



MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*

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February 21, 2019

HID Global Corporation
6533 Flying Cloud Drive
Eden Prairie, MN 55344

Dear Robert Cresswell,

Enclosed is the EMC test report for compliance testing of the HID Global Corporation, X002200, tested to the requirements of LP0002 Low-power Radio-frequency Devices Technical Regulations for Certification as an Intentional Radiator.

Thank you for using the services of MET Laboratories, Inc. If you have any questions regarding these results or if MET can be of further service to you, please feel free to contact me.

Sincerely yours,
MET LABORATORIES, INC.

Kristine Song
Electromagnetic Compatibility Lab

Reference: (\HID Global Corporation\EMCA97887-LP0002 Rev. 5)

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The Nation's First Licensed Nationally Recognized Testing Laboratory

Electromagnetic Compatibility Criteria Test Report

for the

**HID Global Corporation
X002200**

Tested under

LP0002 Low-power Radio-frequency Devices Technical Regulations
for Intentional Radiators

MET Report: EMCA97887-LP0002 Rev. 5

February 21, 2019

Prepared For:

**HID Global Corporation
6533 Flying Cloud Drive
Eden Prairie, MN 55344**

Prepared By:
MET Laboratories, Inc.
13501 McCallen Pass
Austin, TX 78753

Electromagnetic Compatibility Criteria Test Report

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Giuliano Messina, Project Engineer
Electromagnetic Compatibility Lab



Kristine Song
Electromagnetic Compatibility Lab

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. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the LP0002 under normal use and maintenance.



John Mason,
Director, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	July 26, 2018	Initial Issue.
1	November 8, 2018	BSMI Review.
2	January 22, 2019	Photograph and Cal table updates.
3	February 14, 2019	Label, applicant and EUT product info updates.
4	February 21, 2019	Korean Review Comments.
5	March 25, 2019	Taiwan Review Comments.

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List of Terms and Abbreviations

AC	Alternating Current
ACF	Antenna Correction Factor
Cal	Calibration
d	Measurement Distance
dB	Decibels
dBμA	Decibels above one microamp
dBμV	Decibels above one microvolt
dBμA/m	Decibels above one microamp per meter
dBμV/m	Decibels above one microvolt per meter
DC	Direct Current
E	Electric Field
DSL	Digital Subscriber Line
ESD	Electrostatic Discharge
EUT	Equipment Under Test
f	Frequency
FCC	Federal Communications Commission
GRP	Ground Reference Plane
H	Magnetic Field
HCP	Horizontal Coupling Plane
Hz	Hertz
IEC	International Electrotechnical Commission
kHz	kilohertz
kPa	kilopascal
kV	kilovolt
LISN	Line Impedance Stabilization Network
MHz	Megahertz
μH	microhenry
μ	microfarad
μs	microseconds
NEBS	Network Equipment-Building System
PRF	Pulse Repetition Frequency
RF	Radio Frequency
RMS	Root-Mean-Square
TWT	Traveling Wave Tube
V/m	Volts per meter
VCP	Vertical Coupling Plane

I. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the HID Global Corporation X002200, with the requirements of LP0002 Low-power Radio-frequency Devices Technical Regulations. In accordance with LP0002, the following data is presented in support of the Certification of the X002200. HID Global Corporation should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the X002200, 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 LP0002, in accordance with HID Global Corporation, purchase order number. All tests were conducted using the measurement procedures of ANSI C63.4-2014 and LP0002 Appendix.

LP0002 Reference	Description	Compliance
2.2	Antenna Requirement	Compliant
2.3	Conducted Emission Limits	Compliant
3.2.1.1	Field Strength emissions within the band 13.553 – 13.567 MHz	Compliant
3.2.1.2	Unwanted Emissions Outside the bands 13.553 – 13.567 MHz	Compliant
3.2.1.3	Frequency Tolerance of the Carrier	Compliant
5.20	RF Exposure	Compliant

Table 1. Executive Summary of EMC LP0002 Compliance Testing

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by HID Global Corporation to perform testing on the X002200, under HID Global Corporation's purchase order number 1110960151.

