# FCC PART 18 CERTIFICATION TEST REPORT

for the

## POWERCAST CORPORATION

## TX91513 (FCC ID: YESTX91513)

## WLL REPORT# 17309-01 REV 1

Prepared for:

**Powercast Corporation**

**620 Alpha Drive**

**Pittsburgh, PA 15238**

Prepared By:

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**4840 Winchester Boulevard**

**Frederick, MD 21703**

Testing Certificate AT-1448

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October 21, 2021

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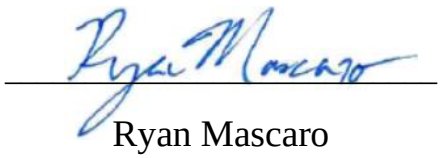
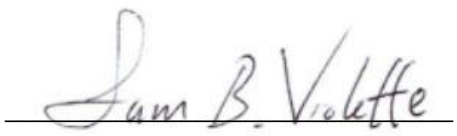
Prepared by:



Ryan Mascaro
RF Test Engineer

Reviewed by:



Samuel Violette
Vice President

# Abstract

This report has been prepared on behalf of Powercast Corporation to support the attached Application for Equipment Authorization. The test report and application are submitted for a Non-Consumer Equipment, Transmitter under Part §18 of the FCC Rules. This Part §18 Test Report documents the test configuration and test results for the Powercast Corporation TX91513 (FCC ID: YESTX91513). The information provided in this report is only applicable to device herein documented, as the EUT.

Radiated testing was performed on an Open Area Test Site (OATS) of Washington Laboratories, Ltd, 4340 Winchester Boulevard, Frederick, MD 21703. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. The scopes can be seen on the OET Accredited test firm list. Washington Laboratories, Ltd. has been accepted by the FCC and approved by ANAB under Certificate AT-1448 as an independent FCC test laboratory.

These tests are accredited and meet the requirements of ISO/IEC 17025 as verified by the ANSI-ASQ National Accreditation Board/ANAB. Refer to certificate and scope of accreditation AT-1448.

The Powercast Corporation TX91513 (FCC ID: YESTX91513) complies with the requirements for a Non-Consumer Equipment, Transmitter under Part §18 of the FCC Rules.

| Revision History | Description of Change | Date |
|---|---|---|
| Rev 0 | Initial Release | October 21, 2021 |
| Rev 1 | Edits per client comments | November 5, 2021 |

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# 1 Introduction

## 1.1 Compliance Statement

The Powercast Corporation TX91513 (FCC ID: YESTX91513) complies with the requirements for a Non-Consumer Equipment, Transmitter under Part §18 of the FCC Rules.

## 1.2 Test Scope

Tests for radiated and AC power line conducted emissions were performed. The measurement equipment conforms to ANSI C63.2 – Specifications for Electromagnetic Noise and Field Strength Instrumentation and the measurement procedures conform to FCC/OST MP-5 (1986).

## 1.3 Contract Information

| | |
|---|---|
| Customer: | Powercast Corporation |
| Purchase Order Number: | Deposit Terms |
| Quotation Number: | 72796A |

## 1.4 Test and Support Personnel

| | |
|---|---|
| Washington Laboratories, LTD | Ryan Mascaro |
| Customer Representative | John Macho |

## 1.5 Test Dates

The TX91513 (FCC ID: YESTX91513) was tested during the following dates:

10/13/2021 to 10/15/2021.

# 2 Equipment Under Test

## 2.1 EUT Identification & Description

Table 1: Device Summary

| | |
|---|---|
| Manufacturer: | Powercast Corporation |
| EUT Name/Model: | TX91513 |
| FCC ID: | YESTX91513 |
| FCC Rule Part: | §18 |
| ISM TX Frequency: | 915 MHz |
| Maximum Output Power (declared): | 29.5 dBm (antenna port, conducted) |
| Maximum EIRP: | 35.5 dBm (calculated) |
| Occupied Bandwidth: | 1.67 MHz (20 dB) |
| FCC Emission Designator: | 1M67N0N |
| Number of RF Channels: | 1 |
| Duty Cycle (declared): | 100 % |
| Pulsed Transmitter: | No |
| Antenna Type: | Internal Patch, 6.0 dBi |
| Power Source & Voltage: | 120 VAC, 60 Hz (wall-wart) |
| Type of Information: | None |
| Keying: | N/A |
| Modulation: | None |
| Maximum Data Rate: | N/A |
| Worst Case Transmitter Field Strength: | 344,630.1 µV/m (AVG) @ 10m (no limit) |
| Worst Case Radiated Spurious: | 1830 MHz @ 3m; 193.6 µV/m (AVG) |

