HEADQUARTERS: 914 WEST PATAPSCO AVENUE • BALTIMORE, MARYLAND 21230 • PHONE (410) 354-3300 • FAX (410) 354-3313

12/18/2024

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

Dear Nic Holmes,

Enclosed is the EMC test report for compliance testing of HID Global Corporation (US), HID Signo PIV Contact Reader, 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: WIRA133283_FCC_IC_HF RFID Rev 2

13.56MHz RFID
Test Report

for the

HID Global Corporation (US)
HID Signo PIV Contact Reader (Model: 40TC)

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
∅	9/13/2024	Initial Issue.
1	11/07/2024	Customer Requested Changes.
2	12/18/2024	Reviewer Requested Changes.

Table of Contents

List of Tables

List of Figures

Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the HID Global Corporation (US) HID Signo PIV Contact Reader, with the requirements of Part 15, §15.225 and RSS-210 Issue10, 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 HID Signo PIV Contact Reader. 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 HID Signo PIV Contact Reader, 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 HID022810. 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 HID Signo PIV Contact Reader.

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) HID Signo PIV Contact Reader.

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

Product Name:	HID Signo PIV Contact Reader	
Model(s) Tested:	40TC	
FCCID:	JQ6-SIGNO40TC	
ICID:	2236B-SIGNO40TC	
Sample Number:	24775-17	
Equipment Specifications:	Primary Power:	12VDC
	Type of Modulation(s):	ASK
	Equipment Code:	DXX
	Maximum field Strength:	87.54dBuV/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	
Test Date(s):	08/26/2024 to 08/31/2024	

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.

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.

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

FCC Lab Info:
Designation Number: US1127

D. Measurement Uncertainty

Test Method	Typical Expanded Uncertainty	K	Confidence Level
Occupied Bandwidth Measurements	±4.52 Hz	2	95%
Conducted Power Measurements	±2.74 dB	2	95%
Power Spectral Density Measurements	±2.74 dB	2	95%
Conducted Spurious Emissions	±2.80 dB	2	95%
Conducted Emissions (Mains)	±2.97 dB	2	95%
Radiated Spurious Emissions (9kHz – 1GHz)	±2.95 dB	2	95%
Radiated Spurious Emissions (1GHz - 40GHz)	±3.54 dB	2	95%

Table 4. Uncertainty Calculations Summary

E. Description of Test Sample

HID Signo PIV Contact Reader is a Access Control credential reader that is equipped with LF, HF, BLE and Contact card read ability.

The intended use of the product is for gaining secure access into building, sites or places via the use of a secure credential in the form of a LF credential card, HF credential card, NFC enabled smart phone, BLE Mobile credential or Contact chip credential.

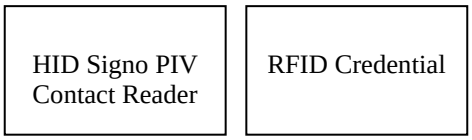


Figure 1. Block Diagram of Test Configuration

F. Equipment Configuration

A 13.56MHz credential was placed in the field in front of the HID Signo PIV Contact Reader which was configured to allow continuous reading whilst the credential was present..

G. Support Equipment

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

Ref. ID	Name/Description	Manufacturer	Model Number	Customer Supplied Calibration Data
None	Laptop Computer	Lenovo	ThinkPad	None

Table 5. Support Equipment

The RFID credential used during the testing is shown below:

Figure 2: Front / Back Photo of the 13.56MHz RFID Credential

H. Ports and Cabling Information

Ref. Id	Port Name on EUT	Cable Description or reason for no cable	Qty	Length as tested (m)	Max Length (m)	Shielded? (Y/N)	Termination Box ID & Port Name
---	DC Input	DC Input	1	1m	---	No	12V DC Power Source

Table 6. Ports and Cabling Information

I. Mode of Operation

The RF credential was placed in the field in front of the HID Signo PIV Contact Reader which was configured to allow continuous reading whilst the credential was present

Transmit Band	Modulation	Channel Frequencies Tested	Exercising Method
13.56MHz	ASK	13.56MHz	13.56MHz RFID Credential

Table 7. Test Channels Utilized

J. 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.

K. 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 HID Signo PIV Contact Reader as evaluated, was compliant as the antenna was permanently attached.

Test Engineer(s): Bryan Taylor

Test Date(s): 8/26/2024

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.