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, X002200.

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

Model(s) Tested:	X002200	
Model(s) Covered:	X002200	
Brand	HID	
Manufacturer:	HID Global Corporation	
Manufacturer Address	6533 Flying Cloud Drive Eden Prairie, MN 55344 USA	
Contact Person:	Robert Cresswell	
Equipment Type	Color Card Printer (彩色卡片熱感印表機)	
EUT Specifications:	Primary Power: 100-240VAC	
	Type of Modulations:	ASK
	Equipment Code:	DXX
	Peak RF Field Strength:	4.71 dBuV/m
	EUT Frequency Ranges:	13.56 MHz
	Antenna Type:	HF Integrated Inductive Loop Antenna
	Antenna Gain:	1 dBi
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35° C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Giuliano Messina	
Report Date(s):	February 21, 2019	

Table 2. EUT Summary Table

Local Applicant Company	銓宥有限公司
Local Applicant Address:	新北市中和區碧河里建八路219號12樓

B. References

LP0002: 2018	Low-power Radio-frequency Devices Technical Regulations.
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
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 17025:2005	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

All testing was performed at MET Laboratories, Inc., 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 LP0002, a complete site description is contained at MET Laboratories.

MET Laboratories's NCC accreditation number is US0004.

MET Laboratories' Taiwan Lab number is SL2-IN-E-1142R.

A. Measurement Uncertainty

Test Method	Typical Expanded Uncertainty	K	Confidence Level
RF Frequencies	±441.52 Hz	2	95%
RF Power Radiated Emissions	±2.95 dB	2	95%
Conducted Emissions	±2.97 dB	2	95%

Table 4. Uncertainty Calculations Summary

B. Description of Test Sample

The X002200, Equipment Under Test (EUT), is a dual sided full color card printer. It uses a ribbon and film process and receives information regarding image and quantity via connection to a computer.