The TX91513 is a non-consumer, ISM transmitter, that uses a 915 MHz signal to transfer power from an emitter, located under a store shelf, in order to illuminate product labels on the shelf. The TX91513 transmitter has an integrated antenna with a gain of 6 dBi. The maximum output power is factory set to 29.5 dBm. The transmitter has no user adjustment for output power or frequency. If an object is placed too close to the unit and causes the unit to overheat, the status LED will switch from green to red flashing to indicate that the transmitter has stopped transmitting. The transmitter case has keyholes and holes for mounting tabs to secure the transmitter if needed. The operational power for the transmitter is provided by an external AC/DC power supply.

This device will not be classified under §18.107(g).

## 2.2 Testing Algorithm

The TX91513 (FCC ID: YESTX91513) was tested at all times with the transmitter enabled. When +5VDC is delivered to the EUT, from the AC Mains wall-wart, the power LED turns green, indicating that the transmitter is enabled. Worst case emission levels are provided throughout this report.

## 2.3 Test Location

All measurements herein were performed at the Washington Laboratories, Ltd. test center in Frederick, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. The ISED Canada OATS number is 3035A-1 for Washington Laboratories, Ltd. Washington Laboratories, Ltd. has been accepted by the FCC and approved by ANAB under Testing Certificate AT-1448 as an independent FCC test laboratory.

## 2.4 Test Configuration

The TX91513 (FCC ID: YESTX91513) was provided in one sample configuration. The EUT appears to be a wall-mounted or tabletop device and has no external antennas. For radiated emissions, the EUT was evaluated in three orthogonal axes (x, y, and z), in order to determine the orientation which produced the highest amplitude of emissions. The worst-case position was used for all of the radiated testing.

Table 2: System Configuration List (declared by the applicant)

| Description | Model/Manufacturer | Part Number | Serial Number | Rev. |
|---|---|---|---|---|
| N/A | N/A | N/A | N/A | N/A |

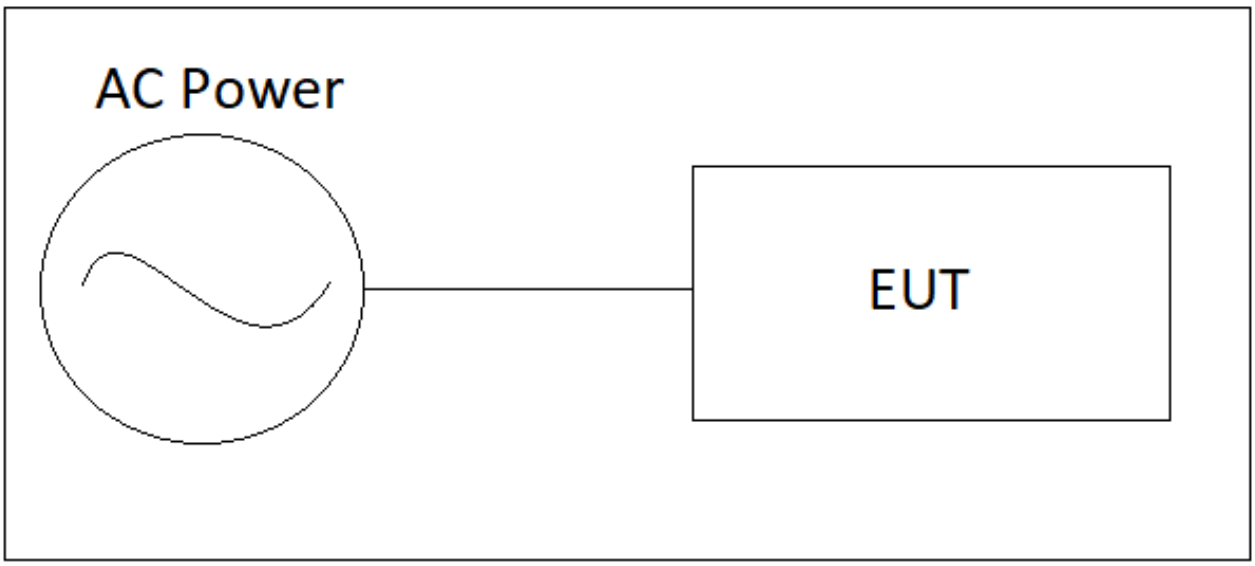
Table 3: Support Equipment

| Description | Model/Manufacturer | Part Number | Serial Number | Rev. |
|---|---|---|---|---|
| N/A | N/A | N/A | N/A | N/A |