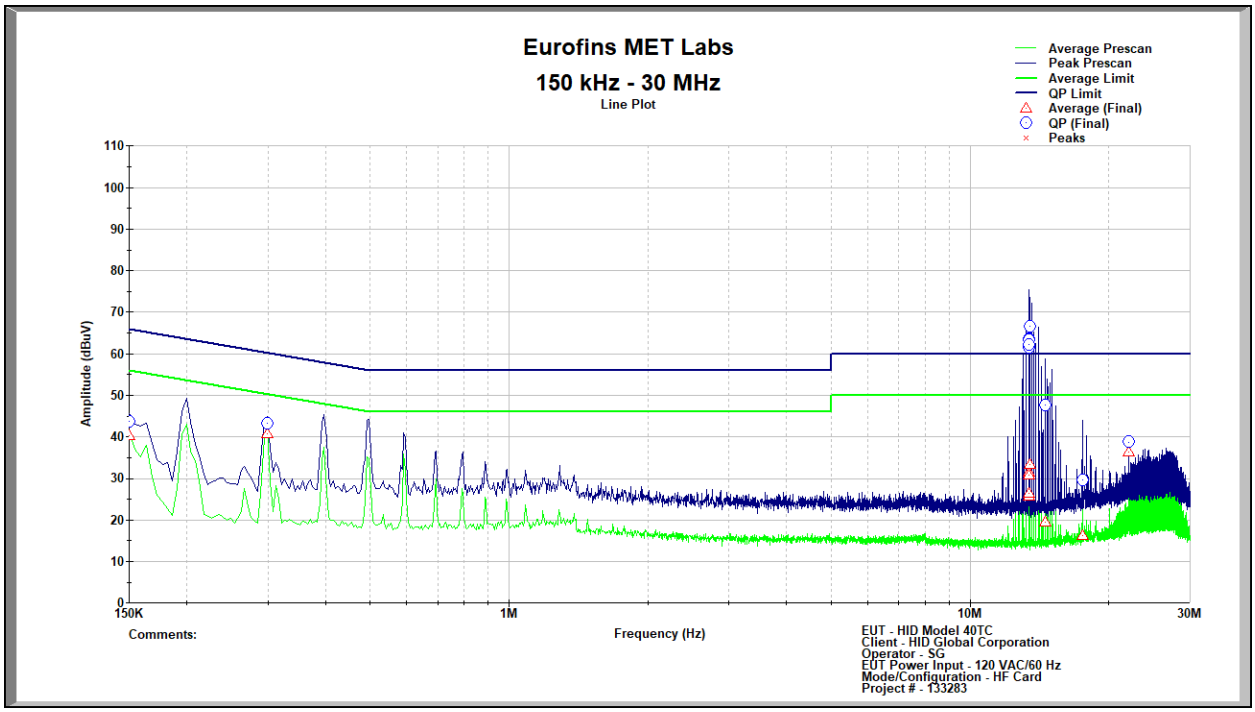
Test Procedure: The EUT was placed on a 0.8 m-high non-conducting table above a ground plane. The EUT was situated such that the back of the EUT was 0.4 m from one wall of the vertical ground plane, and the remaining sides of the EUT were no closer than 0.8 m from any other conductive surface. The EUT 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 HID Signo PIV Contact Reader was compliant with this requirement.

Test Engineer(s): Sergio Gutierrez

Test Date(s): 8/28/2024

15.207(a) Conducted Emissions Test Results

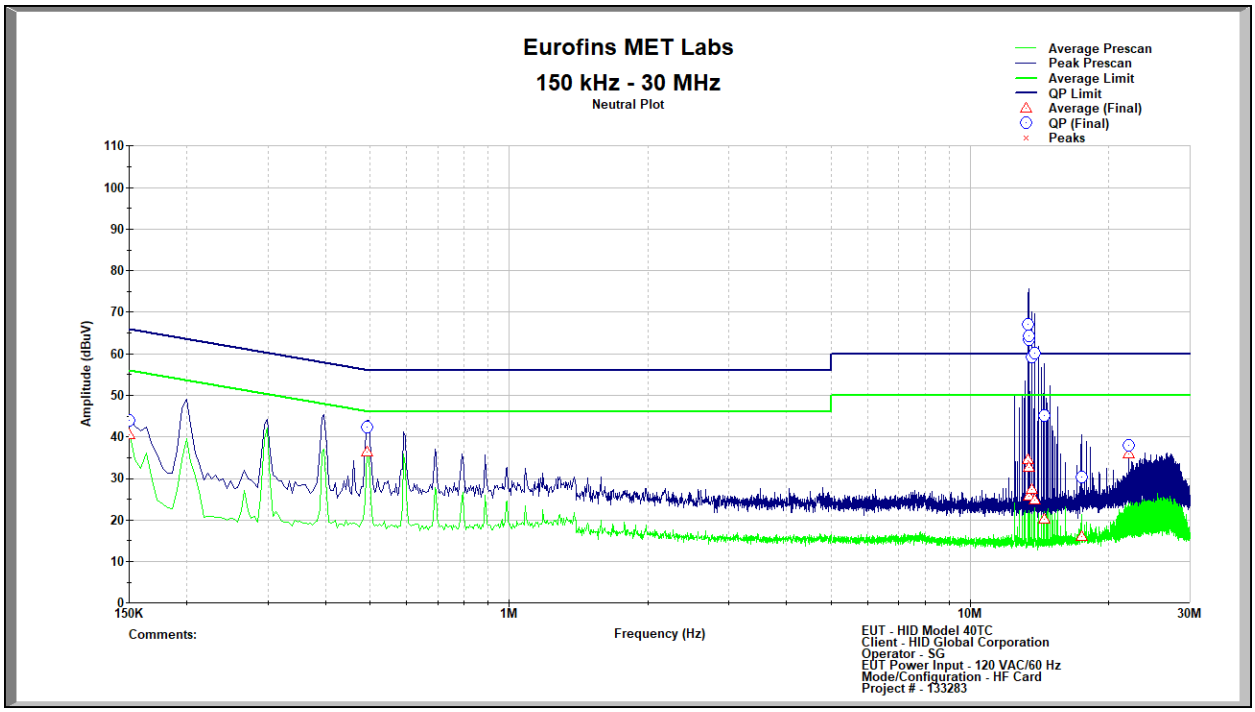


Conducted Emissions, 15.207(a), Phase

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)
0.150	43.671	66.000	22.329	40.307	56.000	15.693
0.298	43.223	61.757	18.534	40.708	51.757	11.049
14.547	47.617	60.000	12.383	19.515	50.000	30.485
17.509	29.733	60.000	30.267	16.173	50.000	33.827
22.125	38.772	60.000	21.228	36.310	50.000	13.690

