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3/26/2025

HID Global Corporation (US)
611 Center Ridge Drive
Austin, TX 78753
USA

Dear Erik Ray,

Enclosed is the EMC test report for compliance testing of HID Global Corporation (US), HDP5000e, tested to the requirements of:

- Title 47 of the CFR, Part 15.225, Subpart C for Certification as an Intentional Radiator.
- RSS-210: Issue 11, License-Exempt Radio Apparatus: Category 1 Equipment

Thank you for using the services of Eurofins E&E North America. If you have any questions regarding these results or if we can be of further service to you, please feel free to contact me.

Sincerely,

Nancy LaBrecque
Documentation Department
Eurofins Electrical and Electronic Testing NA, Inc.

Reference: WIRA134308 – FCC-IC-HF_R5

# 13.56MHz RFID
# Test Report

for the

## HID Global Corporation (US)
## HDP5000e (Model: X002700LAM)

**Tested under**
the FCC Certification Rules
contained in
15.225 Subpart C and
RSS-210: Issue 11
for Intentional Radiators

Bryan Taylor, Wireless Team Lead
Electromagnetic Compatibility Lab

Nancy LaBrecque
Documentation Department

**Engineering Statement:** The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

Matthew Hinojosa
EMC Manager, Austin Electromagnetic Compatibility Lab

# Report Status Sheet

| Revision | Report Date | Reason for Revision |
|---|---|---|
| ∅ | 1/14/2025 | Initial Issue. |
| 1 | 1/29/2025 | Changes requested by client |
| 2 | 2/25/2025 | Changes requested by client |
| 3 | 3/6/2025 | Updated to reflect the Laminator as the test sample |
| 4 | 3/7/2025 | Changes requested by reviewer |
| 5 | 3/26/2025 | Changes requested by reviewer |

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# Executive Summary

## A. Purpose of Test

An EMC evaluation was performed to determine compliance of the HID Global Corporation (US) HDP5000e, with the requirements of Part 15, §15.225 and RSS-210 Issue 11, Annex B, B.6. All references are to the most current version of Title 47 of the Code of Federal Regulations and RSS-210 in effect. The following data is presented in support of the Certification of the HDP5000e. HID Global Corporation (US) should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the HDP5000e, has been **permanently** discontinued.

## B. Executive Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, §15.225 and RSS-210, in accordance with HID Global Corporation (US), under purchase order number HID023839. All tests were conducted using measurement procedures ANSI C63.4-2014 and C63.10-2013.

| FCC Reference | ISED Reference | Description | Compliance |
|---|---|---|---|
| Part 15 §15.203 | --- | Antenna Requirement | **Compliant** |
| Part 15 §15.207(a) | RSS-Gen (8.8) | Conducted Emission Limits | **Compliant** |
| Part 15 §15.215 | --- | 20dB Occupied Bandwidth | **Compliant** |
| --- | RSS-Gen (6.7) | 99% Occupied Bandwidth | **Compliant** |
| Part 15 §15.225(a) | RSS-210 (B.6.a.i) | Field Strength emissions within the band 13.553 – 13.567 MHz | **Compliant** |
| Part 15 §15.225(b) | RSS-210 (B.6.a.ii) | Field Strength emissions within the band 13.410 – 13.553 MHz and 13.567 – 13.710 MHz | **Compliant** |
| Part 15 §15.225(c) | RSS-210 (B.6.a.iii) | Field Strength emissions within the band 13.110 – 13.410 MHz and 13.710 – 14.010 MHz | **Compliant** |
| Part 15 §15.225(d) | RSS-210 (B.6.a.iv) | Outside-Band Field Strength emissions per 15.209 - 13.110 – 14.010 MHz | **Compliant** |
| Part 15 §15.225(e) | RSS-210 (B.6.b) | Frequency Tolerance of the Carrier | **Compliant** |

**Table 1. Executive Summary**

# Equipment Configuration

## A. Overview

Eurofins E&E North America was contracted by HID Global Corporation (US) to perform testing on the HDP5000e.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the HID Global Corporation (US) HDP5000e.

The results obtained relate only to the item(s) tested.

| | | |
|---|---|---|
| **Product Name:** | HDP5000e | |
| **Model(s) Tested:** | X002700LAM | |
| **Model(s) Covered:** | X002700LAM | |
| **Sample Number:** | 25033-1 | |
| **FCCID:** | JQ6-X002700LAM | |
| **ICID:** | 2236B-X002700LAM | |
| **EUT Specifications:** | Primary Power: 100 – 240VAC | |
| | Type of Modulation(s): | ASK |
| | Equipment Code: | DXX |
| | Maximum field Strength: | 57.90dBuV/m |
| | Antenna Type: | loop |
| | EUT Frequency Ranges: | 13.56MHz |
| **Analysis:** | The results obtained relate only to the item(s) tested. | |
| **Environmental Test Conditions:** | Temperature: 15-35º C | |
| | Relative Humidity: 30-60% | |
| | Barometric Pressure: 860-1060 mbar | |
| **Evaluated by:** | Bryan Taylor and Sergio Gutierrez | |
| **Report Date:** | 3/26/2025 | |

**Table 2. EUT Summary Table**

## B. References

| | |
|---|---|
| **CFR 47, Part 15, Subpart C** | Federal Communication Commission, Code of Federal Regulations, Title 47, Part 15: General Rules and Regulations, Allocation, Assignment, and Use of Radio Frequencies |
| **RSS-210 Issue 11** | Licence-Exempt Radio Apparatus: Category I Equipment |
| **ANSI C63.4:2014** | Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz |
| **ISO/IEC 17025:2017** | General Requirements for the Competence of Testing and Calibration Laboratories |
| **ANSI C63.10-2013** | American National Standard for Testing Unlicensed Wireless Devices |

**Table 3. References**

## C. Test Site

Eurofins MET Laboratories Inc. (Eurofins E&E North America) is part of the Eurofins Electrical & Electronics (E&E) global compliance network.

All testing was performed at Eurofins E&E North America, 13501 McCallen Pass, Austin, TX 78753. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

**ISED Lab Info:**
CAB Identifier: US0004
Company Number: 2043D

**FCC Lab Info:**
Designation Number: US1127

Radiated Emissions measurements were performed in a 10 meter semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

Correlation between semi-anechoic chamber and OATS:

Two calibrated Loop antennas were used on an OATS. One antenna was driven by a signal generator with a known power. The receive antenna was initially placed 1m away from the transmit antenna. The two antennas were placed parallel to each other. The receive antenna was in turn connected to a calibrated spectrum analyzer. The emissions were swept from 9 kHz to 30 MHz. The receive antenna was then rotated 90 degrees and measurements re-taken. Additional measurements were taken when the receive antenna was placed at 3meters.
This same setup was taken to inside the semi-anechoic chamber and the measurements repeated.

The data was used to correlate the semi-anechoic chamber and OATS.

## D. Measurement Uncertainty

| Test Method | Typical Expanded Uncertainty | K | Confidence Level |
|---|---|---|---|
| RF Frequencies | ±4.52 Hz | 2 | 95% |
| RF Power Conducted Emissions | ±2.97 dB | 2 | 95% |
| RF Power Radiated Emissions | ±2.95 dB | 2 | 95% |
| Radiated Emissions, (30 MHz – 1 GHz) | ±2.95 | 2 | 95% |
| Radiated Emissions, (1 GHz – 18 GHz) | ±3.54 | 2 | 95% |
| Conducted Emission Voltage | ±2.97 | 2 | 95% |

**Table 4. Uncertainty Calculations Summary**

## E. Description of Test Sample

The HDP5000e, Model X002700 is a modular, high definition printer system designed to print, laminate, and encode ID cards. The Laminator device (model: X002700LAM) contains two 13.56MHz transmitters (upper and lower). The transmitters onboard the Laminator are covered by this report.

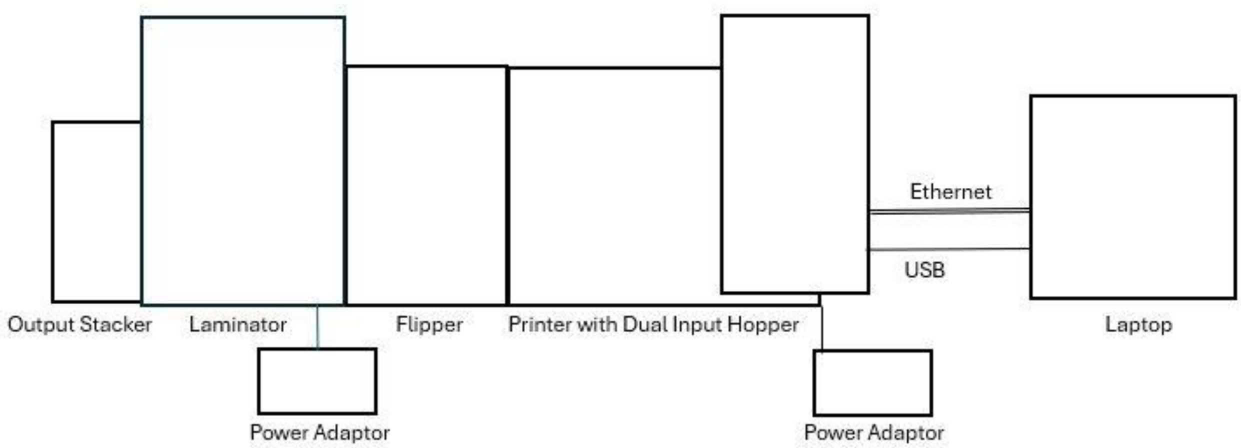



**Figure 1. Block Diagram of Test Configuration**

## F. Equipment Configuration

The EUT was set up as outlined in Figure 1 above. A laptop was used to control the transmitters onboard and force them to transmit one at a time in order to measure their individual radio parameters. In normal operation the transmitters do not operate simultaneously.

## G. Support Equipment

Support equipment necessary for the operation and testing of the EUT is included in the following list.

| Name/Description | Manufacturer | Model Number | Serial Number | *Customer Supplied Calibration Data |
|---|---|---|---|---|
| Support Laptop | Dell | Lattitude | ErayRegsLaptop1 | N.A. |
| Support Laptop | Dell | Lattitude | Compliance Lab PC | N.A. |

**Table 5. Support Equipment**

## Ports and Cabling Information

| Port Name on EUT | Cable Desc. or reason for none | 3 Meters or Longer | Length as tested (m) | Max Length (m) | Shielded? | Termination Box ID & Port Name |
|---|---|---|---|---|---|---|
| USB | --- | No | 2 | 2 | Yes | Laptop |
| Ethernet | --- | Yes | 3 | >3m | No | Laptop |
| Power | --- | No | 2 | 2 | No | AC outlet |
| Power | --- | No | 2 | 2 | No | AC outlet |

**Table 6. Ports and Cabling Information**

## H. Mode of Operation

A laptop computer with a specific utility that allowed for controlling of each transmitter on board the HDP5000e was used during the testing. The following transmitters were tested:

| Transmitter | Channel Frequencies Tested | Exercising Method |
|---|---|---|
| Laminator Upper RFID | 13.56MHz | Test commands via laptop computer |
| Laminator Lower RFID | 13.56MHz | Test commands via laptop computer |

**Table 7. Transmitters Onboard**

## I. Modifications

### a) Modifications to EUT

No modifications were made to the EUT.

### b) Modifications to Test Standard

No modifications were made to the test standard.

## J. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to HID Global Corporation (US) upon completion of testing.

## Antenna Requirements

### § 15.203 Antenna Requirement

**Test Requirement:** **§ 15.203:** 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 shall be considered sufficient to comply with the provisions of this section. 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.

The structure and application of the EUT were analyzed to determine compliance with Section 15.203 of the Rules. Section 15.203 states that the subject device must meet at least one of the following criteria:

a.) Antenna must be permanently attached to the unit.

b.) Antenna must use a unique type of connector to attach to the EUT.

c.) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

**Results:** The HDP5000e as evaluated, was compliant as the antennas were permanently attached.

**Test Engineer(s):** Bryan Taylor

**Test Date(s):** 11/13/2024

## Conducted Emissions

### § 15.207(a) Conducted Emissions Limits

**Test Requirement(s):** **§ 15.207 (a):** For an intentional radiator that 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 or frequencies, within the band 150 kHz to 30MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 Ω line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

| Frequency range (MHz) | § 15.207(a), Conducted Limit (dBµV) | |
|---|---|---|
| | Quasi-Peak | Average |
| * 0.15 - 0.5 | 66 - 56 | 56 - 46 |
| 0.5 - 5 | 56 | 46 |
| 5 - 30 | 60 | 50 |

**Table 8. Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a)**

Note: *Decreases with the logarithm of the frequency.