Photograph 1. EUT front



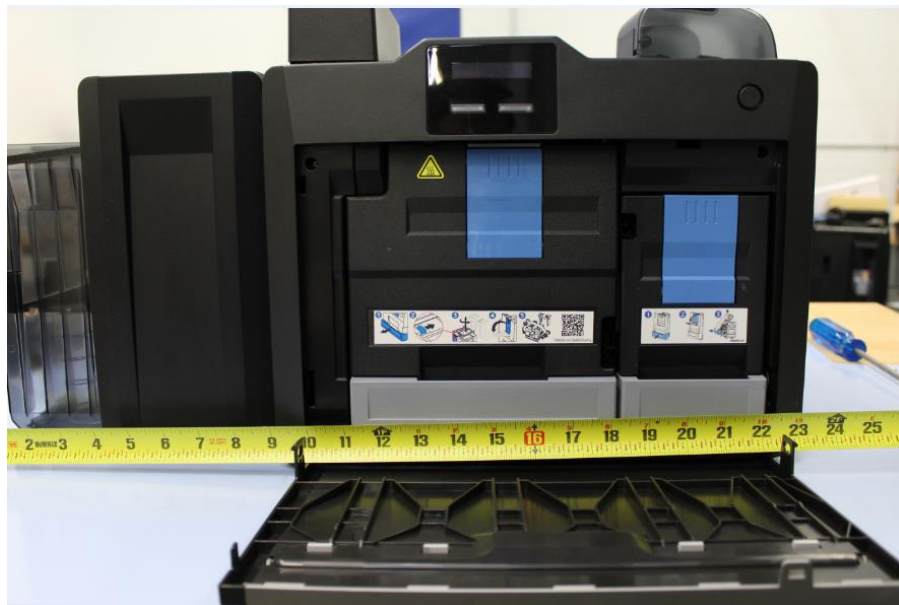
Photograph 2. EUT right



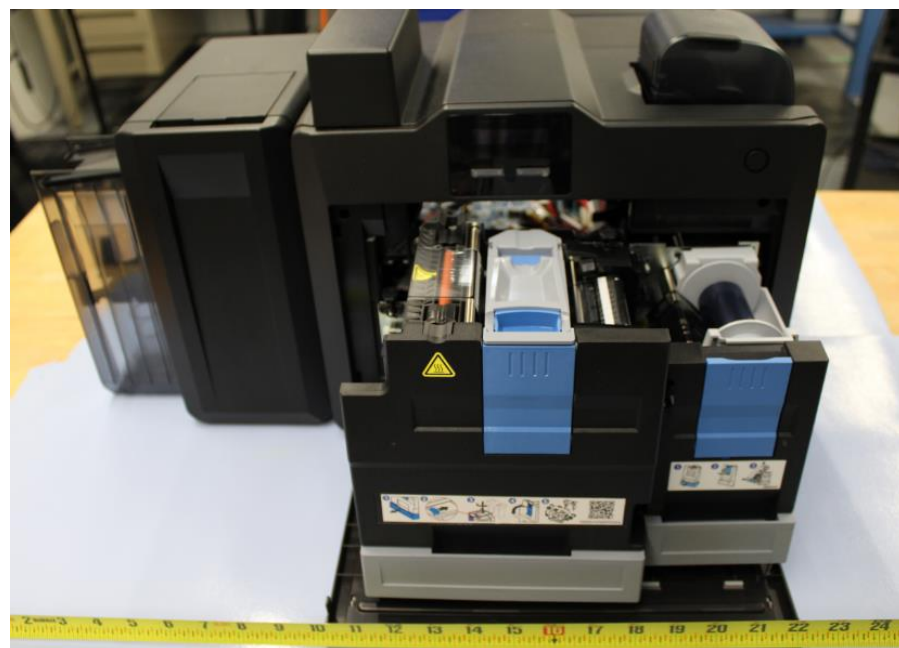
Photograph 3. EUT rear



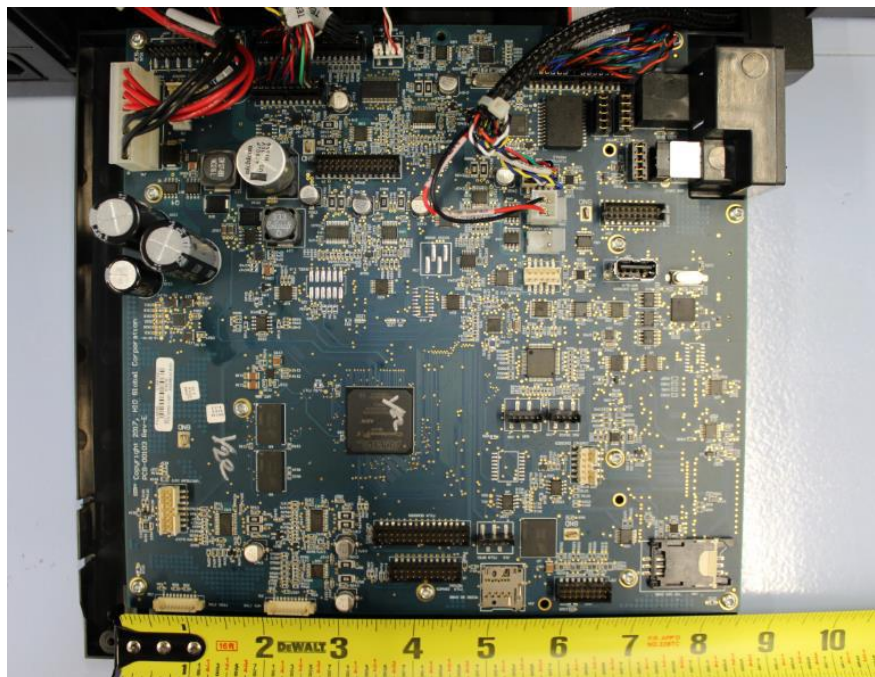
Photograph 4. EUT left



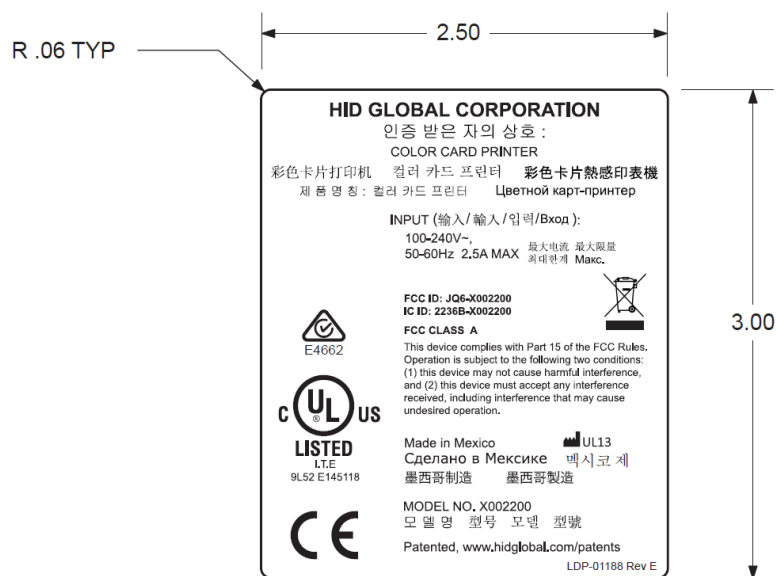
Photograph 5. EUT tray open



Photograph 6. EUT tray extended



Photograph 7. EUT main board



Photograph 8. EUT label #1



Photograph 9. EUT label #2

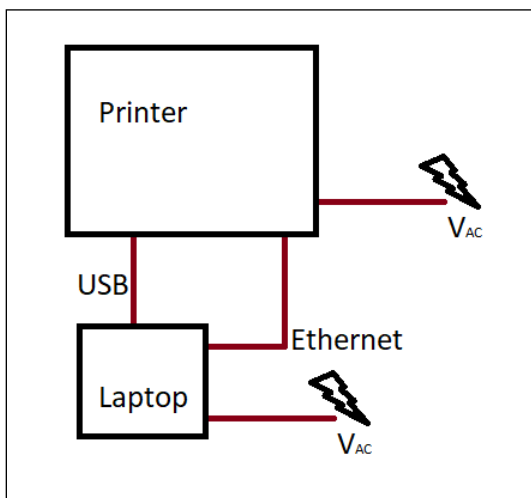


Figure 1. Block Diagram of Test Configuration

C. Equipment Configuration

The EUT was set up as outlined in Figure 1. All equipment incorporated as part of the EUT is included in the following list.

Ref. ID	Slot #	Name / Description	Model Number	Part Number	Serial Number	Rev. #
N/A	N/A	Color Card Printer (彩色卡片熱感印表機)	X002200	N/A	N/A	N/A

Table 5. Equipment Configuration

D. 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
N/A	Laptop	Dell	Inspiron 15	N/A

The 'Customer Supplied Calibration Data' column will be marked as either not applicable, not available, or will contain the calibration date supplied by the customer.

Table 6. Support Equipment

E. 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
N/A	USB	USB connection to computer	1	1.5	1.5	N	Data/Power
N/A	Ethernet	Network connection to laptop	1	1	30	N	Network

Table 7. Ports and Cabling Information

F. Mode of Operation

The EUT was connected to a laptop, which provided the printer with the image and quantity of cards to be printed. The printer performed the card printing function for the entirety of testing.

G. Method of Monitoring EUT Operation

The EUT's status screen was monitored for any error messages. The printed product was monitored for accurate printing (color, placement).

H. Modifications

a) Modifications to EUT

A ferrite, Fair Rite part # 0444164951, was placed on the Ethernet cable.

b) Modifications to Test Standard

No modifications were made to the test standard.