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

15.207(a) Conducted Emissions Test Results



Conducted Emissions, 15.207(a), Neutral

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)
0.150	43.884	66.000	22.116	40.545	56.000	15.455
0.492	42.425	56.229	13.804	36.241	46.229	9.988
14.489	45.169	60.000	14.831	20.040	50.000	29.960
17.447	30.379	60.000	29.621	16.056	50.000	33.944
22.125	37.886	60.000	22.114	35.975	50.000	14.025

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

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 HID Signo PIV Contact Reader 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): 8/26/2024

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 HID Signo PIV Contact Reader 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): 8/26/2024

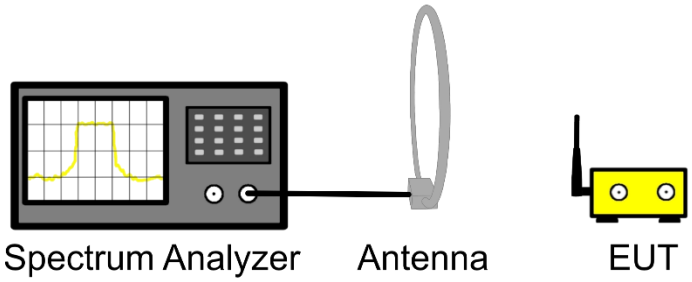
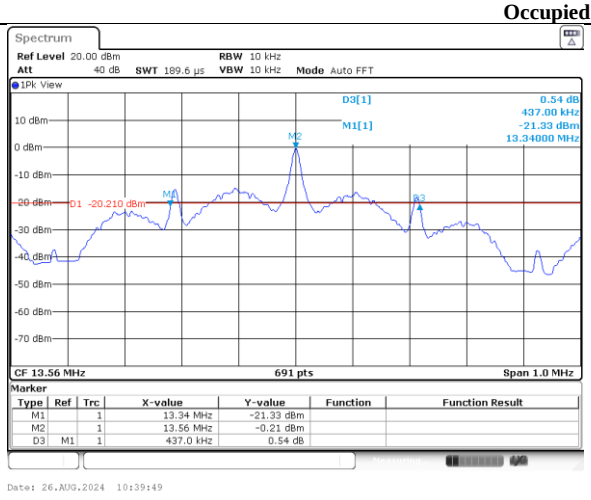


Figure 3. 20 dB Bandwidth and 99% Bandwidth Test Setup

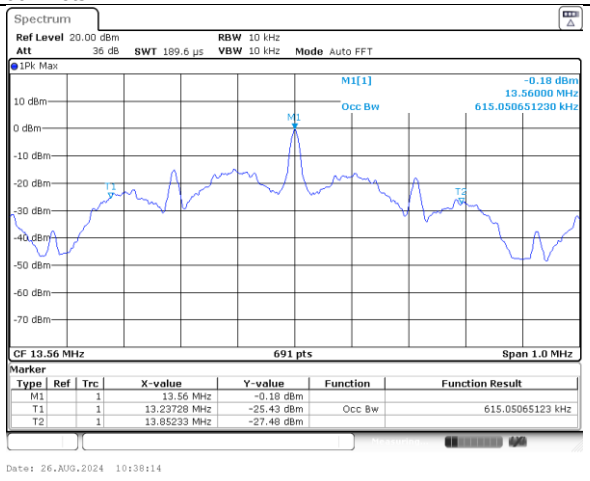
Center Frequency (MHz)	20 dB Bandwidth	99% Bandwidth
13.56MHz	437kHz	615kHz

Table 12. Occupied Bndwidth Test Results

Occupied Bandwidth Plots



20dB Bandwidth



99% Bandwidth

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 made at 3 m with the loop antenna (below 30MHz) 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