## RSS-GEN (8.8) AC Power-Line Conducted Emissions Limits

**Test Requirement(s):** **RSS-GEN (8.8):** Unless stated otherwise in the applicable RSS, for radio apparatus that are designed to be connected to the public utility AC power network, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the range 150 kHz to 30 MHz shall not exceed the limits in the below figure, as measured using a 50 μH / 50 Ω line impedance stabilization network (LISN). This requirement applies for the radio frequency voltage measured between each power line and the ground terminal of each AC power-line mains cable of the EUT.

For an EUT that connects to the AC power lines indirectly, through another device, the requirement for compliance with the limits in the below figure shall apply at the terminals of the AC power-line mains cable of a representative support device, while it provides power to the EUT. The lower limit applies at the boundary between the frequency ranges. The device used to power the EUT shall be representative of typical applications.

| Frequency (MHz) | Conducted Limit (dBμV) | |
|---|---|---|
| | Quasi-Peak | Average |
| * 0.15-0.5 | 66 to 56 | 56 to 46[1] |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

**Table 9. AC Power Line Conducted Emissions Limits**

Note: *Decreases with the logarithm of the frequency.

**Test Procedure:** The EUT was placed on a 0.8 m-high non-conducting table above a ground plane. The EUT was situated such that the back of the EUT was 0.4 m from one wall of the vertical ground plane, and the remaining sides of the EUT were no closer than 0.8 m from any other conductive surface. The EUT was powered from a 50 Ω/50 μH Line Impedance Stabilization Network (LISN). The EMC receiver scanned the frequency range from 150 kHz to 30 MHz. Conducted Emissions measurements were made in accordance with *ANSI C63.10-2013 "Procedures for Compliance Testing of Unlicensed Wireless Devices"*. The measurements were performed over the frequency range of 0.15 MHz to 30 MHz using a 50 Ω/50 μH LISN as the input transducer to an EMI receiver.

**Test Results:** The HDP5000e was compliant with this requirement. Testing was performed on the AC input to an AC to DC power supply that was feeding the 12VDC to the HDP5000e.

**Test Engineer(s):** Tyler Quintanna

**Test Date(s):** 11/11/2024

## Conducted Emissions Voltage Test Setup

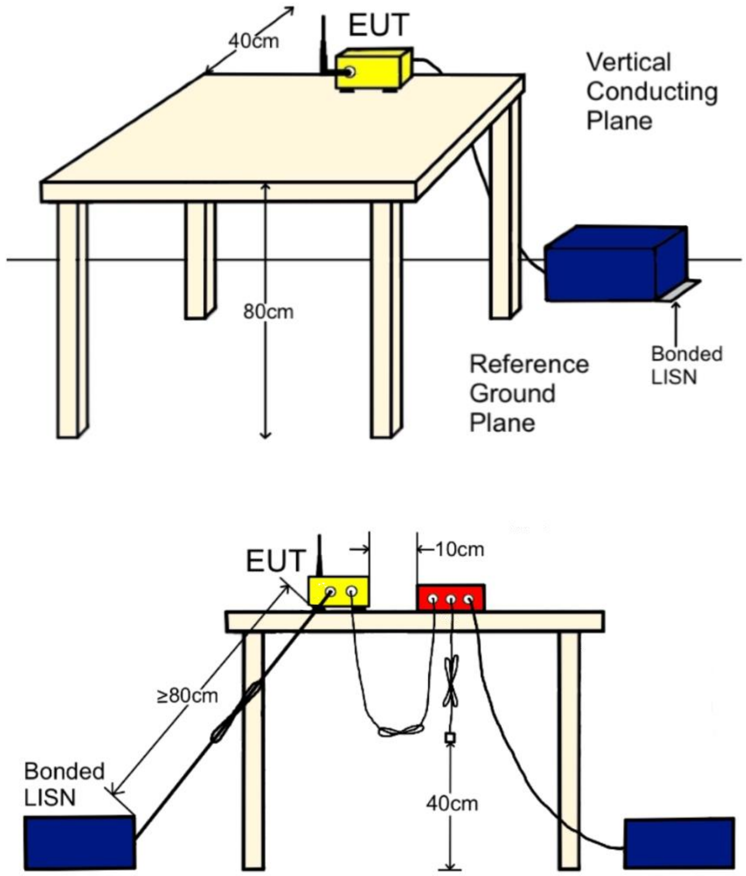
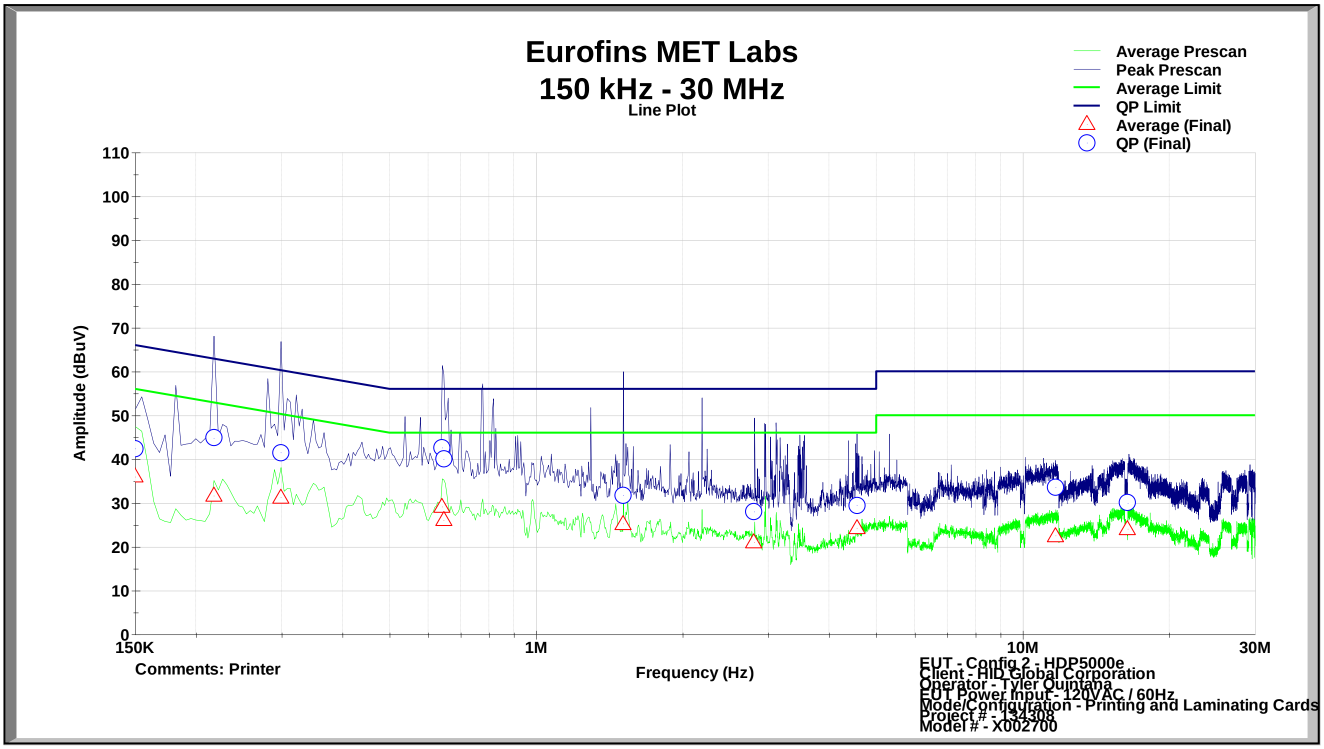



**Figure 2. CEV Test Setup**

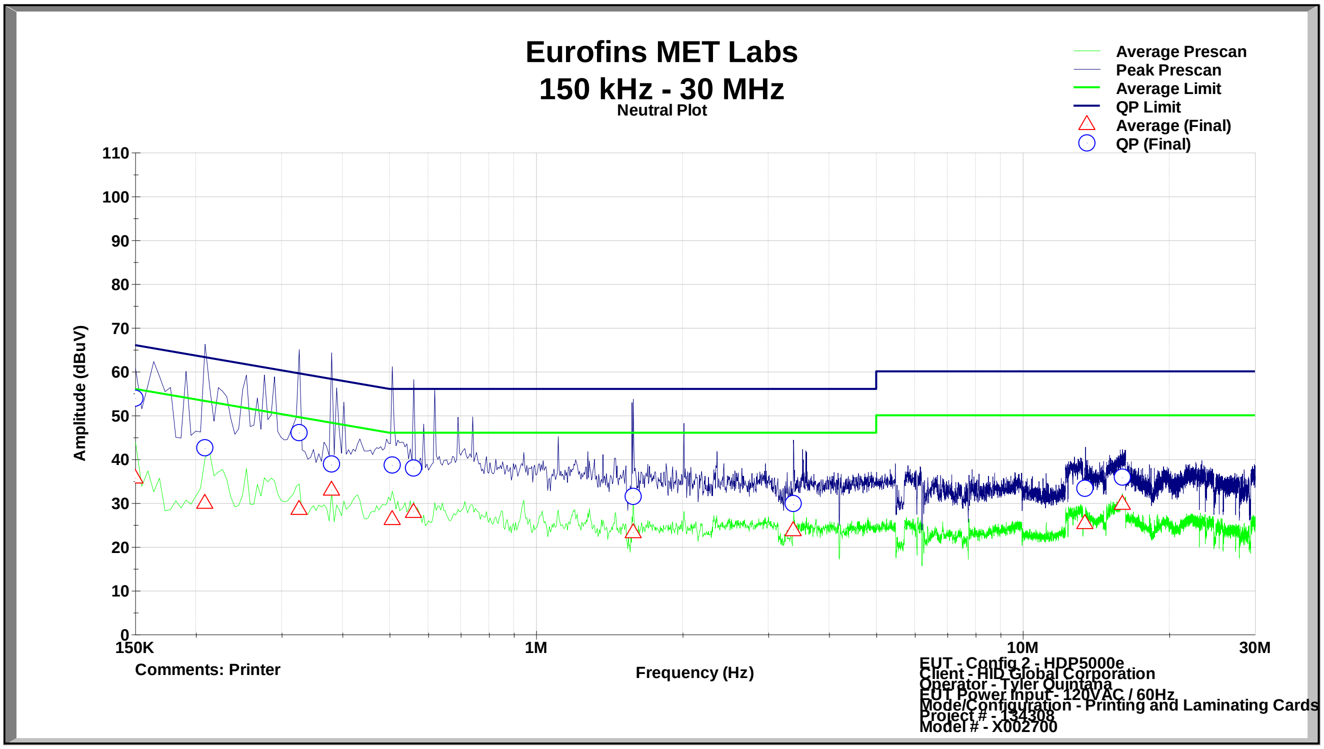
## 15.207(a) Conducted Emissions Test Results




**Conducted Emissions, 15.207(a), Phase (Printer)**

| Frequency (MHz) | Quasi-Peak (dBµV/m) | Quasi-Peak Limit (dBµV/m) | Quasi-Peak Margin (dB) | Average (dBµV/m) | Average Limit (dBµV/m) | Average Margin (dB) |
|---|---|---|---|---|---|---|
| 0.15 | 42.427 | 66 | 23.573 | 35.986 | 56 | 20.014 |
| 0.217 | 44.824 | 64.071 | 19.247 | 31.66 | 54.071 | 22.411 |
| 0.298 | 41.521 | 61.757 | 20.236 | 31.35 | 51.757 | 20.407 |
| 0.64 | 42.643 | 56 | 13.357 | 29.165 | 46 | 16.835 |
| 0.645 | 40.005 | 56 | 15.995 | 26.127 | 46 | 19.873 |
| 1.509 | 31.792 | 56 | 24.208 | 25.309 | 46 | 20.691 |
| 2.805 | 28.028 | 56 | 27.972 | 20.994 | 46 | 25.006 |
| 4.557 | 29.492 | 56 | 26.508 | 24.301 | 46 | 21.699 |
| 11.675 | 33.663 | 60 | 26.337 | 22.572 | 50 | 27.428 |
| 16.425 | 29.997 | 60 | 30.003 | 24.1 | 50 | 25.9 |