Table 4: Cable Configuration

| Port Identification | Connector Type | Cable Length | Shielded (Y\N) | EUT Port | Termination Point |
|---|---|---|---|---|---|
| 1 | USB to DC Jack | 1.75m | Yes | Power Input | AC/DC PS |

Figure 1: EUT Test/Power Configuration



# 3 Measurements

## 3.1 References

ANSI C63.2 (2016) – Specifications for Electromagnetic Noise and Field Strength Instrumentation

FCC/OST MP-5 (1986) – FCC Methods of Measurements of Radio Noise Emission from ISM Equipment

## 3.2 Measurement Uncertainty

All results reported herein relate only to the equipment tested. The basis for uncertainty calculation uses ANSI/NCSL Z540-2-1997 (R2002) with a type B evaluation of the standard uncertainty. Elements contributing to the standard uncertainty are combined using the method described in Equation 1 to arrive at the total standard uncertainty. The standard uncertainty is multiplied by the coverage factor to determine the expanded uncertainty which is generally accepted for use in commercial, industrial, and regulatory applications and when health and safety are concerned (see

Equation 2). A coverage factor was selected to yield a 95% confidence in the uncertainty estimation.

Equation 1: Standard Uncertainty

$$u_c = \pm\sqrt{\frac{a^2}{div_a{}^2} + \frac{b^2}{div_b{}^2} + \frac{c^2}{div_c{}^2} + .....}$$

Where uc = standard uncertainty
a, b, c,.. = individual uncertainty elements
Diva, b, c = the individual uncertainty element divisor based on the probability distribution
Divisor = 1.732 for rectangular distribution
Divisor = 2 for normal distribution
Divisor = 1.414 for trapezoid distribution

Equation 2: Expanded Uncertainty

$$U = ku_c$$

Where:
U = expanded uncertainty
k = coverage factor
k ≤ 2 for 95% coverage (ANSI/NCSL Z540-2 Annex G)
uc = standard uncertainty

The measurement uncertainty complies with the maximum allowed uncertainty from CISPR 16-4-2. Measurement uncertainty is not used to adjust the measurements to determine compliance. The expanded uncertainty values for the various scopes in the WLL accreditation are provided in Table 5 below.

Table 5: Expanded Uncertainty List

| Scope | Standard(s) | Expanded Uncertainty |
|---|---|---|
| Conducted Emissions | CISPR11, CISPR32, CISPR14, FCC Part 15 & 18 | ± 2.63 dB |
| Radiated Emissions | CISPR11, CISPR32, CISPR14, FCC Part 15 & 18 | ± 4.55 dB |

# 4 Test Results

## 4.1 Transmitter Peak Field Strength

Though not required for proof of conformity, the maximum transmitter radiated field strength was measured at 10m. The orientation that produced the highest fundamental field strength shall be used for the radiated testing in Section 4.3 of this report.

There is no limit for the ISM fundamental field strength defined under FCC Part §18

Table 6: Transmitter Field Strength at 10m

| Frequency | EUT Orientation | Corrected Field Strength |
|---|---|---|
| 915 MHz | X | 77,153.1 uV/m |
| | Y | 344,630.1 uV/m |
| | Z | 94,919.0 uV/m |

## 4.2 Occupied Bandwidth

Though not required for proof of conformity, the transmitter occupied channel bandwidth was measured.

The plot provided below is a relative representation of power. The amplitude is not corrected.

There is no limit for OBW defined under FCC Part §18.

This data does, however, show compliance for §18.301.

The 915 MHz transmitter meets the frequency tolerance requirement of ± 13.0 MHz.