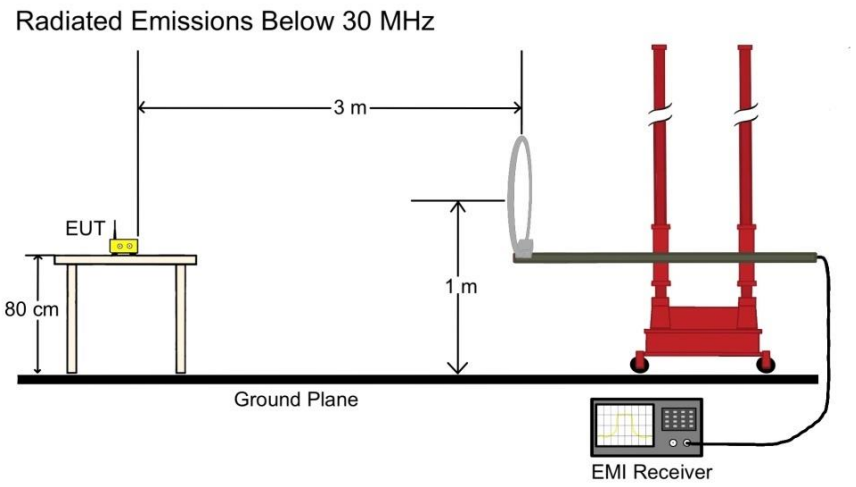


Figure 4: Radiated Emissions (Below 30MHz), Test Setup

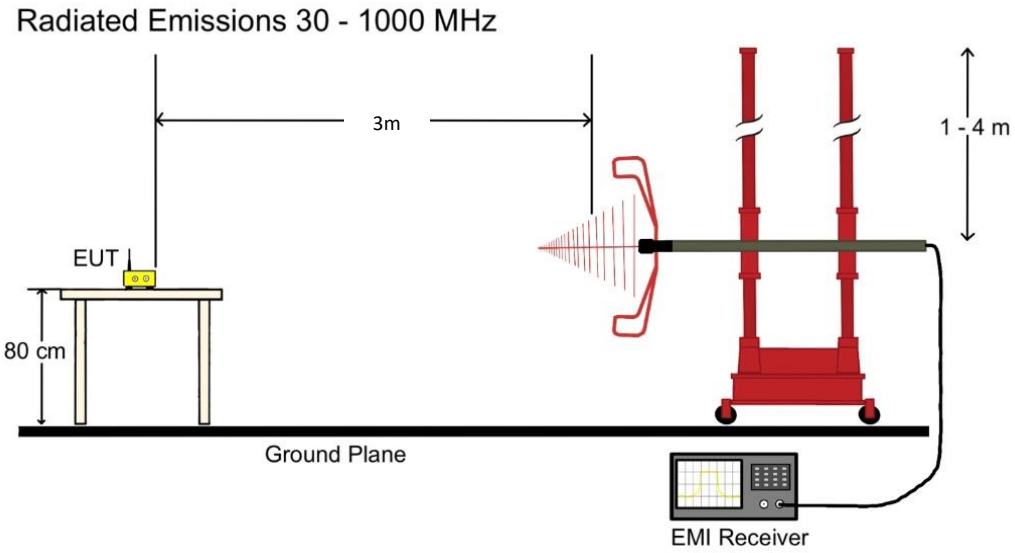


Figure 5. Radiated Emissions (Above 30MHz), Test Setup

Test Results: The HID Signo PIV Contact Reader 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): An Dang and Sergio Gutierrez

Test Date(s): 8/26/2024 - 8/30/2024

Radiated Field Strength Test Results

Frequency [MHz]	Peak Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]	Result
13.349	17.30	80.50	63.20	10.62	H	178.5	1	9.000	Pass
13.349	18.66	80.50	61.84	10.62	V	254.6	1	9.000	Pass
13.452	19.20	90.50	71.30	10.61	V	255.4	1	9.000	Pass
13.479	18.59	90.50	71.91	10.61	H	177.4	1	9.000	Pass
13.560	84.52	124.00	39.48	10.61	H	177.9	1	9.000	Pass
13.560	87.54	124.00	36.46	10.61	V	256.2	1	9.000	Pass
13.637	17.91	90.50	72.59	10.60	H	177.4	1	9.000	Pass
13.668	19.65	90.50	70.85	10.60	V	256.2	1	9.000	Pass
13.772	18.63	80.50	61.87	10.60	H	177.8	1	9.000	Pass
13.772	63.47	80.50	17.03	10.60	V	242.1	1	9.000	Pass

Figure 6. Worst Case In-Band Field Strength

Frequency [MHz]	Peak Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]	Result
0.200	81.27	101.60	20.34	11.35	H	259.8	1	9.000	Pass
0.200	86.57	101.60	15.03	11.35	V	292.2	1	9.000	Pass
0.497	71.06	73.69	2.63	11.28	H	338.6	1	9.000	Pass
0.497	69.79	73.69	3.89	11.28	V	336.4	1	9.000	Pass
0.596	66.24	72.10	5.86	11.41	H	333.9	1	9.000	Pass
0.596	69.84	72.10	2.27	11.41	V	284.8	1	9.000	Pass

Figure 7. Worst Case Field Strength Below 30MHz

Frequency [MHz]	QPK Level [dBµV/m]	QPK Limit [dBµV/m]	QPK Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]	Result
40.680	36.08	40.00	3.92	-8.71	V	264.8	1.5	120.000	Pass
52.230	31.21	40.00	8.79	-13.55	H	11.3	3.1	120.000	Pass
54.240	33.01	40.00	6.99	-13.94	V	134.9	1.33	120.000	Pass
63.960	30.60	40.00	9.40	-12.94	V	306.4	1.18	120.000	Pass
64.560	31.24	40.00	8.76	-12.89	V	207.9	1.39	120.000	Pass
64.860	30.83	40.00	9.17	-12.87	V	250	1.06	120.000	Pass
65.460	31.16	40.00	8.84	-12.86	V	313.9	1.02	120.000	Pass
66.360	33.20	40.00	6.80	-12.79	H	271.3	3.12	120.000	Pass
66.390	38.70	40.00	1.30	-12.86	V	332.1	1.05	120.000	Pass
127.980	30.27	43.50	13.23	-6.34	H	328	3.56	120.000	Pass
162.720	36.05	43.50	7.45	-7.77	H	135.3	1.66	120.000	Pass
176.280	35.05	43.50	8.45	-8.33	V	129.5	1.12	120.000	Pass
255.990	39.47	46.00	6.53	-7.67	H	306.2	1.06	120.000	Pass
366.120	38.15	46.00	7.85	-3.70	H	314.1	0.99	120.000	Pass
384.000	41.80	46.00	4.20	-3.49	V	326.2	1.28	120.000	Pass