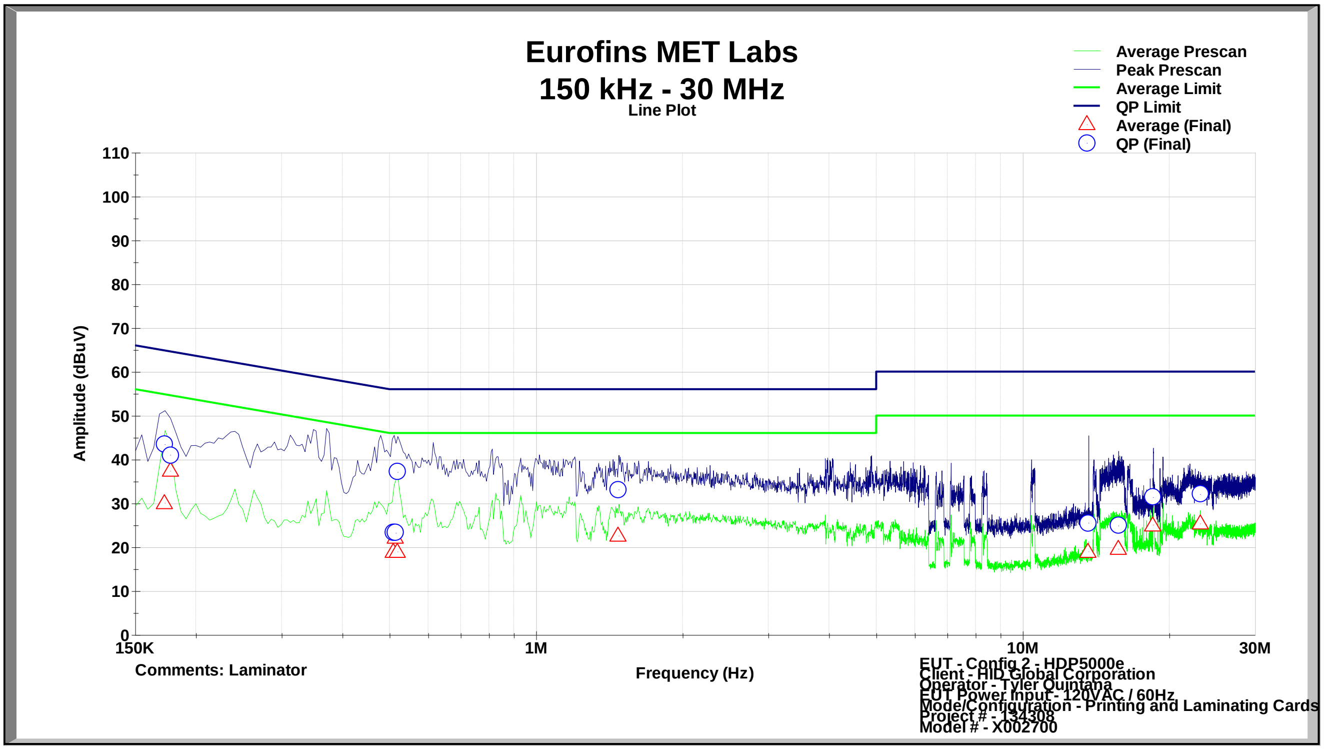
**Table 10. Conducted Emissions, 15.207(a), Phase, Test Results (Printer)**




**Conducted Emissions, 15.207(a), Neutral (Printer)**

| Frequency (MHz) | Quasi-Peak (dBµV) | Quasi-Peak Limit (dBµV) | Quasi-Peak Margin (dB) | Average (dBµV) | Average Limit (dBµV) | Average Margin (dB) |
|---|---|---|---|---|---|---|
| 0.15 | 53.923 | 66 | 12.077 | 35.762 | 56 | 20.238 |
| 0.208 | 42.508 | 64.329 | 21.821 | 30.044 | 54.329 | 24.285 |
| 0.326 | 46.067 | 60.986 | 14.919 | 28.783 | 50.986 | 22.202 |
| 0.38 | 38.784 | 59.443 | 20.659 | 33.023 | 49.443 | 16.42 |
| 0.505 | 38.623 | 56 | 17.377 | 26.319 | 46 | 19.681 |
| 0.559 | 38.059 | 56 | 17.941 | 28.097 | 46 | 17.903 |
| 1.581 | 31.427 | 56 | 24.573 | 23.369 | 46 | 22.631 |
| 3.373 | 29.765 | 56 | 26.235 | 23.956 | 46 | 22.044 |
| 13.435 | 33.405 | 60 | 26.595 | 25.455 | 50 | 24.545 |
| 15.993 | 35.863 | 60 | 24.137 | 29.858 | 50 | 20.142 |

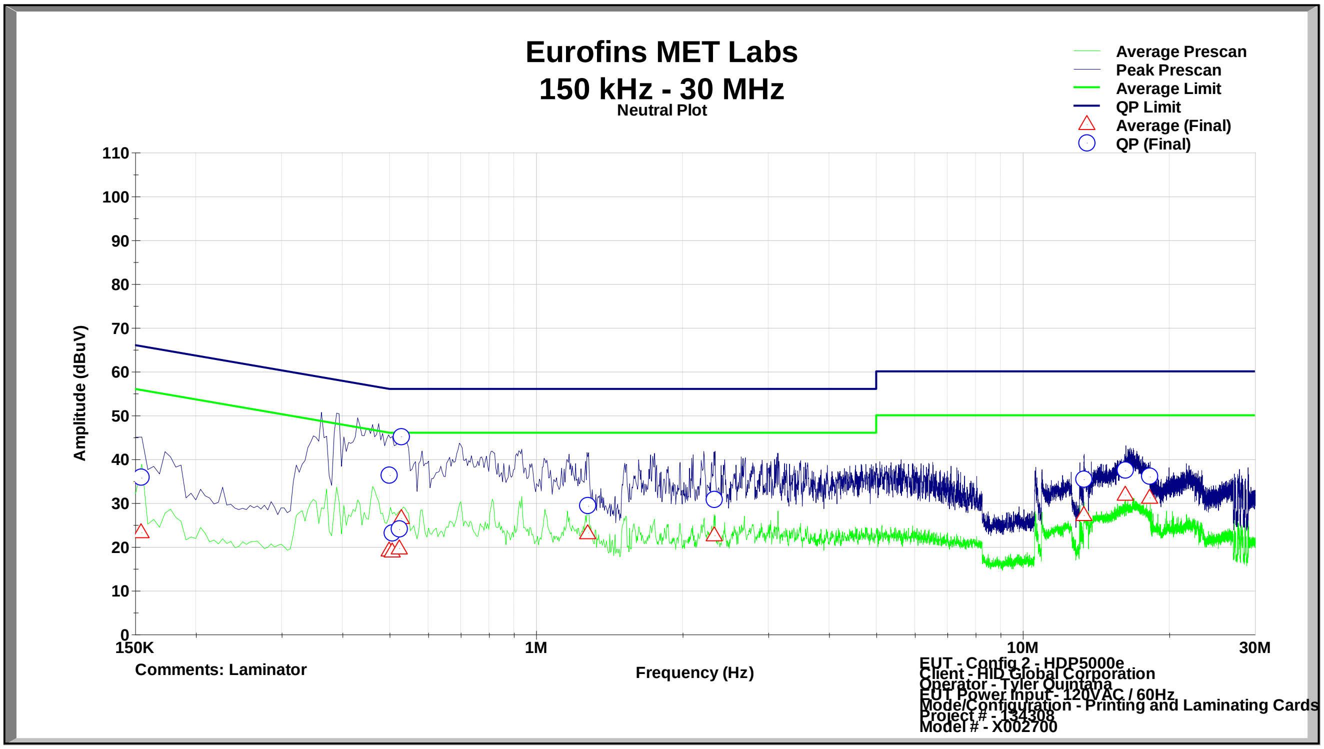
**Table 11. Conducted Emissions, 15.207(a), Neutral, Test Results (Printer)**




**Conducted Emissions, 15.207(a), Phase (Laminator)**

| Frequency (MHz) | Quasi-Peak (dBµV/m) | Quasi-Peak Limit (dBµV/m) | Quasi-Peak Margin (dB) | Average (dBµV/m) | Average Limit (dBµV/m) | Average Margin (dB) |
|---|---|---|---|---|---|---|
| 0.172 | 43.494 | 65.357 | 21.864 | 30.116 | 55.357 | 25.241 |
| 0.177 | 41.057 | 65.229 | 24.171 | 37.434 | 55.229 | 17.795 |
| 0.51 | 23.439 | 56 | 32.561 | 19.019 | 46 | 26.981 |
| 0.514 | 23.293 | 56 | 32.707 | 22.186 | 46 | 23.814 |
| 0.519 | 37.145 | 56 | 18.855 | 19.015 | 46 | 26.985 |
| 1.478 | 33.169 | 56 | 22.831 | 22.618 | 46 | 23.382 |
| 13.643 | 25.577 | 60 | 34.423 | 19.04 | 50 | 30.96 |
| 15.719 | 24.936 | 60 | 35.064 | 19.629 | 50 | 30.371 |
| 18.519 | 31.419 | 60 | 28.581 | 25.116 | 50 | 24.884 |
| 23.128 | 32.105 | 60 | 27.895 | 25.391 | 50 | 24.609 |

**Table 12. Conducted Emissions, 15.207(a), Phase, Test Results (Laminator)**




Conducted Emissions, 15.207(a), Neutral (Laminator)

| Frequency (MHz) | Quasi-Peak (dBµV) | Quasi-Peak Limit (dBµV) | Quasi-Peak Margin (dB) | Average (dBµV) | Average Limit (dBµV) | Average Margin (dB) |
|---|---|---|---|---|---|---|
| 0.154 | 35.752 | 65.871 | 30.119 | 23.282 | 55.871 | 32.589 |
| 0.5 | 36.295 | 56 | 19.705 | 19.302 | 46 | 26.698 |
| 0.505 | 23.135 | 56 | 32.865 | 18.905 | 46 | 27.095 |
| 0.523 | 24.014 | 56 | 31.986 | 19.773 | 46 | 26.227 |
| 0.528 | 45.203 | 56 | 10.797 | 26.536 | 46 | 19.464 |
| 1.28 | 29.315 | 56 | 26.685 | 23.24 | 46 | 22.76 |
| 2.328 | 30.748 | 56 | 25.252 | 22.605 | 46 | 23.395 |
| 13.345 | 35.4 | 60 | 24.6 | 27.213 | 50 | 22.787 |
| 16.227 | 37.474 | 60 | 22.526 | 31.886 | 50 | 18.114 |
| 18.244 | 36.012 | 60 | 23.988 | 31.274 | 50 | 18.726 |

Table 13. Conducted Emissions, 15.207(a), Neutral, Test Results (Laminator)

## Occupied Bandwidth Measurements

### § 15.215(c) 20 dB Occupied Bandwidth

**Test Requirement(s):** **§ 15.215 (c)** Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

**Test Procedure:** The transmitter was on and transmitting at the highest output power. The bandwidth of the fundamental frequency was measured with the spectrum analyzer. Per ANSI C63.10: 2020 the RBW should be between 1% and 5% of the occupied bandwidth.

**Test Results:** The HDP5000e was compliant with this requirement. The 20dB Bandwidth is shown on the plots on the following pages.

**Test Engineer(s):** Bryan Taylor

**Test Date(s):** 3/4/2024 - 11/13/2024

## RSS-GEN (6.7) 99% Occupied Bandwidth

**Test Requirements:** The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

**Test Procedure:** The EUT was on and transmitting at the highest output power. The bandwidth of the fundamental frequency was measured with the spectrum analyzer. Per ANSI C63.10: 2020 the RBW should be between 1% and 5% of the occupied bandwidth.

**Test Results** The HDP5000e was compliant with this requirement. The 99% Bandwidth is shown on the plots on the following pages.

