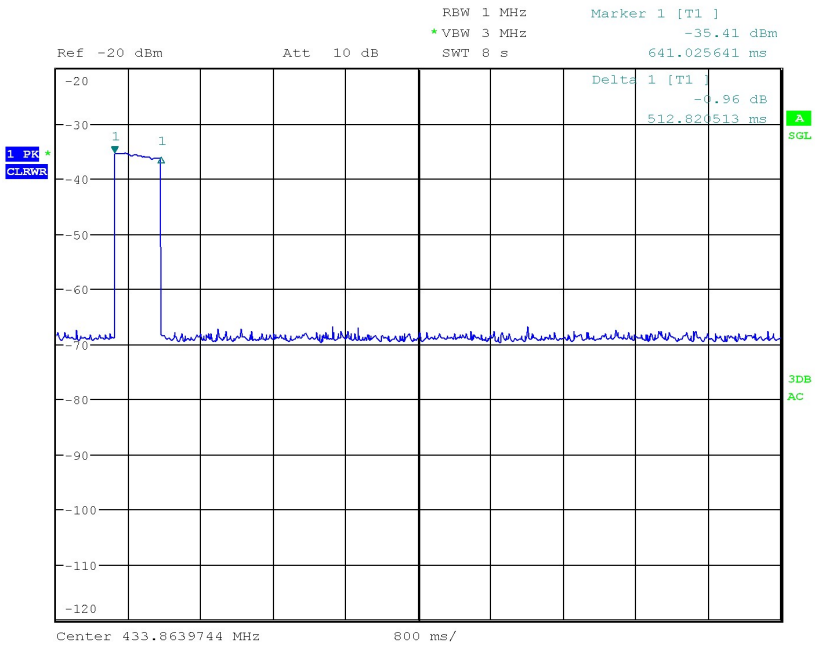


4.3 Deactivation Testing

4.3.1 Requirement

Per §15.231(a) (1), a manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

4.3.2 Test Result



Note: The emission was found to cease within 5 seconds after button release.

Result	Pass

4.4 AC Line Conducted Emission
FCC Rule 15.207, FCC 15.107

4.4.1 Requirement

Frequency Band MHz	Class B Limit dB(μV)		Class A Limit dB(μV)	
	Quasi-Peak	Average	Quasi-Peak	Average
0.15-0.50	66 to 56 *	56 to 46 *	79	66
0.50-5.00	56	46	73	60
5.00-30.00	60	50	73	60

*Note: *Decreases linearly with the logarithm of the frequency. At the transition frequency the lower limit applies.*

4.4.2 Procedure

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Floor standing EUT are placed on a horizontal metal ground plane and isolated from the ground plane by resting on an insulating material. The metal ground plane extends at least 0.5m beyond the boundaries of the EUT and has minimum dimensions of 2m by 2m.

EUT was placed in transmission mode then tested for conducted emissions per 15.207 to ensure the device complies with 15.207. After, the EUT RF was powered off and was measured to show compliance with the 15.107 limits.

4.4.3 Test Result

Result	**Not Applicable. EUT is battery powered.**

5.0 List of Test Equipment

Measurement equipment used for emission compliance testing utilized the equipment on the following list:

Equipment	Manufacturer	Model/Type	Serial #	Cal Int	Cal Due
EMI Test Receiver	Rohde & Schwarz	ESR	02016	12	07/20/2024
EMI Test Receiver	Rohde & Schwarz	ESU	01375	12	05/30/2024
9kHz-1GHzPre-Amplifier	Sonoma Instruments	310N	00415	12	05/23/2025
Radio Frequency Shielded System	Panashield	10 Meter Chamber	00984	#	#
150kHz - 30MHz LISN	COM-POWER	LIN-115A	01283	12	12/11/2024
9kHz-30MHz Loop Antenna (Passive)	ETS Lindgren	6512	01573	12	11/30/2024
30MHz-2GHz Bi-Log Antenna	SunAR RF Motion	JB1	01577	12	02/28/2025
1-18GHz Active Horn Antenna with Preamp	ETS Lindgren	3117-PA	01365	12	05/20/2024

"#" = Calibration not required.

Software used for emission compliance testing utilized the following:

Name	Manufacturer	Version	Template/Profile
BAT-EMC	Nexio	3.20.0.23	Lamplight 05.09.24.bpp
RS Commander	Rohde Schwarz	1.6.4	Not Applicable (Screen grabber)

6.0 Document History

Revision/ Job Number	Writer Initials	Reviewer Initials	Date	Change
1.0 / G105649210	KT	ML	May 17, 2024	Original document
1.1 / G105649210	KT	AC	June 06, 2024	Updated equipment information in Section 5.0