Figure 8. Worst Case Field Strength Above 30MHz

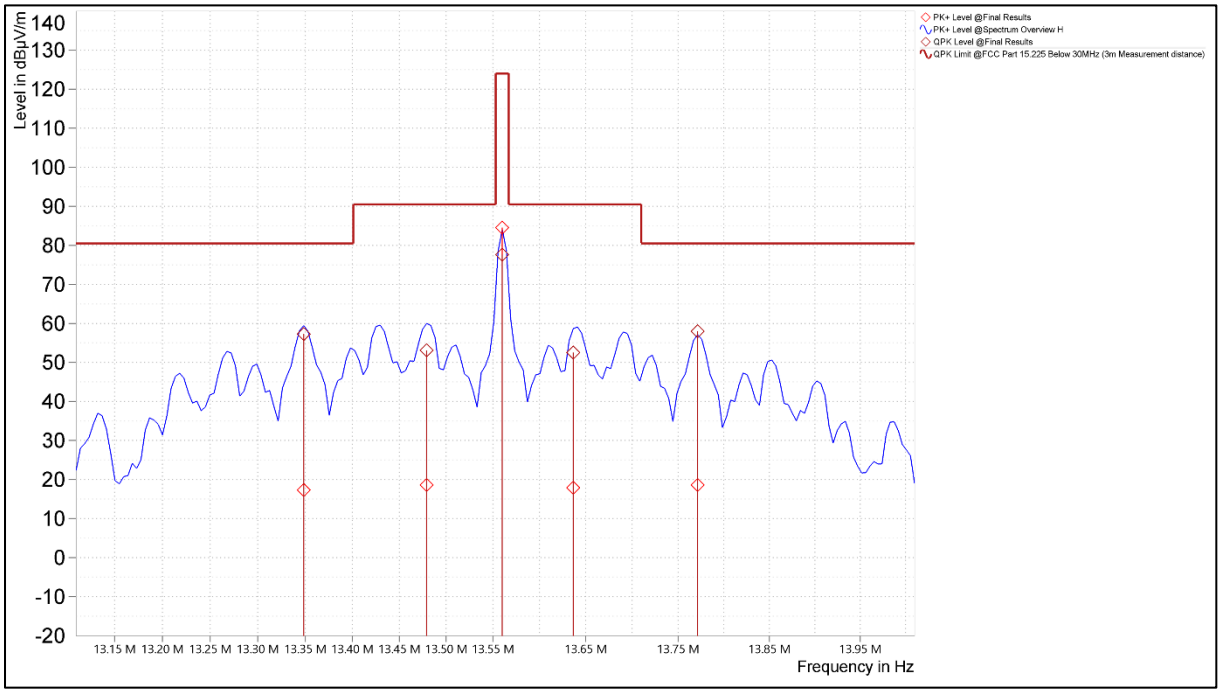


Figure 9. In-Band Emission Mask (Coplanar Loop)