**Test Engineer(s):** Bryan Taylor

**Test Date(s):** 3/4/2024 - 11/13/2024

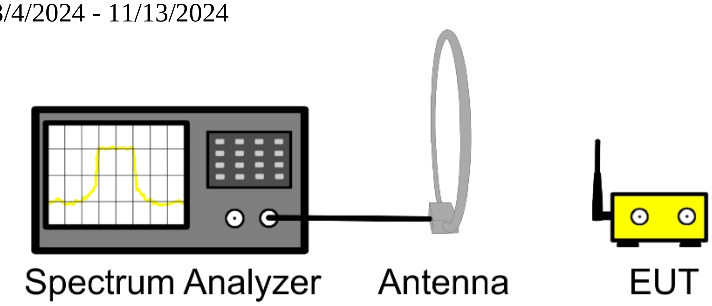
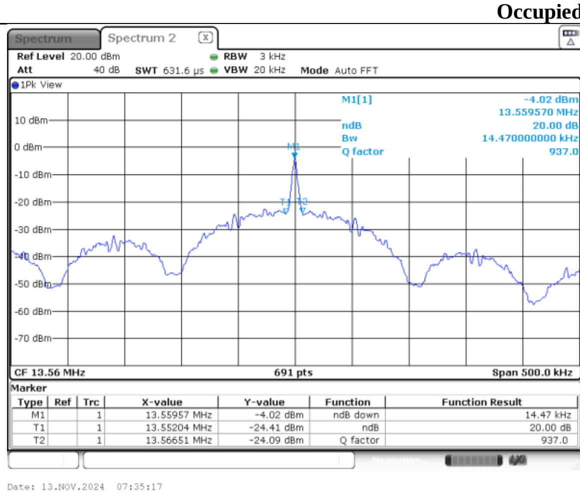



**Figure 3. 20 dB Bandwidth and 99% Bandwidth Test Setup**

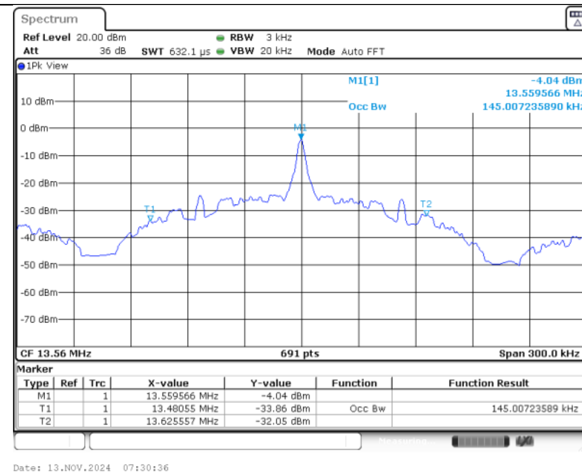
| Transmitter Under Test | Center Frequency (MHz) | 20 dB Bandwidth | 99% Bandwidth |
|---|---|---|---|
| Laminator Upper RFID | 13.56MHz | 14.47kHz | 145.00kHz |
| Laminator Lower RFID | 13.56MHz | 15.20kHz | 149.78kHz |

**Table 14. Occupied Bandwidth Test Results**

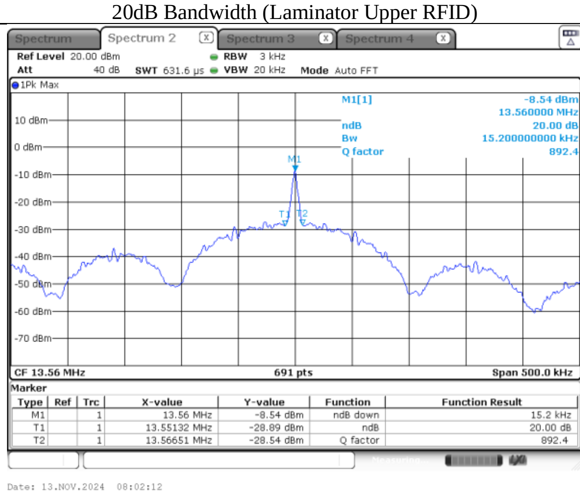
## Occupied Bandwidth Plots



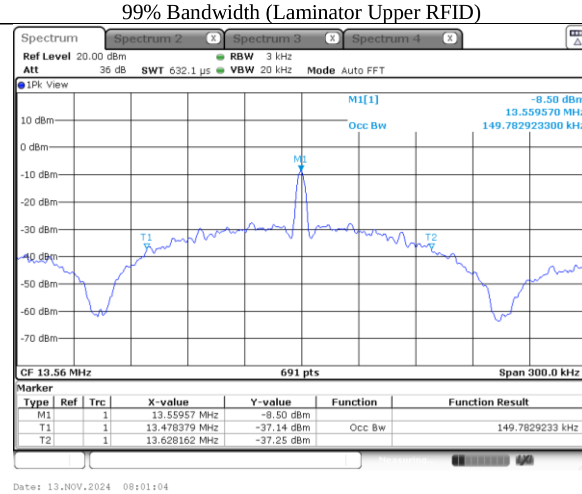

20dB Bandwidth (Laminator Upper RFID)




99% Bandwidth (Laminator Upper RFID)




20dB Bandwidth (Laminator Lower RFID)




99% Bandwidth (Laminator Lower RFID)

## Electromagnetic Compatibility Criteria for Intentional Radiators

## § 15.225(a-d) Field Strength of Radiated Emissions

**Test Requirement(s):**

**15.225 (a)** The field strength of any emissions within the band 13.553 – 13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

**15.225 (b)** Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

**15.225 (c)** Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

**15.225 (d)** The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

## RSS-210 (B.6.a(ii - iv)) Field Strength of Radiated Emissions

**Test Requirement(s):**

**RSS-210 (B.6.a(i))** The field strength of any emissions within the band 13.553 – 13.567 MHz shall not exceed 15.848 mV/m (84 dBμV/m) at 30 meters.

**RSS-210 (B.6.a(ii))** Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 μV/m (50.5 dBμV/m) at 30 meters.

**RSS-210 (B.6.a(iii))** Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 μV/m (40.5 dBμV/m) at 30 meters.

**RSS-210 (B.6.a(iv))** The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in RSS-GEN Section 8.9.

**Test Procedure:** The EUT was set to transmit and placed on a 0.8 m-high wooden stand inside a semi-anechoic chamber. The method of testing and test conditions of ANSI C63.10: 2013 were used. For measurements below 30 MHz a loop antenna placed 3m away from the unit was used. For measurements above 30 MHz a biconalog antenna placed 10 m away from the unit was used. Measurements below 30 MHz were conducted with the loop antenna at coaxial (parallel) and planar (perpendicular) orientations. Measurements above 30 MHz were conducted with the biconalog antenna in the vertical and horizontal polarizations. A peak detector was used to perform a pre-scan from 9 kHz to 10 times the fundamental frequency. Spurious emissions within 20 dB of the applicable limit were measured using a quasi-peak detector and recorded in the subsequent section. Peak emissions that were observed over the appliable limit were determined to be digital emissions subject to the requirements of FCC Part 15 Subpart B and ICES-003 subsection 6.2 for Class A devices.

The measurements were made at 3 m with the loop antenna (below 30MHz). They were then extrapolated to 30m or 300 m using the following correction factors which were applied to the limit.

40log (30/3) = 40 dB
40log (300/3) = 80 dB

The measurements made at 10 m with the biconilog antenna (above 30MHz) were then extrapolated to the 3m using the following correction factor.

20log (10/3) = +10.46 dB

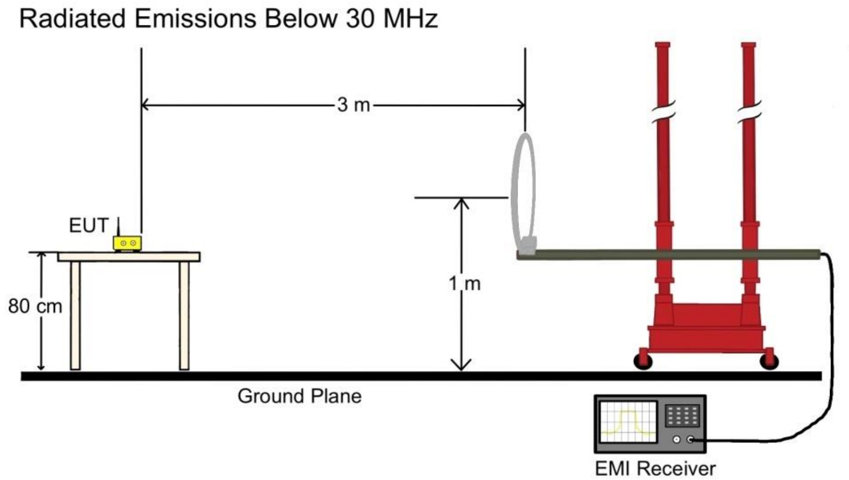



**Figure 4: Radiated Emissions (Below 30MHz), Test Setup**

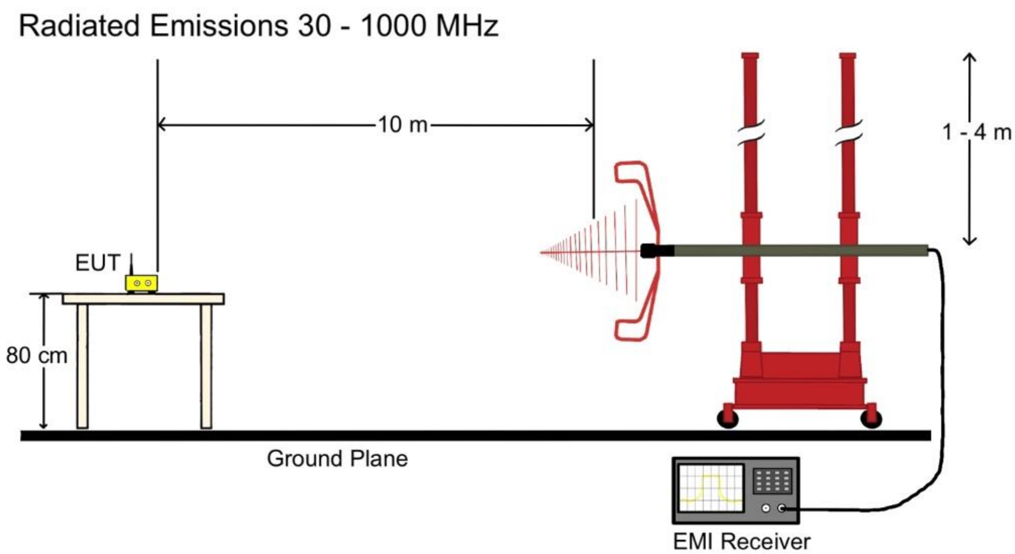



**Figure 5. Radiated Emissions (Above 30MHz), Test Setup**

**Test Results:** The HDP5000e was compliant with the requirements of **§15.225(a - d)** and **RSS-210 RSS-210 (B.6.a(i, ii, iii, and iv))**.

**Test Engineer(s):** Sergio Gutierrez

**Test Date(s):** 3/4/2024 - 11/12/2024

## Radiated Field Strength Test Results

| Frequency [MHz] | QPK Level [dBµV/m] [1] | QPK Limit [dBµV/m] | QPK Margin [dB] | Correction [dB] [2] | Polarization | Azimuth [deg] | Antenna Height [m] | Meas. BW [kHz] | Result |
|---|---|---|---|---|---|---|---|---|---|
| 13.137 | 36.29 | 80.50 | 44.21 | 10.62 | H | 347 | 1 | 9.000 | Pass |
| 13.137 | 30.31 | 80.50 | 50.19 | 10.62 | V | 285.3 | 1 | 9.000 | Pass |
| 13.506 | 36.51 | 90.50 | 53.99 | 10.61 | H | 11.6 | 1 | 9.000 | Pass |
| 13.533 | 33.83 | 90.50 | 56.67 | 10.61 | V | 270.4 | 1 | 9.000 | Pass |
| 13.560 | 57.90 | 124.00 | 66.10 | 10.61 | H | 3.2 | 1 | 9.000 | Pass |
| 13.560 | 52.12 | 124.00 | 71.88 | 10.61 | V | 261.1 | 1 | 9.000 | Pass |
| 13.587 | 35.40 | 90.50 | 55.10 | 10.61 | H | 181.1 | 1 | 9.000 | Pass |
| 13.587 | 33.07 | 90.50 | 57.43 | 10.61 | V | 309.5 | 1 | 9.000 | Pass |
| 13.983 | 33.74 | 80.50 | 46.76 | 10.59 | H | 0 | 1 | 9.000 | Pass |
| 13.983 | 29.17 | 80.50 | 51.33 | 10.59 | V | 104.2 | 1 | 9.000 | Pass |

**Figure 6. Worst Case In-Band Field Strength (Laminator Upper RFID)**

| Frequency [MHz] | Peak Level [dBµV/m][1] | Limit [dBµV/m] | Margin [dB] | Correction [dB][2] | Polarization | Azimuth [deg] | Antenna Height [m] | Meas. BW [kHz] | Result |
|---|---|---|---|---|---|---|---|---|---|
| 0.107 | 37.66 | 107.03 | 69.36 | 11.34 | V | 91.3 | 1 | 0.200 | Pass |
| 0.107 | 42.86 | 107.02 | 64.16 | 11.35 | H | 139.9 | 1 | 0.200 | Pass |
| 0.600 | 45.51 | 72.04 | 26.53 | 11.49 | H | 255.3 | 1 | 9.000 | Pass |
| 0.600 | 50.47 | 72.04 | 21.56 | 11.49 | V | 78.1 | 1 | 9.000 | Pass |
| 0.641 | 43.68 | 71.47 | 27.80 | 11.36 | H | 115 | 1 | 9.000 | Pass |
| 0.641 | 43.41 | 71.47 | 28.06 | 11.36 | V | 122.4 | 1 | 9.000 | Pass |