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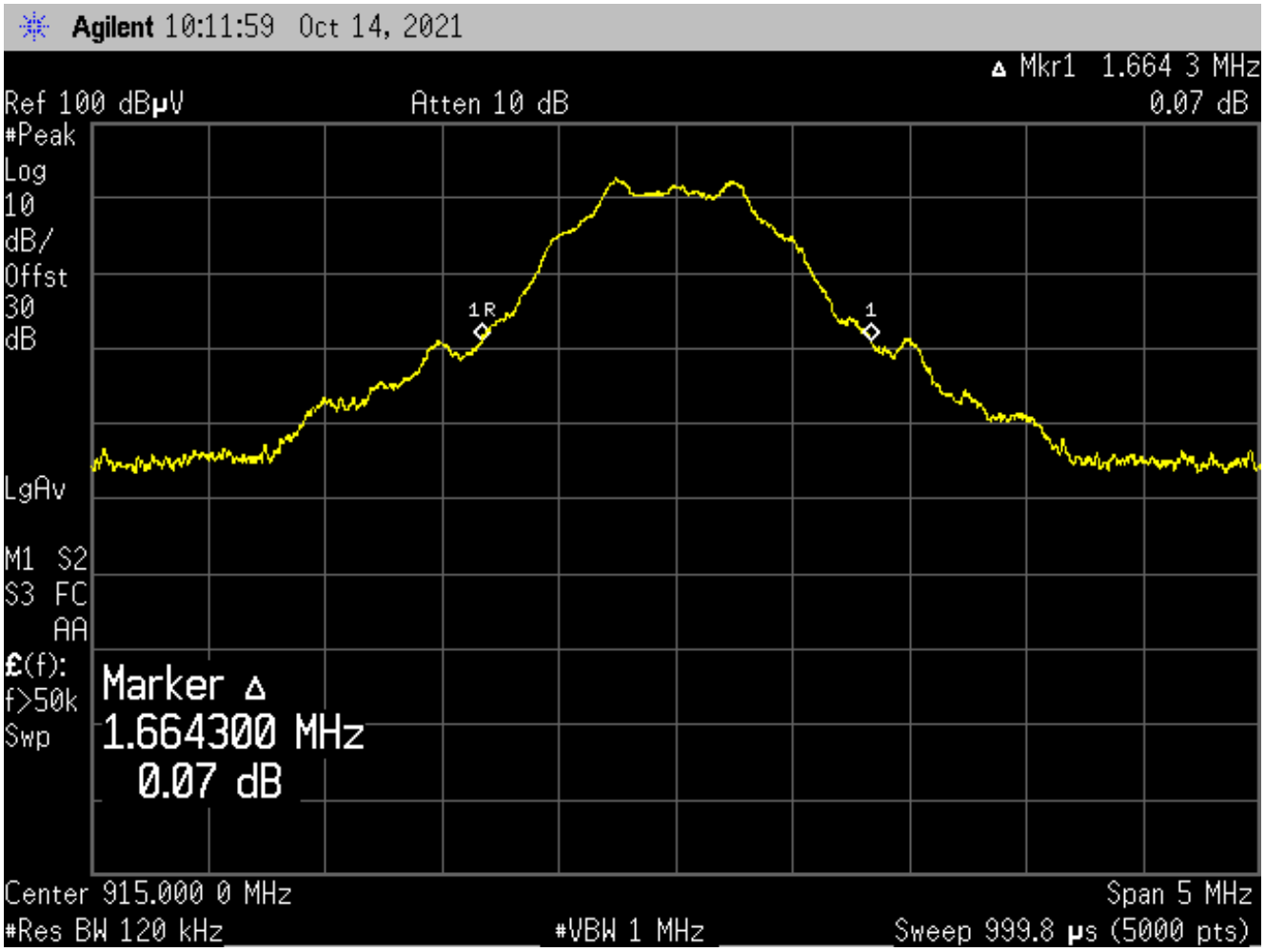
Table 7: Occupied Bandwidth Results, CW

| Frequency | 20 dB OBW |
|---|---|
| 915 MHz | 1.67 MHz |

Figure 2: 20 dB Occupied Bandwidth



## 4.3 Field Strength Limits – FCC §18.305

§18.305(b) – The field strength levels of emissions which lie outside the bands specified in §18.301, unless otherwise indicated, shall not exceed the following limit: 25 µV/m at 300m

This limit shall be interpolated for measurements made at 10m, for all frequencies below 1000 MHz, via the follow formula:

20LOG(25) = 28 dBµV /m at 300m

20LOG(300/10) + 28 = 58 dBµV/m at 10m

$10^{(58/20)}$ = 794 (rounded down to 750 µV/m at 10m)

Where: the final 10m limit is 750 µV/m (Average)

The measurement distance for frequencies above 1000 MHz is 3m. The original 300m limit shall be interpolated as such:

20LOG(25) = 28 dBµV/m at 300m

20LOG(300/3) + 28 = 68 dBµV/m at 3m

$10^{(68/20)}$ = 2512 (rounded down to 2500 µV/m at 3m)

Where: the final 3m limit is 2500 µ/m (Average)

### 4.3.1 Test Procedure

The requirements of FCC/OST MP-5 (1986) call for the testing to be performed on an open field test site, or open area test site (OATS) that is equivalent to an Open Field Site. The EUT shall be placed on a 1m X 1.5-meters non-conductive motorized turntable and the emissions from the EUT measured continuously at every azimuth, by rotating the turntable. The height of the table is fixed at 1m for all testing. For measurements of frequencies in the range of 9 kHz to 10 GHz, an appropriate antenna shall be utilized. An active loop antenna, set to a height of 2m will be used for measuring the field strength of emissions below 30 MHz. For frequencies below 1000 MHz, a calibrated linearly polarized antenna with performance that is correlatable to a tuned half-wave dipole shall be used. Measurements made above 1000 MHz will be performed with a broadband horn antenna. The linearly polarized antennas for use above 30 MHz, shall be mounted to an antenna mast and varied in height, between 1 and 4 meters. The output from the antenna was connected, via a preamplifier, to the input of the spectrum analyzer. The analyzer detector function was set to Average for all compliance measurements. The measurement bandwidth of the spectrum analyzer system was set to the following:

9 kHz – 150 kHz, RBW = 200 Hz
150 kHz – 30 MHz, RBW = 9 kHz
30 MHz – 1 GHz, RBW = 120 kHz
1 GHz – 10 GHz, RBW = 1 MHz

The post-detector video filtering shall be, in most cases, no less than 10 times the measurement bandwidth. Both the horizontal and vertical field components are measured. The maximum emissions shall be determined, and the worst-case levels will be reported.

Environmental Conditions During Radiated Emissions Testing

| | |
|---|---|
| Ambient Temperature: | 23.3 °C |
| Relative Humidity: | 68 % |

### 4.3.2 Radiated Data Reduction and Reporting

To convert the raw spectrum analyzer radiated data into a form that can be compared with the FCC limits, it is necessary to account for various calibration factors that are supplied with the antennas and other measurement accessories. These factors are included into the antenna factor (AF) column of the table and in the cable factor (CF) column of the table. The AF (in dB/m) and the CF (in dB) is algebraically added to the raw Spectrum Analyzer Voltage in dBµV to obtain the Radiated Electric Field in dBµV/m. This logarithm amplitude is converted to a linear amplitude, then compared to the FCC limit.

Example:

| | |
|---|---|
| Spectrum Analyzer Voltage: | VdBµV |
| Antenna Correction Factor: | AFdB/m |
| Cable Correction Factor: | CFdB |
| Pre-Amplifier Gain (if applicable): | GdB |
| Electric Field: EdBµV/m = | V dBµV + AFdB/m + CFdB - GdB |
| Convert to linear units of measure: | EdBµV/m/20 Inv log |

### 4.3.3 Test Results

The EUT complies with the emission requirements of this section.

The frequency range of 9 kHz to 10 GHz was investigated.

Near field pre-scans of the EUT were performed as a measure to identify any emissions characterized by the EUT, prior to the OATS testing.

In the frequency range of 9 kHz to 30 MHz, there were no detectable emissions from the EUT. This was also confirmed on the OATS at 10m.

During the pre-scan, some emissions between 30 MHz and 1000 MHz were noted. These were determined to be digital products of the apparatus, and not transmitter spurs. None of these signals were detectable on the OATS at 10m.

Emissions listed in Table 9 are the harmonics of the transmitter, evaluated to the tenth harmonic.

AMB indicates that the measurement was taken at the noise floor.

Spur indicates that an emission was detected on the OATS.