I. 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 upon completion of testing.

III. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 2.2 Antenna Requirement

Test Requirement:	§ 2.2: Antenna requirement: Low-power radio frequency transmitter or transceiver (receiver) shall utilize a permanently, semi-permanently attached antenna or uses a unique coupling of the antenna and at any cable connector between the transmitter and the antenna. The antenna shall be an omni-directional type. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector or other than authorized is prohibited. Such standard connectors are for example: BNC, F type, N type, M type, UG type, RCA, SMA, SMB, and other standard type antenna connectors.
Results:	The EUT as tested is compliant with §2.2. The antenna is integrated into the EUT (permanently attached) and is unable to be modified by the end user.
Test Engineer(s):	Giuliano Messina
Test Date(s):	February 16, 2018

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 2.3 Conducted Emissions Limits

Test Requirement(s): § 2.3: 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 μ H/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)	§ 2.3, Conducted Limit (dB μ V)	
	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 § 2.3

Note: * Decreases with the logarithm of the frequency

Test Procedure: The EUT was placed on a 0.8 m-high wooden 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 μ H 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 C63.4-2014 and LP0002 Appendix*. The measurements were performed over the frequency range of 0.15 MHz to 30 MHz using a 50 Ω /50 μ H LISN as the input transducer to an EMC/field intensity meter. For the purpose of this testing, the transmitter was turned on. Scans were performed with the transmitter on.

Test Results: The EUT was compliant with this requirement.

Test Engineer(s): Giuliano Messina

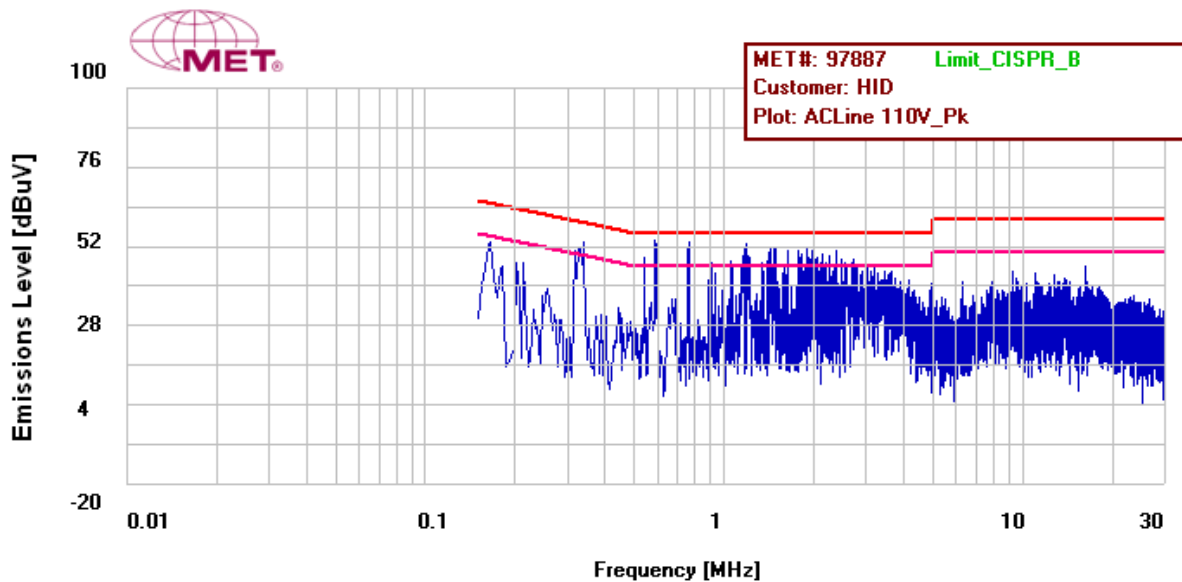
Test Date(s): February 15, 2018

Meas. Location	Meas. m	Limit	Pass/Fail
Bonding measurement from LISN ground to ground plane	0.48	< 2.5 m Ω	Pass