**Figure 7. Worst Case Field Strength Below 30MHz (Laminator Upper RFID)**

[1] This corrected level includes the factor shown in the "correction" column. The corrected level = Raw Reading + Correction Factor. The raw reading is not shown in the table above.
[2] This correction factor includes cable loss in dB, preamplifier gain in dB, and an electric field antenna factor in (dB/m).

| Frequency [MHz] | QPK Level [dBµV/m] [1] | QPK Limit [dBµV/m] | QPK Margin [dB] | Correction [dB] [2] | Polarization | Azimuth [deg] | Antenna Height [m] | Meas. BW [kHz] | Result |
|---|---|---|---|---|---|---|---|---|---|
| 62.760 | 22.93 | 29.55 | 6.62 | -13.10 | V | 101.7 | 1.64 | 120.000 | Pass |
| 75.000 | 24.98 | 29.55 | 4.57 | -12.22 | V | 64.1 | 1.5 | 120.000 | Pass |
| 148.110 | 24.96 | 33.07 | 8.11 | -7.63 | V | 82.7 | 1.49 | 120.000 | Pass |
| 157.350 | 21.72 | 33.07 | 11.35 | -7.77 | V | 58.7 | 1.5 | 120.000 | Pass |
| 176.280 | 29.32 | 33.07 | 3.75 | -8.43 | H | 8.7 | 3.56 | 120.000 | Pass |
| 203.400 | 27.44 | 33.07 | 5.63 | -7.20 | V | 41.6 | 1.1 | 120.000 | Pass |
| 257.640 | 31.71 | 35.57 | 3.86 | -7.10 | V | 44.7 | 1.04 | 120.000 | Pass |
| 264.720 | 27.82 | 35.57 | 7.75 | -6.39 | H | 202.2 | 3.77 | 120.000 | Pass |
| 350.010 | 30.77 | 35.57 | 4.80 | -4.22 | H | 91.8 | 2.65 | 120.000 | Pass |
| 350.010 | 32.23 | 35.57 | 3.34 | -4.02 | V | 225.1 | 0.99 | 120.000 | Pass |
| 902.730 | 25.23 | 35.57 | 10.34 | 6.65 | V | 196.3 | 3.58 | 120.000 | Pass |
| 913.230 | 21.70 | 35.57 | 13.87 | 6.42 | H | 98.5 | 1.67 | 120.000 | Pass |

**Figure 8. Worst Case Field Strength Above 30MHz (Laminator Upper RFID)**

| Frequency [MHz] | QPK Level [dBµV/m] [3] | QPK Limit [dBµV/m] | QPK Margin [dB] | Correction [dB] [4] | Polarization | Azimuth [deg] | Antenna Height [m] | Meas. BW [kHz] | Result |
|---|---|---|---|---|---|---|---|---|---|
| 13.137 | 36.74 | 80.50 | 43.76 | 10.62 | H | 358.5 | 1 | 9.000 | Pass |
| 13.137 | 30.12 | 80.50 | 50.38 | 10.62 | V | 105.5 | 1 | 9.000 | Pass |
| 13.506 | 34.08 | 90.50 | 56.42 | 10.61 | H | 329 | 1 | 9.000 | Pass |
| 13.533 | 29.65 | 90.50 | 60.85 | 10.61 | V | 259.7 | 1 | 9.000 | Pass |
| 13.560 | 57.34 | 124.00 | 66.66 | 10.61 | H | 358.1 | 1 | 9.000 | Pass |
| 13.560 | 51.67 | 124.00 | 72.33 | 10.61 | V | 77.1 | 1 | 9.000 | Pass |
| 13.587 | 35.68 | 90.50 | 54.82 | 10.61 | H | 27.7 | 1 | 9.000 | Pass |
| 13.587 | 29.40 | 90.50 | 61.10 | 10.61 | V | 284.7 | 1 | 9.000 | Pass |
| 13.983 | 32.24 | 80.50 | 48.26 | 10.59 | H | 8.2 | 1 | 9.000 | Pass |
| 13.983 | 25.16 | 80.50 | 55.34 | 10.59 | V | 114.8 | 1 | 9.000 | Pass |

**Figure 9. Worst Case In-Band Field Strength (Laminator Lower RFID)**

| Frequency [MHz] | Peak Level [dBµV/m] [1] | Limit [dBµV/m] | Margin [dB] | Correction [dB] [2] | Polarization | Azimuth [deg] | Antenna Height [m] | Meas. BW [kHz] | Result |
|---|---|---|---|---|---|---|---|---|---|
| 0.087 | 41.95 | 108.86 | 66.91 | 11.68 | V | 154.5 | 1 | 0.200 | Pass |
| 0.107 | 39.61 | 107.03 | 67.43 | 11.34 | H | 137.2 | 1 | 0.200 | Pass |
| 0.107 | 39.75 | 107.02 | 67.27 | 11.35 | V | 137.7 | 1 | 0.200 | Pass |
| 0.443 | 51.53 | 94.69 | 43.15 | 11.28 | H | 246.6 | 1 | 9.000 | Pass |
| 0.591 | 51.46 | 72.17 | 20.71 | 11.32 | V | 133.4 | 1 | 9.000 | Pass |
| 0.596 | 48.68 | 72.10 | 23.42 | 11.41 | H | 219.1 | 1 | 9.000 | Pass |

**Figure 10. Worst Case Field Strength Below 30MHz (Laminator Lower RFID)**

[3] This corrected level includes the factor shown in the “correction” column. The corrected level = Raw Reading + Correction Factor. The raw reading is not shown in the table above.
[4] This correction factor includes cable loss in dB, preamplifier gain in dB, and an electric field antenna factor in (dB/m).

| Frequency [MHz] | QPK Level [dBµV/m] [1] | QPK Limit [dBµV/m] | QPK Margin [dB] | Correction [dB] [2] | Polarization | Azimuth [deg] | Antenna Height [m] | Meas. BW [kHz] | Result |
|---|---|---|---|---|---|---|---|---|---|
| 62.760 | 23.27 | 29.55 | 6.28 | -13.10 | V | 88.7 | 2.47 | 120.000 | Pass |
| 75.030 | 23.66 | 29.55 | 5.89 | -12.22 | V | 77.6 | 1.96 | 120.000 | Pass |
| 81.060 | 22.96 | 29.55 | 6.59 | -13.22 | V | 49.5 | 1.5 | 120.000 | Pass |
| 151.530 | 27.24 | 33.07 | 5.83 | -7.79 | V | 98.7 | 1.2 | 120.000 | Pass |
| 162.720 | 24.56 | 33.07 | 8.51 | -7.87 | V | 109.4 | 1.04 | 120.000 | Pass |
| 176.280 | 27.75 | 33.07 | 5.32 | -8.43 | H | 6.4 | 3.26 | 120.000 | Pass |
| 262.110 | 27.88 | 35.57 | 7.69 | -6.55 | V | 55.2 | 1.47 | 120.000 | Pass |
| 264.120 | 30.28 | 35.57 | 5.29 | -6.45 | H | 199.2 | 3.31 | 120.000 | Pass |
| 350.010 | 30.80 | 35.57 | 4.77 | -4.22 | H | 103.4 | 2.27 | 120.000 | Pass |
| 350.010 | 31.75 | 35.57 | 3.82 | -4.02 | V | 230.9 | 1.09 | 120.000 | Pass |