Table 8: Radiated Emissions Test Data, 30 MHz – 1000 MHz

| Frequency (MHz) | Polarity H/V | Azimuth (Degree) | Ant. Height (m) | SA Level (dBµV) | Corr Factors (dB) | Corr. Level (µV/m) | Limit (µV/m) | Margin (dB) | Detector | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| 45.91 | V | 0.0 | 1.9 | 42.2 | -13.7 | 26.6 | 750.0 | -29.0 | AVG | AMB |
| 74.69 | V | 0.0 | 1.8 | 37.5 | -15.3 | 12.8 | 750.0 | -35.3 | AVG | AMB |
| 116.18 | V | 0.0 | 2.0 | 36.0 | -9.9 | 20.1 | 750.0 | -31.4 | AVG | AMB |
| 173.26 | V | 0.0 | 1.5 | 46.6 | -11.5 | 57.0 | 750.0 | -22.4 | AVG | AMB |
| 908.50 | V | 0.0 | 1.7 | 42.1 | 2.6 | 171.5 | 750.0 | -12.8 | AVG | AMB |
| 921.50 | V | 0.0 | 1.7 | 46.1 | 2.4 | 267.1 | 750.0 | -9.0 | AVG | AMB |
| | | | | | | | | | | |
| 190.31 | H | 0.0 | 1.7 | 50.1 | -11.7 | 82.9 | 750.0 | -19.1 | AVG | AMB |
| 227.10 | H | 0.0 | 1.5 | 39.0 | -11.7 | 23.1 | 750.0 | -30.2 | AVG | AMB |
| 466.40 | H | 0.0 | 1.6 | 35.6 | -4.6 | 35.6 | 750.0 | -26.5 | AVG | AMB |
| 751.89 | H | 0.0 | 1.4 | 48.8 | 0.2 | 279.2 | 750.0 | -8.6 | AVG | AMB |
| 908.50 | H | 0.0 | 1.7 | 46.2 | 2.6 | 275.0 | 750.0 | -8.7 | AVG | AMB |
| 921.50 | H | 0.0 | 1.7 | 45.8 | 2.4 | 258.0 | 750.0 | -9.3 | AVG | AMB |

Table 9: Radiated Emissions Test Data, 1 GHz – 10 GHz

| Frequency (MHz) | Polarity H/V | Azimuth (Degree) | Ant. Height (m) | SA Level (dBuV) | Corr Factors (dB) | Corr. Level (uV/m) | Limit (uV/m) | Margin (dB) | Detector | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 1830.00 | V | 0.0 | 1.3 | 57.8 | -12.1 | 193.6 | 2500 | -22.2 | AVG | Spur |
| 2745.00 | V | 0.0 | 1.5 | 46.5 | -10.2 | 65.6 | 2500 | -31.6 | AVG | Spur |
| 3660.00 | V | 0.0 | 1.5 | 45.5 | -9.8 | 61.3 | 2500 | -32.2 | AVG | Spur |
| 4575.00 | V | 0.0 | 1.4 | 48.0 | -10.6 | 74.3 | 2500 | -30.5 | AVG | Spur |
| 5490.00 | V | 0.0 | 1.3 | 37.5 | -9.1 | 26.3 | 2500 | -39.6 | AVG | Spur |
| 6405.00 | V | 0.0 | 1.3 | 44.6 | -8.8 | 61.5 | 2500 | -32.2 | AVG | Spur |
| 7320.00 | V | 0.0 | 1.3 | 39.6 | -7.3 | 41.4 | 2500 | -35.6 | AVG | Spur |
| 8235.00 | V | 0.0 | 1.2 | 35.1 | -8.2 | 22.0 | 2500 | -41.1 | AVG | AMB |
| 9150.00 | V | 0.0 | 1.3 | 35.0 | -8.2 | 21.9 | 2500 | -41.1 | AVG | AMB |
| | | | | | | | | | | |
| 1830.00 | H | 0.0 | 1.2 | 52.9 | -12.1 | 110.1 | 2500 | -27.1 | AVG | Spur |
| 2745.00 | H | 0.0 | 1.6 | 44.8 | -10.2 | 53.9 | 2500 | -33.3 | AVG | Spur |
| 3660.00 | H | 0.0 | 1.4 | 45.3 | -9.8 | 59.9 | 2500 | -32.4 | AVG | Spur |
| 4575.00 | H | 0.0 | 1.5 | 48.9 | -10.6 | 82.4 | 2500 | -29.6 | AVG | Spur |
| 5490.00 | H | 0.0 | 1.3 | 37.9 | -9.1 | 27.5 | 2500 | -39.2 | AVG | Spur |
| 6405.00 | H | 0.0 | 1.2 | 45.6 | -8.8 | 69.1 | 2500 | -31.2 | AVG | Spur |
| 7320.00 | H | 0.0 | 1.2 | 38.7 | -7.3 | 37.3 | 2500 | -36.5 | AVG | Spur |
| 8235.00 | H | 0.0 | 1.2 | 34.9 | -8.2 | 21.5 | 2500 | -41.3 | AVG | AMB |
| 9150.00 | H | 0.0 | 1.2 | 34.6 | -8.2 | 21.0 | 2500 | -41.5 | AVG | AMB |

Note: In this frequency range, tunable notch filters and waveguide band-pass filters were used to reject the 915 MHz transmit signal, as a means to ensure that the pre-amplifier did not become saturated. Please see Table 11 for a list of this equipment.