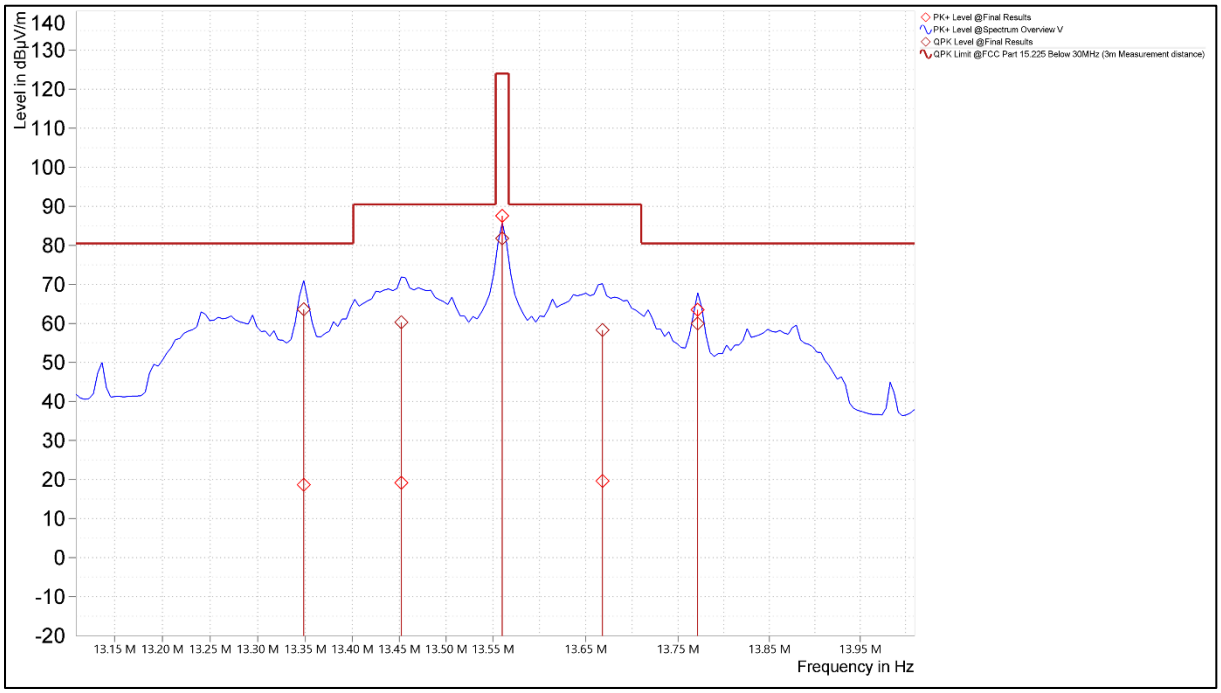


Figure 10. In-Band Emission Mask (Coaxial Loop)

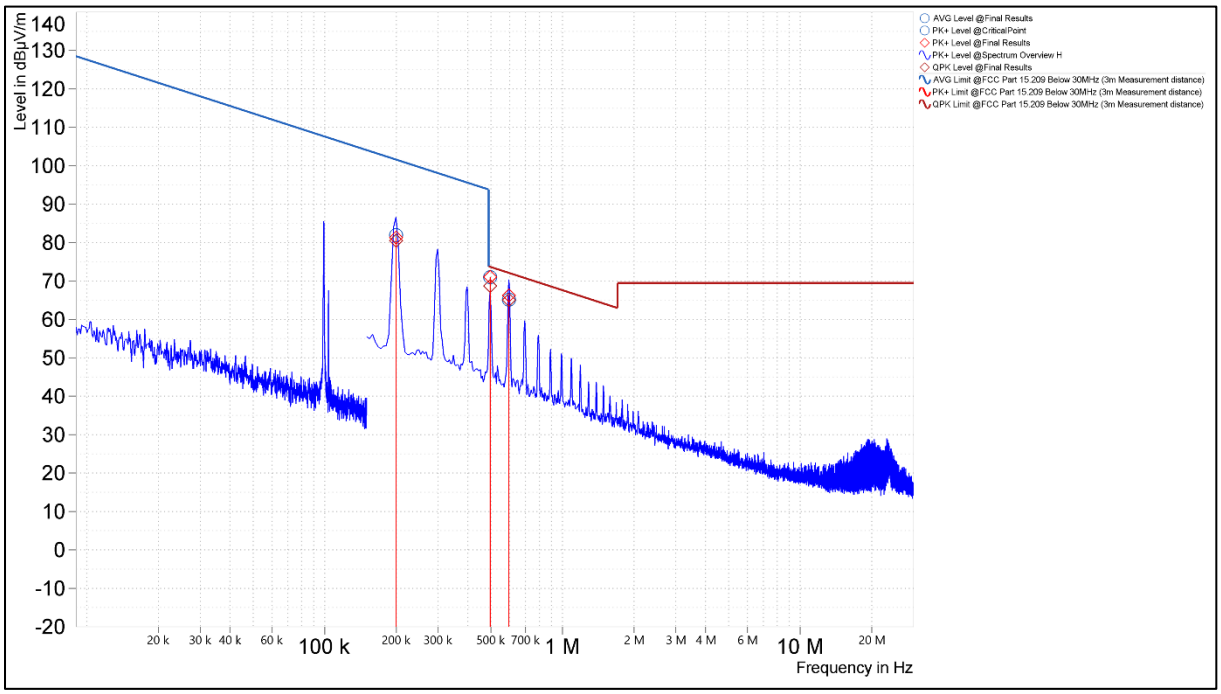


Figure 11. Out of Band Emissions Below 30MHz (Coplanar Loop)