**Figure 11. Worst Case Field Strength Above 30MHz (Laminator Lower RFID)**

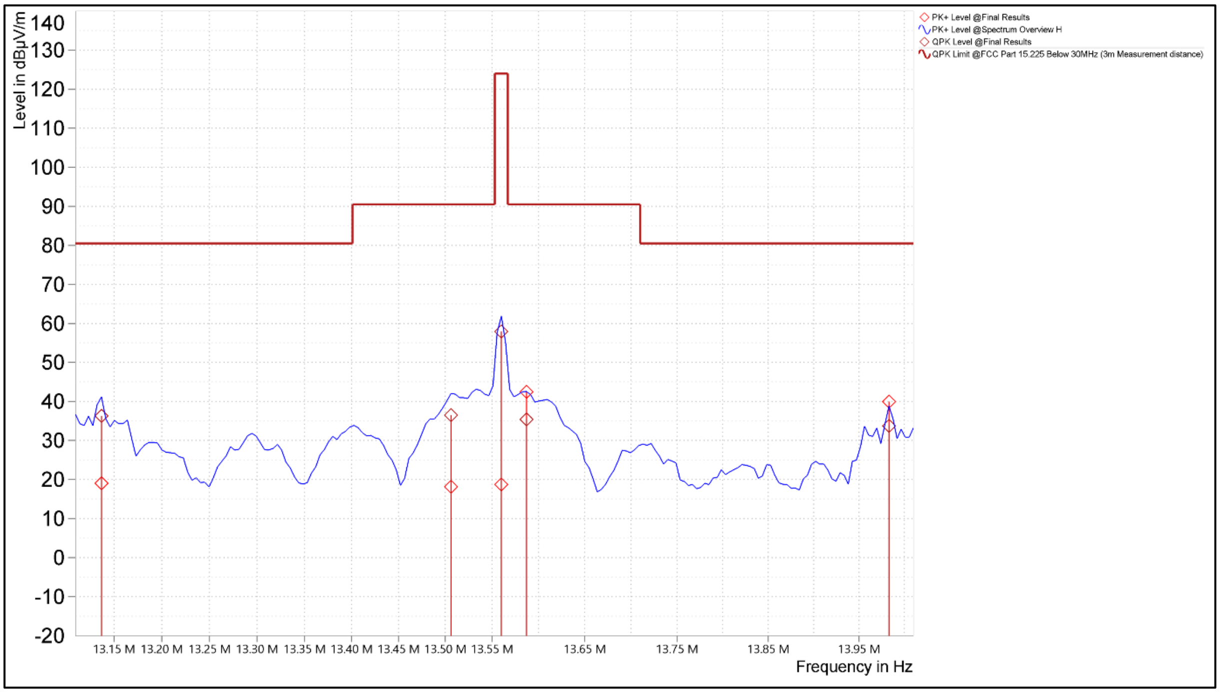



**Figure 12. In-Band Emission Mask (Coplanar Loop, Laminator Upper RFID)**

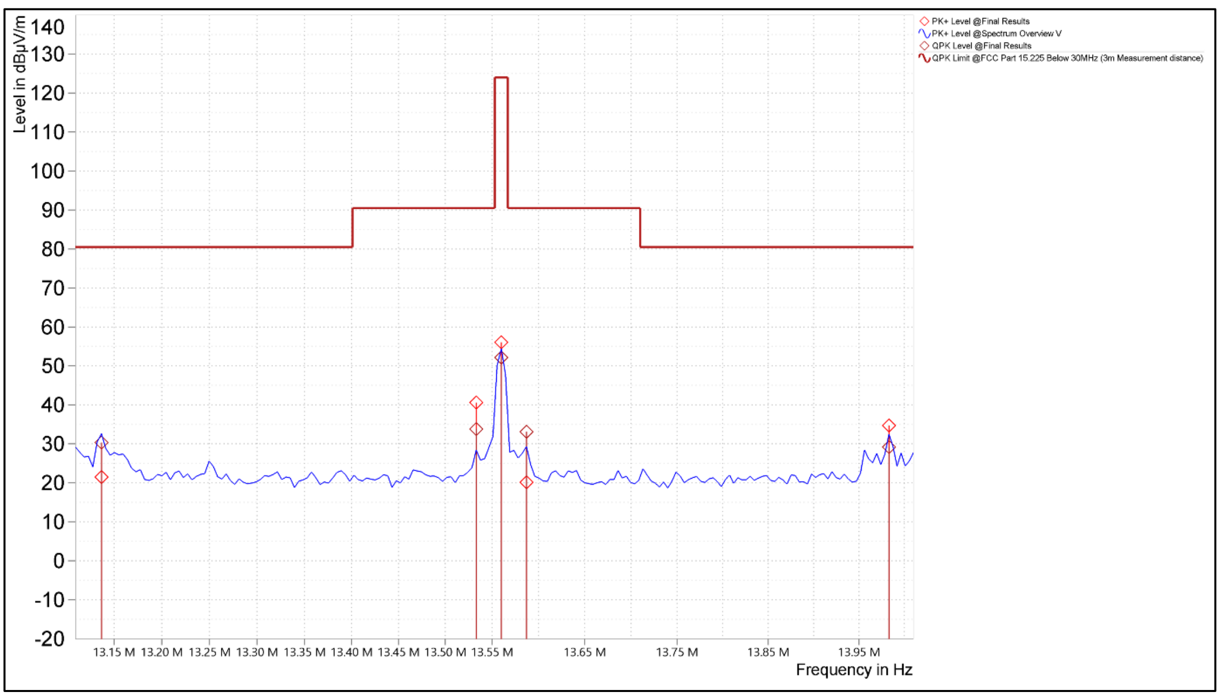



**Figure 13. In-Band Emission Mask (Coaxial Loop, Laminator Upper RFID)**

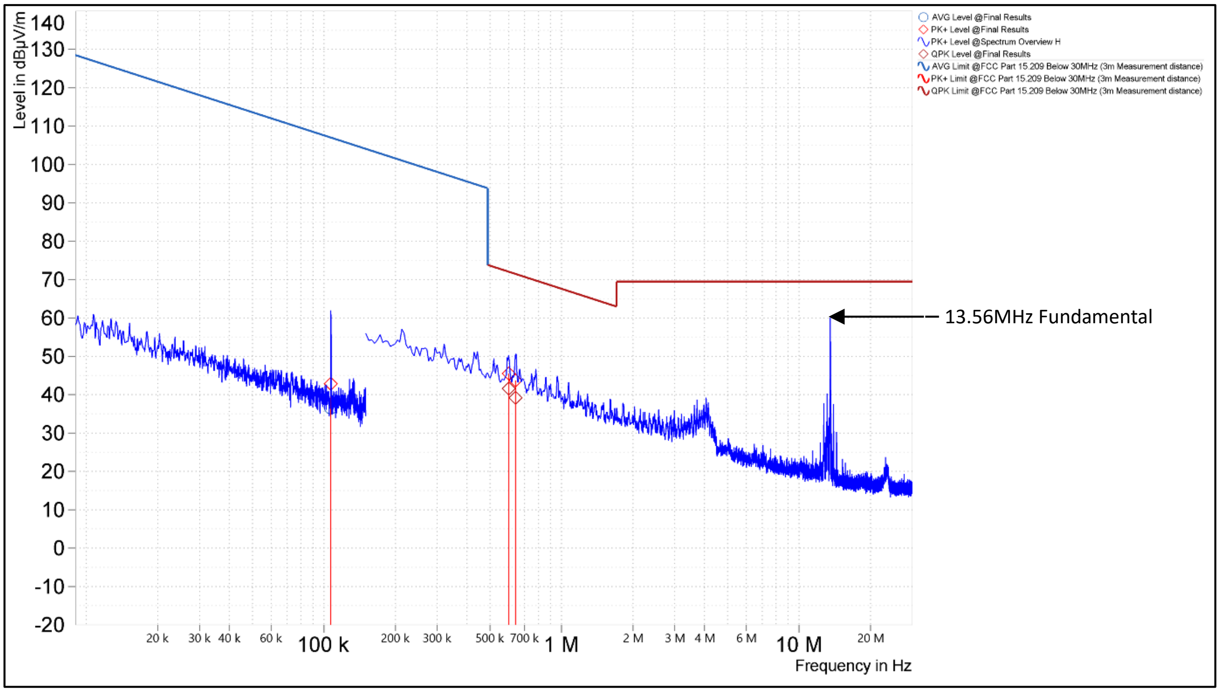



**Figure 14. Out of Band Emissions Below 30MHz (Coplanar Loop, Laminator Upper RFID)**

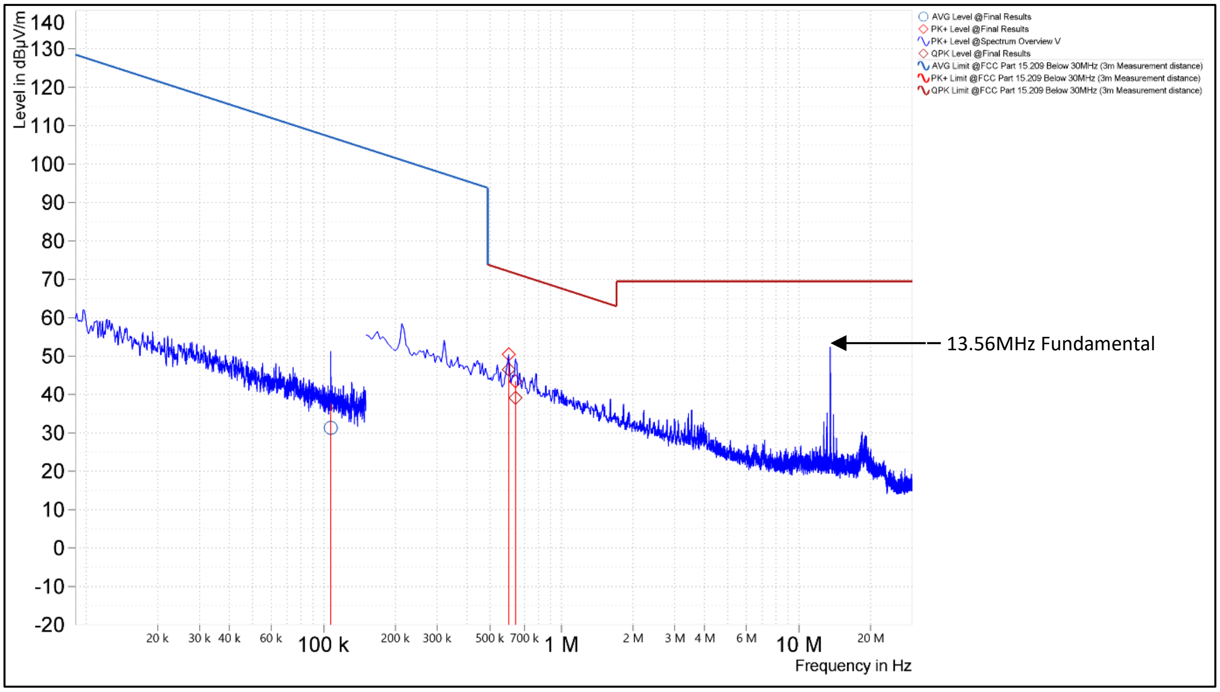



**Figure 15. Out of Band Emissions Below 30MHz (Coaxial Loop, Laminator Upper RFID)**

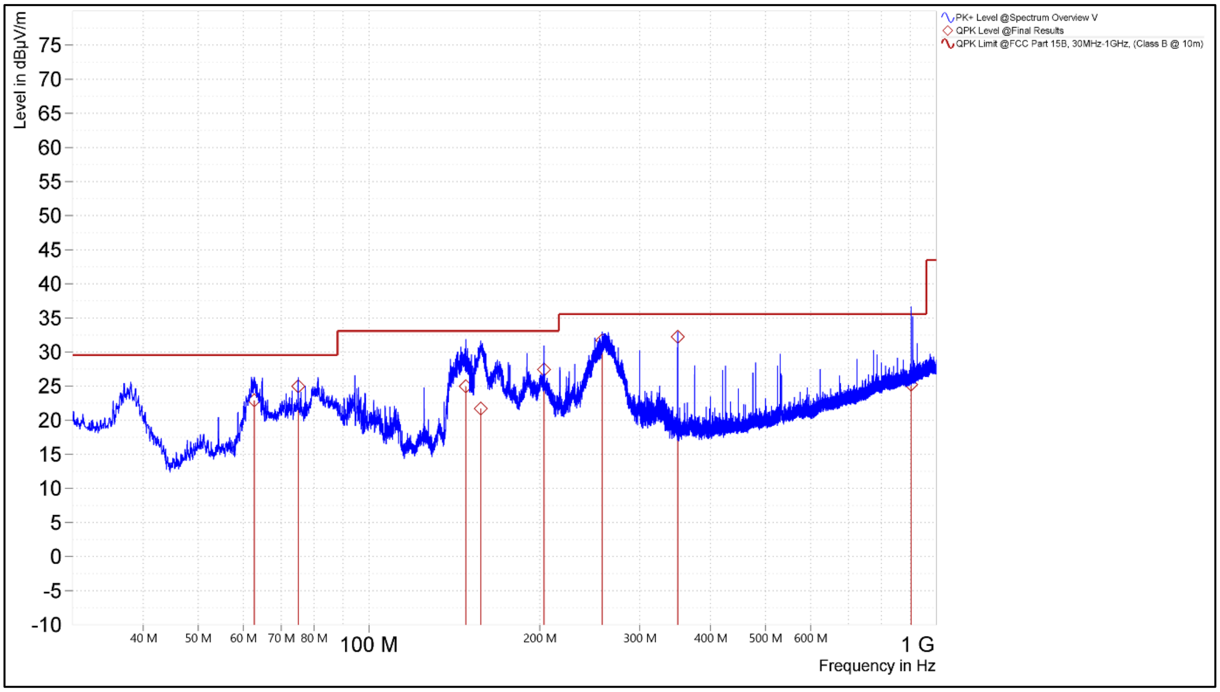