## 4.4 AC Power Conducted Limits – §18.307

There are no specified conducted voltage limits in the rules, for this particular type of device. The EUT is a non-consumer ISM transmitter, that does not inherently fall under the guidelines of §18.307(a) or §18.307(c). However, the EUT is capable of meeting the AC power conduction limits of §18.307(b), which are equal to the Class B limits of FCC Part §15.107(a).

When equipment is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line, on any frequency, shall not exceed the limits in the following table. Compliance with the provisions of this section shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal using a 50 µH/50Ω line impedance stabilization network (LISN).

| AC Power-Line Conduction Limits | | |
|---|---|---|
| Frequency Range (MHz) | Other, Non-Consumer Device | |
| | Quasi-peak | Average |
| .150 – .500 | 66 to 56 dBµV | 56 to 46 dBµV |
| .500 – 5.0 | 56 dBµV | 46 dBµV |
| 5.0 – 30.0 | 60 dBµV | 50 dBµV |

### 4.4.1 Test Procedure

The requirements of this section call for the EUT to be placed on an 80cm-high 1 X 1.5-meter non-conductive table above a ground plane. Power to the EUT was provided through a Solar Corporation 50 Ω/50 µH LISN, bonded to a 3 X 2-meter ground plane. The LISN has its AC input supplied from a filtered AC power source. The EUT does not require the use of any peripherals or additional data cables.

The 50Ω output of the LISN was connected to the input of the spectrum analyzer and the emissions in the frequency range of 150 kHz to 30 MHz were measured. The detector function was set to quasi-peak, and average as appropriate, and the resolution bandwidth during testing was at least 9 kHz, with all post-detector filtering no less than 10 times the resolution bandwidth. For average measurements, the post-detector filter was set to 10 Hz.

The EUT's power cable and the position of the EUT, in reference to the vertical earth grounding reference were configured in accordance with the requirements of FCC/OST MP-5 (1986).

Environmental Conditions During Conducted Emissions Testing

| | |
|---|---|
| Ambient Temperature: | 22.2 °C |
| Relative Humidity: | 59 % |

### 4.4.2 Conducted Data Reduction and Reporting

The comparison between the Conducted emissions level and the FCC limit is calculated as shown in the following example:

Spectrum Analyzer Voltage: VdBµV (raw)
LISN Correction Factor: LISN dB
Cable Correction Factor: CF dB
Voltage: VdBµV = V dBµV (raw) + LISN dB + CF dB

### 4.4.3 Test Data

The EUT complies Conducted Emissions requirements of this test.

The AC power-line conducted emissions test data is provided in the table below.