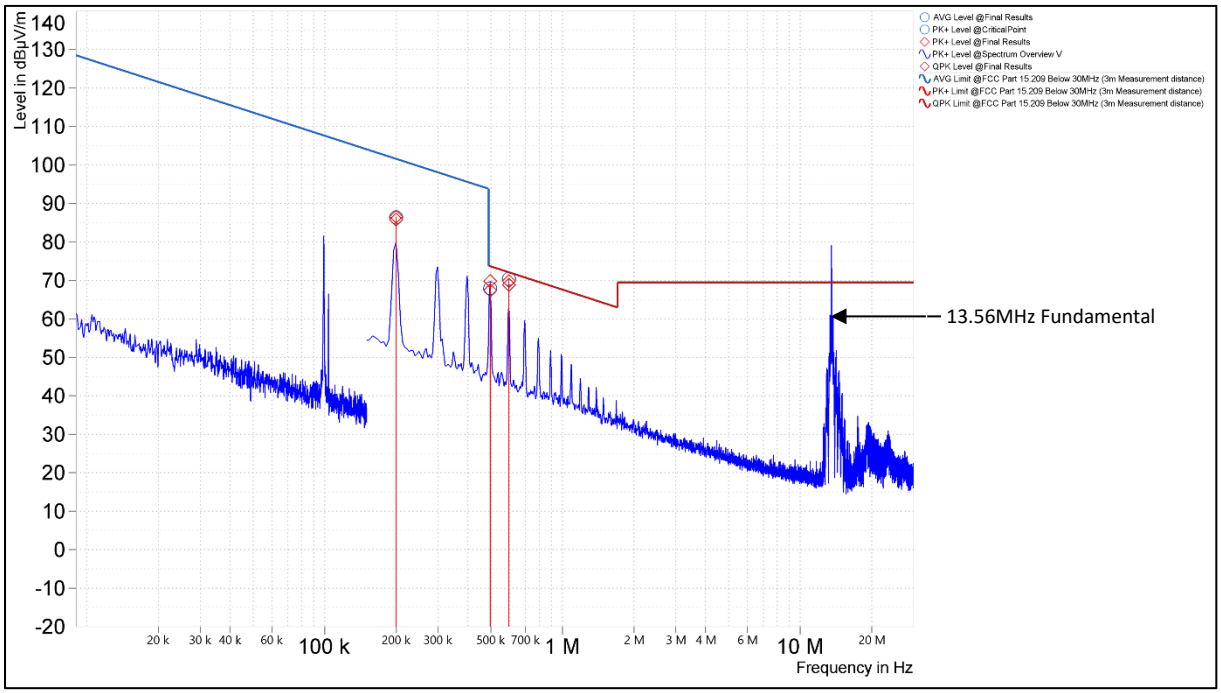


Figure 12. Out of Band Emissions Below 30MHz (Coaxial Loop)

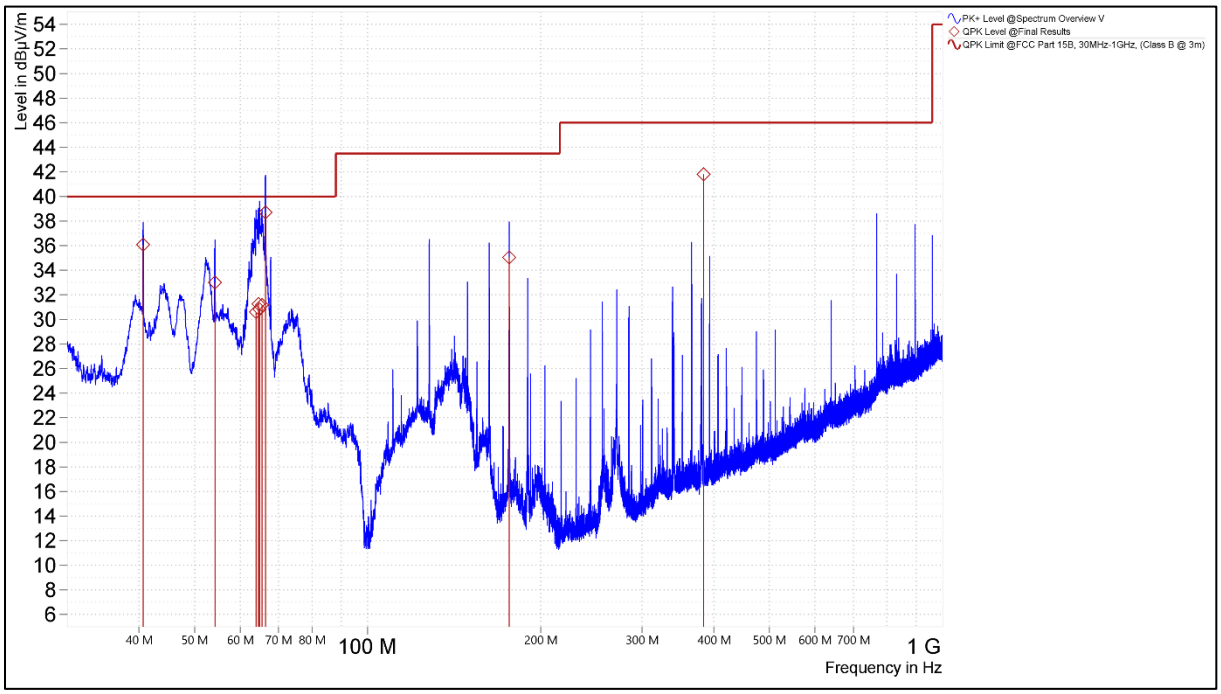


Figure 13. Out of Band Emissions Above 30MHz (Vertical Polarity)