**Figure 16. Out of Band Emissions Above 30MHz (Vertical Polarity, Laminator Upper RFID)**

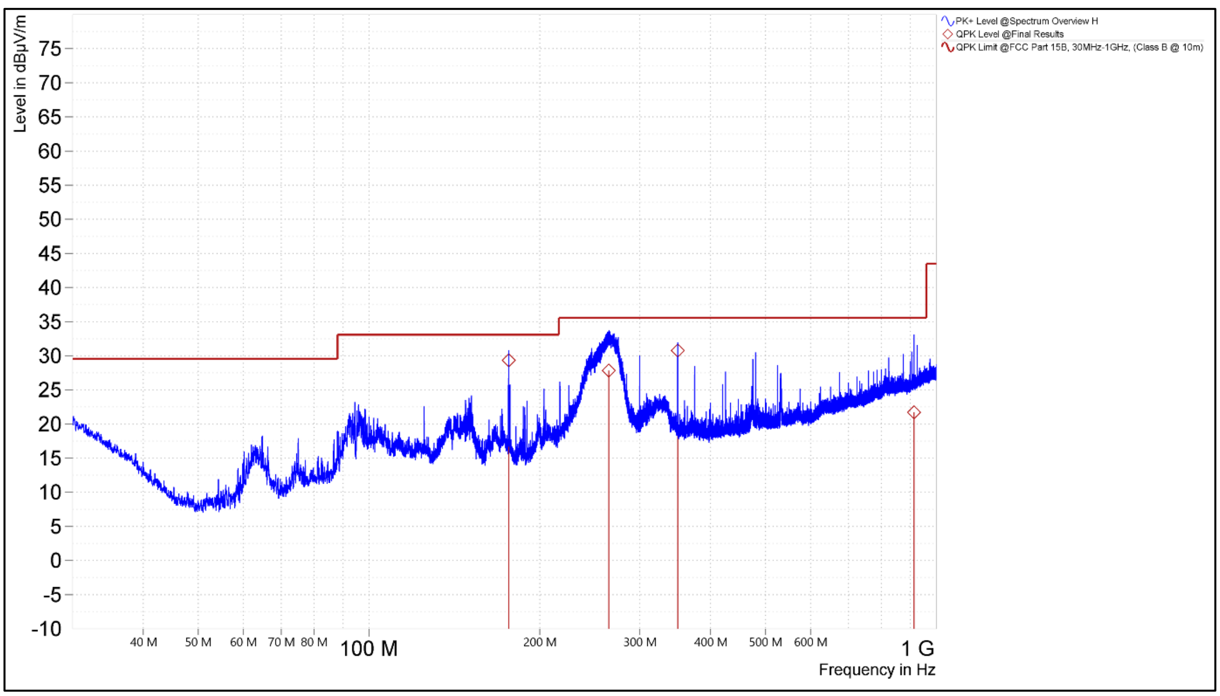



**Figure 17. Out of Band Emissions Above 30MHz (Horizontal Polarity, Laminator Upper RFID)**

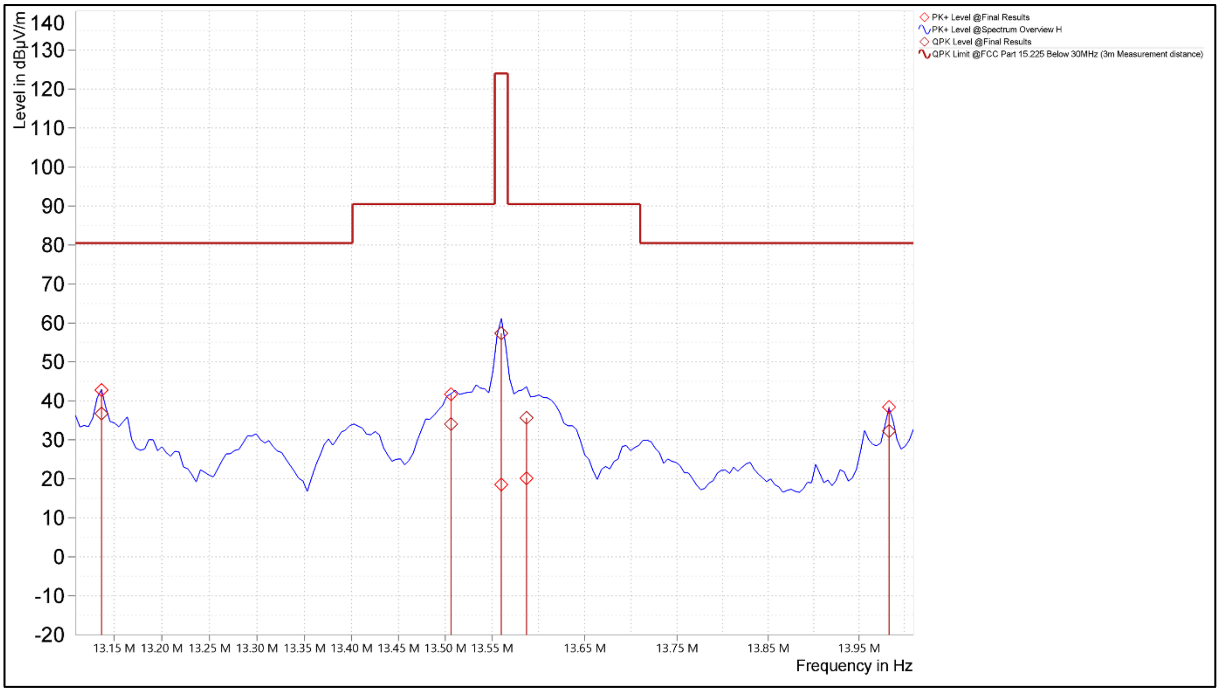



**Figure 18. In-Band Emission Mask (Coplanar Loop, Laminator Lower RFID)**

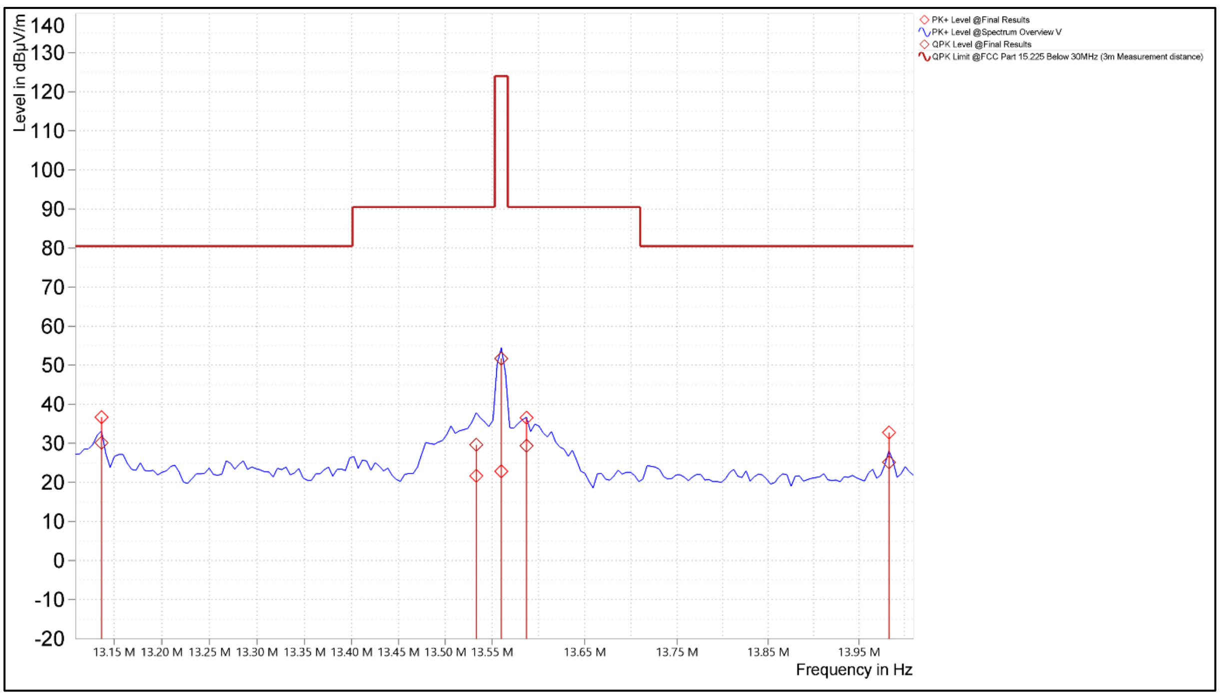



**Figure 19. In-Band Emission Mask (Coaxial Loop, Laminator Lower RFID)**

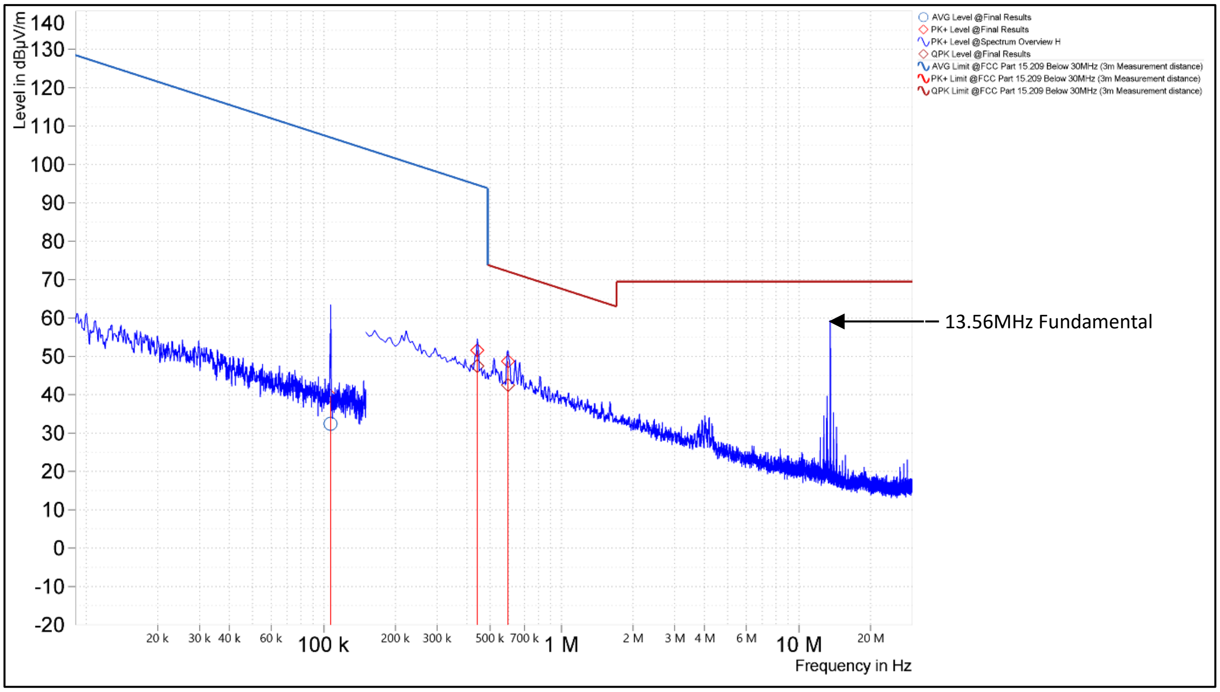



Figure 20. Out of Band Emissions Below 30MHz (Coplanar Loop, Laminator Lower RFID)

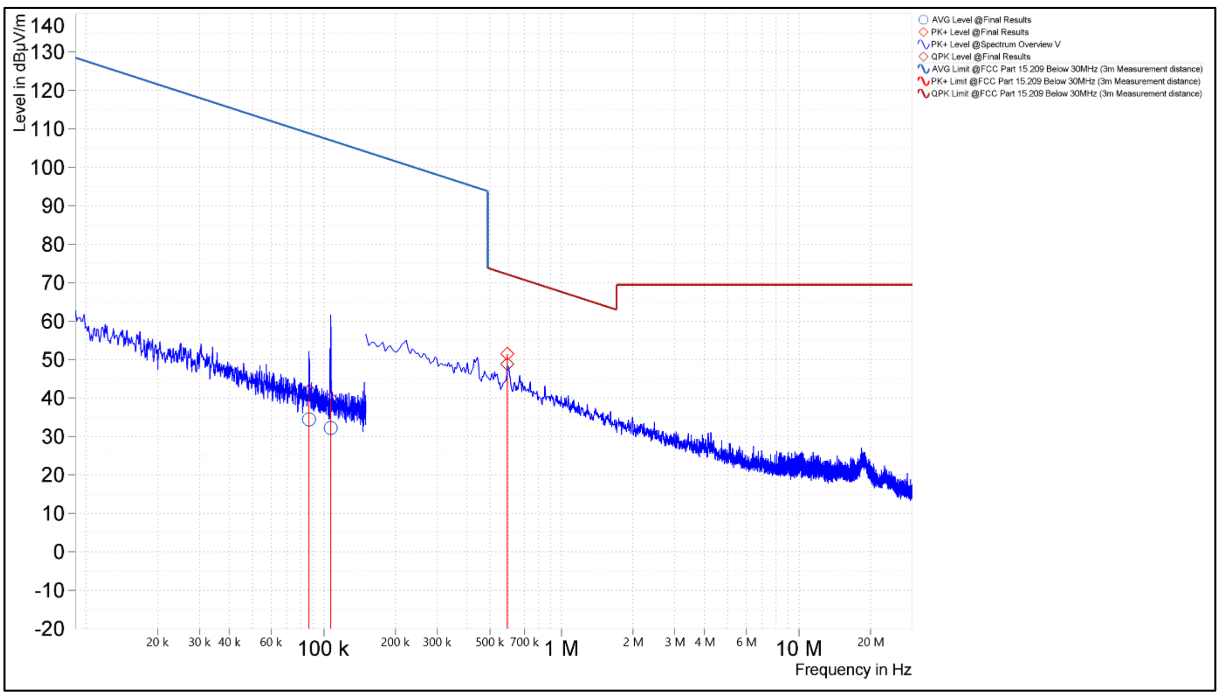



Figure 21. Out of Band Emissions Below 30MHz (Coaxial Loop, Laminator Lower RFID)