Table 10: AC Power Conducted Emissions Test Data

| **NEUTRAL** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Frequency (MHz)** | **Level QP (dBµV)** | **Level AVG (dBµV)** | **Cable Loss (dB)** | **LISN Corr (dB)** | **Level QP Corr (dBµV)** | **Level Avg Corr (dBµV)** | **Limit QP (dBµV)** | **Limit AVG (dBµV)** | **Margin QP (dB)** | **Margin AVG (dB)** |
| 0.153 | 40.1 | 29.0 | 10.2 | 0.6 | 50.9 | 39.8 | 65.8 | 52.8 | -14.9 | -13.0 |
| 0.202 | 26.0 | 28.3 | 10.2 | 0.5 | 36.6 | 38.9 | 63.5 | 50.5 | -26.9 | -11.6 |
| 0.252 | 36.2 | 25.3 | 10.2 | 0.4 | 46.8 | 35.9 | 61.7 | 48.7 | -14.9 | -12.8 |
| 0.465 | 20.9 | 17.0 | 10.2 | 0.3 | 31.4 | 27.5 | 56.6 | 43.6 | -25.2 | -16.1 |
| 1.068 | 37.8 | 22.9 | 10.3 | 0.3 | 48.4 | 33.5 | 56.0 | 43.0 | -7.6 | -9.5 |
| 2.682 | 18.2 | 19.2 | 10.2 | 0.3 | 28.7 | 29.7 | 56.0 | 43.0 | -27.3 | -13.3 |
| 4.390 | 21.0 | 21.8 | 10.6 | 0.4 | 32.0 | 32.8 | 56.0 | 43.0 | -24.0 | -10.2 |
| | | | | | | | | | | |
| **PHASE / L1** | | | | | | | | | | |
| **Frequency (MHz)** | **Level QP (dBµV)** | **Level AVG (dBµV)** | **Cable Loss (dB)** | **LISN Corr (dB)** | **Level QP Corr (dBµV)** | **Level Avg Corr (dBµV)** | **Limit QP (dBµV)** | **Limit AVG (dBµV)** | **Margin QP (dB)** | **Margin AVG (dB)** |
| 0.153 | 39.9 | 29.5 | 10.2 | 0.5 | 50.5 | 40.1 | 65.8 | 52.8 | -15.3 | -12.7 |
| 0.242 | 38.0 | 25.0 | 10.2 | 0.3 | 48.5 | 35.5 | 62.0 | 49.0 | -13.6 | -13.6 |
| 0.310 | 36.2 | 28.0 | 10.2 | 0.3 | 46.7 | 38.5 | 60.0 | 47.0 | -13.3 | -8.5 |
| 0.470 | 37.8 | 23.4 | 10.2 | 0.3 | 48.3 | 33.9 | 56.5 | 43.5 | -8.2 | -9.6 |
| 0.889 | 33.0 | 18.2 | 10.3 | 0.3 | 43.6 | 28.8 | 56.0 | 43.0 | -12.4 | -14.2 |
| 2.848 | 33.6 | 22.5 | 10.2 | 0.3 | 44.1 | 33.0 | 56.0 | 43.0 | -11.9 | -10.0 |
| 5.029 | 33.9 | 24.5 | 10.7 | 0.4 | 45.0 | 35.6 | 60.0 | 47.0 | -15.0 | -11.4 |

# 5 Test Equipment

Table 11 shows a list of the test equipment used for measurements along with the calibration information.

Table 11: Test Equipment List

| Test Name: | **Radiated Emissions** | Test Date: 10/14/2021 & 10/15/2021 | |
|---|---|---|---|
| **Asset #** | **Manufacturer/Model** | **Description** | **Cal. Due** |
| 00031 | EMCO, 6502 | ACTIVE LOOP ANTENNA | 9/17/2022 |
| 00644 | SUNOL SCIENCES CORP. | BICONALOG ANTENNA | 11/9/2022 |
| 00425 | ARA , DRG-118/A | HORN ANTENNA | 8/18/2022 |
| 00528 | AGILENT , E4446A | SPECTRUM ANALYZER, 44 GHZ | 3/18/2022 |
| 00522 | HP, 8449B | PRE-AMPLIFIER > 1 GHZ | 6/4/2022 |
| 00276 | ELECTRO-METRICS, BPA-1000 | PRE-AMPLIFIER < 1 GHZ | 6/8/2022 |
| 00955 | JUNKOSHA-USA, MWX322 | HF COAXIAL CABLE, SMA | 5/10/2022 |
| 00865 | STORM, 874-0101-036 | HF COAXIAL CABLE, SMA | 6/17/2022 |
| 00742 | PENN ENGINEERING, WR284 | BANDPASS FILTER, 2 to 4 GHZ | 1/18/2022 |
| 00281 | ITC 21A-3A1 | BANDPASS FILTER 4 to 10 GHZ | 2/7/2020 |
| 00721 | WEINSCHEL, DS109 | DOUBLE STUB NOTCH TUNER | CNR |

| Test Name: | **AC Power Conducted Emissions** | Test Date: | **10/13/2021** |
|---|---|---|---|
| **Asset #** | **Manufacturer/Model** | **Description** | **Cal. Due** |
| 00942 | AGILENT, MXA-N9020A | SPECTRUM ANALYZER | 9/29/2022 |
| 00125 | SOLAR, 8028-50-TS-24-BNC | LISN | 9/14/2022 |
| 00126 | SOLAR, 8028-50-TS-24-BNC | LISN | 9/14/2022 |
| 00053 | HP, 11947A | LIMITER TRANSIENT | 2/18/2022 |
| 00330 | WLL, CE CABLE | RF COAXIAL CABLE | 5/12/2022 |