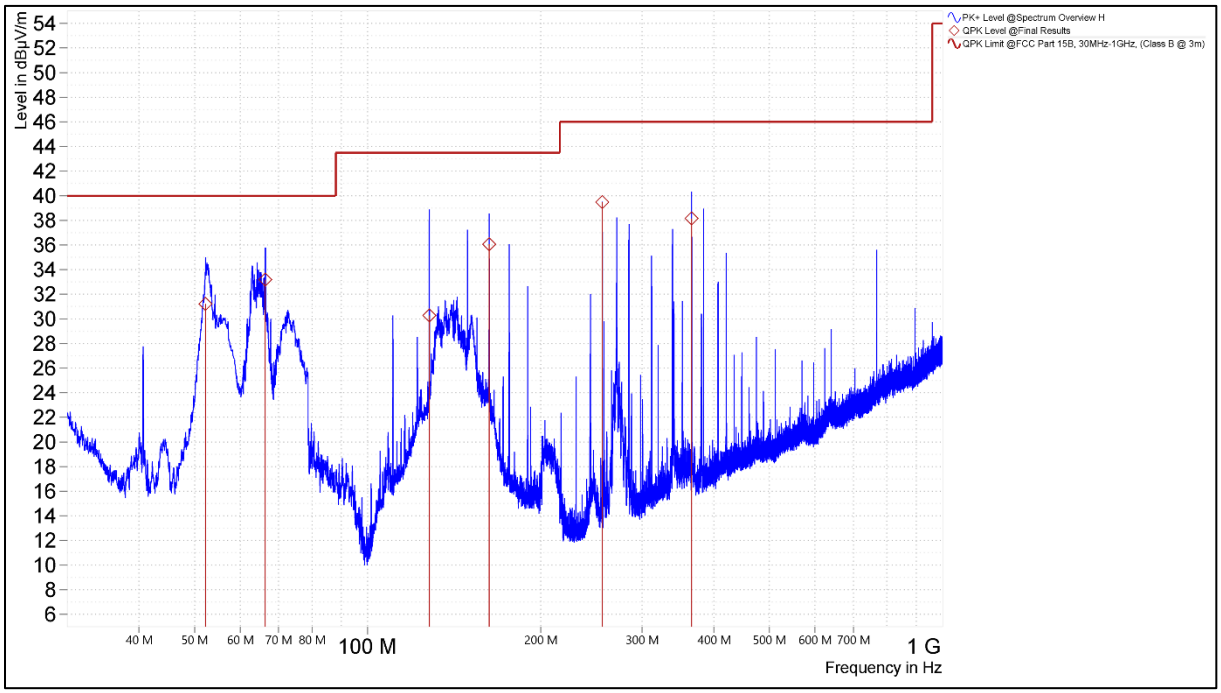


Figure 14. Out of Band Emissions Above 30MHz (Horizontal Polarity)

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 used to measure the frequency drift. 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.

Test Results: The HID Signo PIV Contact Reader 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): 8/26/2024

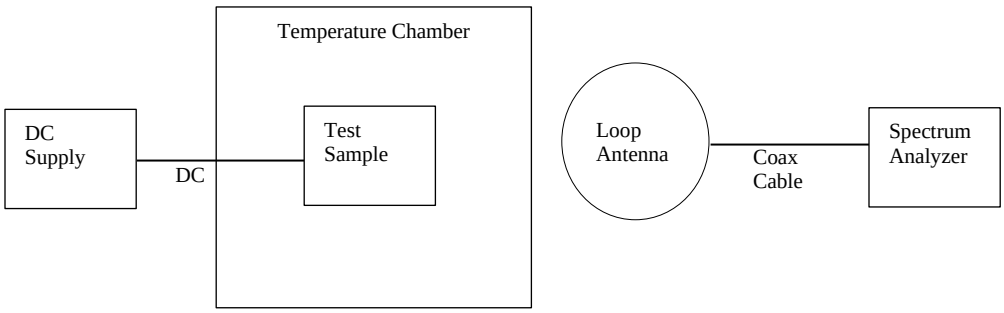


Figure 15. Temperature Stability Test Setup

Operating Freqeuncy:	13,560,000	Hz
Reference Voltage:	12	VDC
Deviation Limit:	0.01	%

Voltage %	Voltage (VDC)	Temp (°C)	Measured Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	Limit (%)
100%	12	-30	13,560,066	66	0.0005	0.01
100%	12	-20	13,560,095	95	0.0007	0.01
100%	12	-10	13,560,095	95	0.0007	0.01
100%	12	0	13,560,069	69	0.0005	0.01
100%	12	10	13,560,026	26	0.0002	0.01
100%	12	20	13,559,768	-232	-0.0017	0.01
100%	12	30	13,559,921	-79	-0.0006	0.01
100%	12	40	13,559,872	-128	-0.0009	0.01
100%	12	50	13,559,846	-154	-0.0011	0.01
115%	13.8	20	13,559,768	-232	-0.0017	0.01
85%	10.2	20	13,559,768	-232	-0.0017	0.01

Figure 16. Frequency Stability Test Results

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	Signal Analyzer	Rohde & Schwarz	FSV40	01/23/2023	01/23/2025
1A1250	Receiver	Rohde & Schwarz	ESW44	04/08/2024	04/08/2025
1A1176	Active Loop Antenna (9KHz-30MHz)	ETS-Lindgren	6502	8/22/2024	08/22/2026
1A1147	Bi-Log Antenna	Suno Sciences Corp	JB3	04/06/2023	04/06/2025
1A1047	Horn Antenna (1GHz – 18GHz)	ETS - Lindgren	3117	06/26/2024	06/26/2025
1A1161	Horn Antenna (18GHz – 40GHz)	ETS Lindgren	3116C	08/01/2024	08/01/2026
1A1065	EMI Receiver	Rohde & Schwarz	ESCI	08/20/2024	08/20/2025
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	09/20/2023	09/20/2024
1A1117	Digital Multimeter	Fluke	87 III	11/6/2023	11/06/2024
1A1225	Environmental Chamber	Espec	EXP-2H/New	5/15/2024	05/15/2025
1A1099	Generator	Com-Power	CGO-51000	See Note	
1A1088	Preamplifier	Rohde & Schwarz	TS-PR1	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	

Table 13. Test Equipment List

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

End of Report