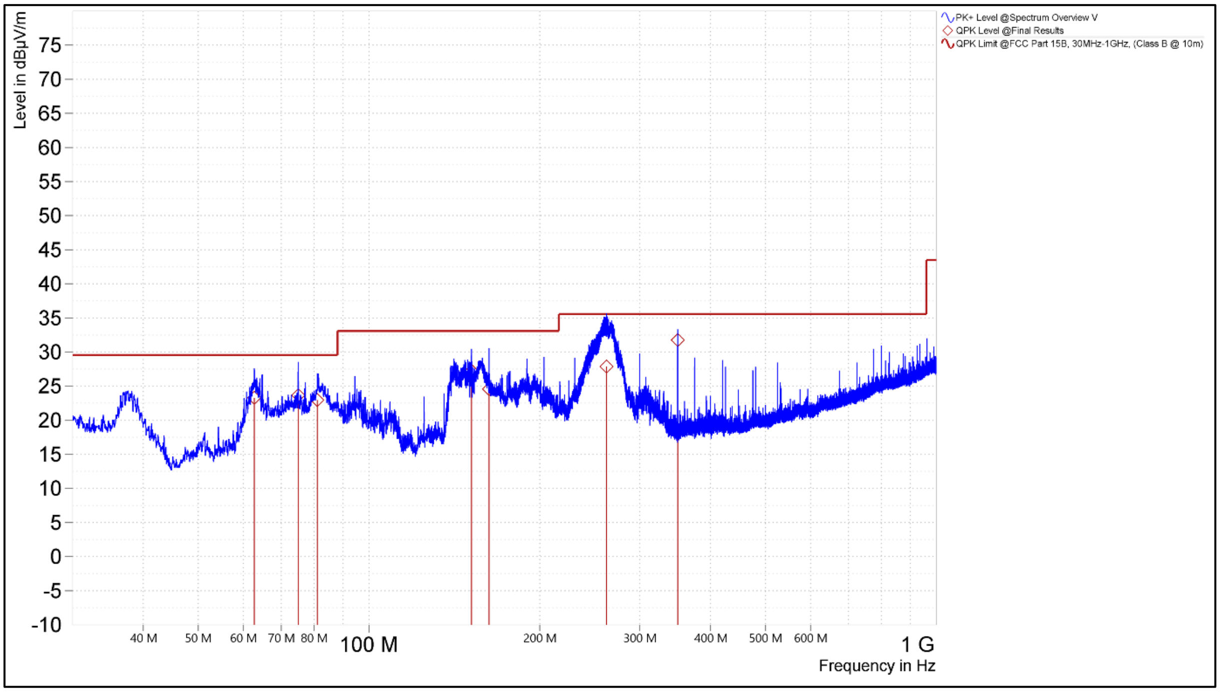



**Figure 22. Out of Band Emissions Above 30MHz (Vertical Polarity, Laminator Lower RFID)**

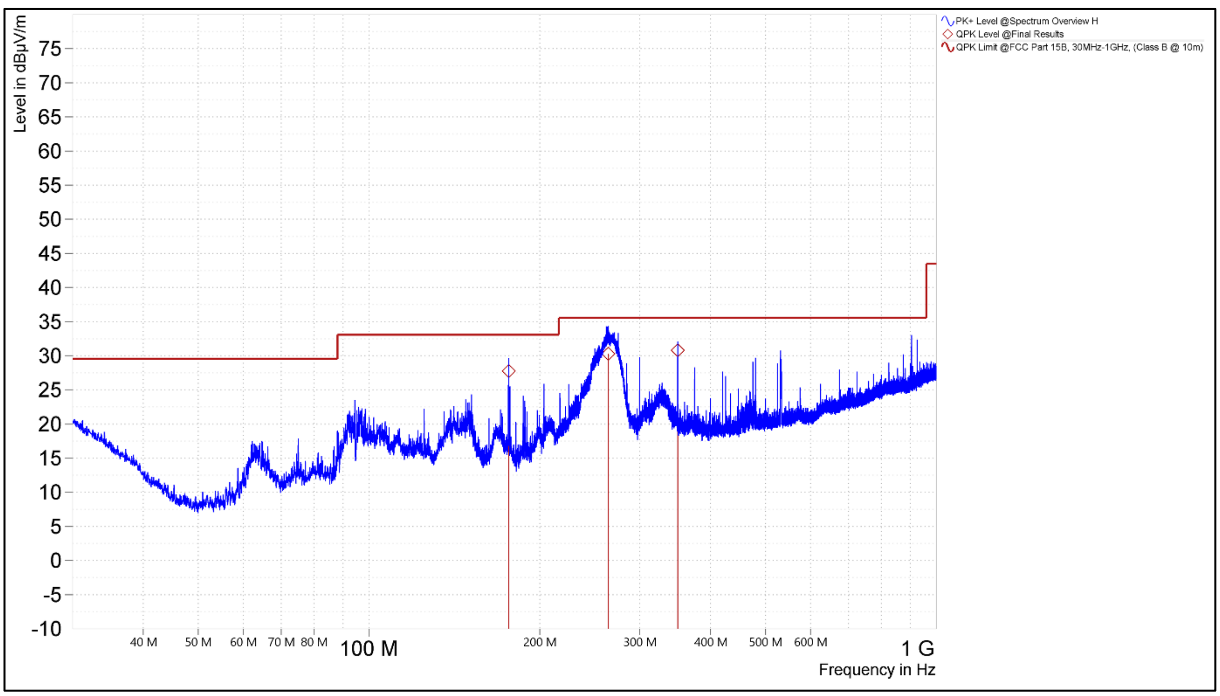



**Figure 23. Out of Band Emissions Above 30MHz (Horizontal Polarity, Laminator Lower RFID)**

## Electromagnetic Compatibility Criteria for Intentional Radiators

## Frequency Stability

**Test Requirement(s):** **15.225(e)** The frequency tolerance of the carrier signal shall be maintained within +/-0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

**RSS-210 (B.6.b)** The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% (± 100 ppm) of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

**Test Procedure:** Measurements are in accordance with section 6.8 of ANSI C63.10. The EUT was placed in the Environmental Chamber and allowed to reach desired temperature. A spectrum analyzer was connected to a magnetic field loop antenna and used to measure the frequency drift via a radiated path measurement. The EUT was set to transmit in the operating frequency range. Frequency drift was investigated for the extreme temperatures and nominal temperature, until the unit is stabilized then recorded the reading in tabular format with the temperature range of -20º to 50ºC. The frequency stability tests were performed with the use of a DC power supply powering the product.

**Test Results:** The HDP5000e was compliant with Part 15.225 (e) and RSS-210 (B.6.b) requirement(s) of this section.

**Test Engineer(s):** Bryan Taylor

**Test Date(s):** 11/12/2024

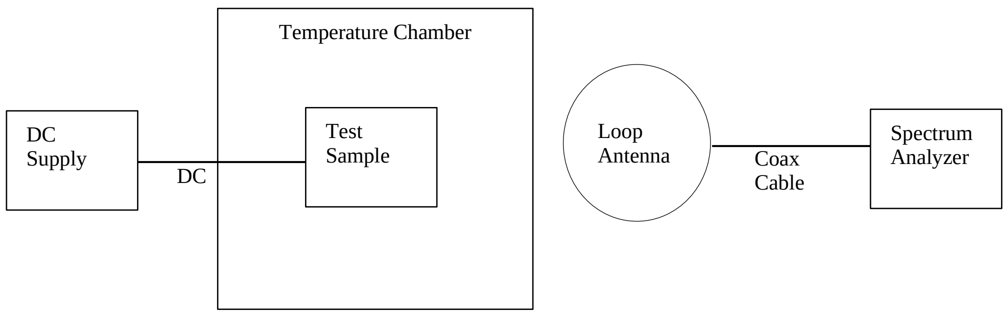



**Figure 24. Temperature Stability Test Setup**

| | | |
|---|---|---|
| **Operating Frequency:** | 13,560,000 | Hz |
| **Reference Voltage:** | 120 | VAC |
| **Deviation Limit:** | 0.01 | % |

| Voltage % | Voltage (VAC) | Temp (°C) | Measured Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | Limit (%) |
|---|---|---|---|---|---|---|
| 100% | 120 | -30 | 13,560,018 | 18 | 0.0001 | 0.01 |
| 100% | 120 | -20 | 13,560,017 | 17 | 0.0001 | 0.01 |
| 100% | 120 | -10 | 13,560,098 | 98 | 0.0007 | 0.01 |
| 100% | 120 | 0 | 13,560,103 | 103 | 0.0008 | 0.01 |
| 100% | 120 | 10 | 13,560,102 | 102 | 0.0008 | 0.01 |
| 100% | 120 | 20 | 13,560,101 | 101 | 0.0007 | 0.01 |
| 100% | 120 | 30 | 13,560,103 | 103 | 0.0008 | 0.01 |
| 100% | 120 | 40 | 13,560,105 | 105 | 0.0008 | 0.01 |
| 100% | 120 | 50 | 13,560,105 | 105 | 0.0008 | 0.01 |
| 115% | 138 | 20 | 13,560,103 | 103 | 0.0008 | 0.01 |
| 85% | 102 | 20 | 13,560,104 | 104 | 0.0008 | 0.01 |

**Figure 25. Frequency Stability Test Results (Laminator Upper RFID)**

| | | |
|---|---|---|
| **Operating Frequency:** | 13,560,000 | Hz |
| **Reference Voltage:** | 120 | VAC |
| **Deviation Limit:** | 0.01 | % |

| Voltage % | Voltage (VAC) | Temp (°C) | Measured Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | Limit (%) |
|---|---|---|---|---|---|---|
| 100% | 120 | -30 | 13,560,109 | 109 | 0.0008 | 0.01 |
| 100% | 120 | -20 | 13,560,106 | 106 | 0.0008 | 0.01 |
| 100% | 120 | -10 | 13,560,103 | 103 | 0.0008 | 0.01 |
| 100% | 120 | 0 | 13,560,101 | 101 | 0.0007 | 0.01 |
| 100% | 120 | 10 | 13,560,109 | 109 | 0.0008 | 0.01 |
| 100% | 120 | 20 | 13,560,105 | 105 | 0.0008 | 1.01 |
| 100% | 120 | 30 | 13,560,104 | 104 | 0.0008 | 0.01 |
| 100% | 120 | 40 | 13,560,109 | 109 | 0.0008 | 0.01 |
| 100% | 120 | 50 | 13,560,111 | 111 | 0.0008 | 0.01 |
| 115% | 138 | 20 | 13,560,104 | 104 | 0.0008 | 0.01 |
| 85% | 102 | 20 | 13,560,105 | 105 | 0.0008 | 0.01 |

**Figure 26. Frequency Stability Test Results (Laminator Lower RFID)**

## Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| MET Asset # | Description | Manufacturer | Model | Last Cal Date | Cal Due Date |
|---|---|---|---|---|---|
| 1A1234 | FSV Signal Analyzer | Rohde & Schwarz | FSV 40 | 1/23/2023 | 1/23/2025 |
| 1A1250 | EMI Test Receiver | Rohde & Schwarz | ESW44 | 04/08/2024 | 04/08/2025 |
| 1A1176 | Active Loop Antenna (9KHz-30MHz) | ETS-Lindgren | 6502 | 08/22/2024 | 08/22/2026 |
| 1A1147 | Bi-Log Antenna | Sunol Sciences Corp | JB3 | 04/06/2023 | 04/06/2025 |
| 1A1065 | EMI Test Receiver | Rohde & Schwarz | ESCI | 08/20/2024 | 08/20/2025 |
| 1A1177 | Pulse Limiter | Rohde & Schwarz | ESH3Z2 | 12/14/2023 | 12/14/2024 |
| 3A3402 | True-RMS Multimeter | Fluke | 179 | 03/27/2024 | 03/27/2025 |
| 3A3215 | ATC Digital Ohmmeter | Valhalla Scientific | 4150 | 05/24/2024 | 05/24/2025 |
| 3A3399 | Environmental Chamber | Thermotron | SM-32-8200 | 05/14/2024 | 05/14/2025 |
| 1A1099 | Generator | Com-Power | CGO-51000 | See Note | |
| 1A1044 | Generator | Com-Power | CG-520 | See Note | |
| 1A1073 | Multi Device Controller | ETS | 2090 | See Note | |
| 1A1074 | System Controller | Panasonic | WV-CU101 | See Note | |
| 1A1080 | Multi-Device | ETS | 2090 | See Note | |
| 1A1180 | Preamplifier | Miteq | AMF-7D-01001800-22-10P | See Note | |
| 3A3219 | DC Power Supply | Topward | 6303A | See Note | |

**Table 15. Test Equipment List (November, 2024)**

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

| MET Asset # | Description | Manufacturer | Model | Last Cal Date | Cal Due Date |
|---|---|---|---|---|---|
| 1A1234 | FSV Signal Analyzer | Rohde & Schwarz | FSV 40 | 1/23/2023 | 1/23/2025 |
| 1A1083 | EMI Test Receiver | Rohde & Schwarz | ESU40 | 11/20/2023 | 11/20/2024 |
| 1A1176 | Active Loop Antenna (9KHz-30MHz) | ETS-Lindgren | 6502 | 7/13/2023 | 7/13/2024 |
| 1A1147 | Bi-Log Antenna | Suno Sciences Corp | JB3 | 04/06/2023 | 04/06/2025 |
| 1A1065 | EMI Receiver | Rohde & Schwarz | ESCI | 8/4/2023 | 8/4/2024 |
| 1A1177 | Pulse Limiter | Rohde & Schwarz | ESH3Z2 | 12/14/2023 | 12/14/2024 |
| 1A1122 | LISN | TESEQ | NNB 51 | 09/21/2023 | 09/21/2024 |
| 1A1149 | DC Milliohm Meter | GW INSTEK | GOM-802 | 09/24/2023 | 09/24/2024 |
| 1A1164 | True-RMS Multimeter | Fluke | 117 | 11/06/2023 | 11/06/2024 |
| 1A1225 | Environmental Chamber | Espec | EXP-2H/New | 5/16/2023 | 5/16/2024 |
| 1A1099 | Generator | Com-Power | CGO-51000 | See Note | |
| 1A1044 | Generator | Com-Power | CG-520 | See Note | |
| 1A1073 | Multi Device Controller | ETS | 2090 | See Note | |
| 1A1074 | System Controller | Panasonic | WV-CU101 | See Note | |
| 1A1080 | Multi-Device | ETS | 2090 | See Note | |
| 1A1180 | Preamplifier | Miteq | AMF-7D-01001800-22-10P | See Note | |
| 3A3219 | DC Power Supply | Topward | 6303A | See Note | |

**Table 16. Test Equipment List (March, 2024)**

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

# End of Report