Table 9. Conducted Emissions, Bonding Measurements

Line	Freq (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
ACLine 110V	0.166	54.1	65.54	-11.44	Pass	41.5	55.54	-14.04	Pass
ACLine 110V	0.338	51.4	60.63	-9.23	Pass	40.3	50.63	-10.33	Pass
ACLine 110V	0.59	48	56	-8	Pass	29.8	46	-16.2	Pass
ACLine 110V	0.766	51.3	56	-4.7	Pass	37.1	46	-8.9	Pass
ACLine 110V	1.194	50.5	56	-5.5	Pass	32	46	-14	Pass
ACLine 110V	1.902	49.1	56	-6.9	Pass	32.8	46	-13.2	Pass

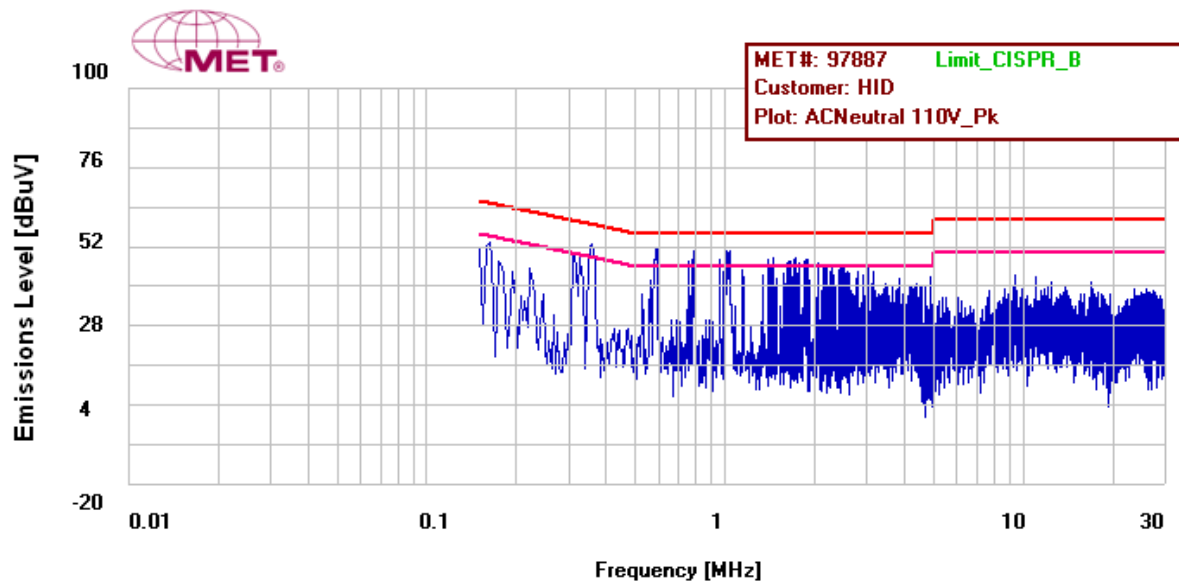
Table 10. Conducted Emissions, 110VAC 60 Hz, Phase Line, Test Results



Plot 1. Conducted Emissions, 110 VAC 60 Hz, Phase Line

Line	Freq (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
ACNeutral 110V	0.15	56.1	66	-9.9	Pass	46.2	56	-9.8	Pass
ACNeutral 110V	0.162	55.6	65.66	-10.06	Pass	39.5	55.66	-16.16	Pass
ACNeutral 110V	0.358	48.3	60.06	-11.76	Pass	32.6	50.06	-17.46	Pass
ACNeutral 110V	0.594	46.9	56	-9.1	Pass	34	46	-12	Pass
ACNeutral 110V	0.79	49	56	-7	Pass	34.3	46	-11.7	Pass
ACNeutral 110V	1.042	48.3	56	-7.7	Pass	31	46	-15	Pass

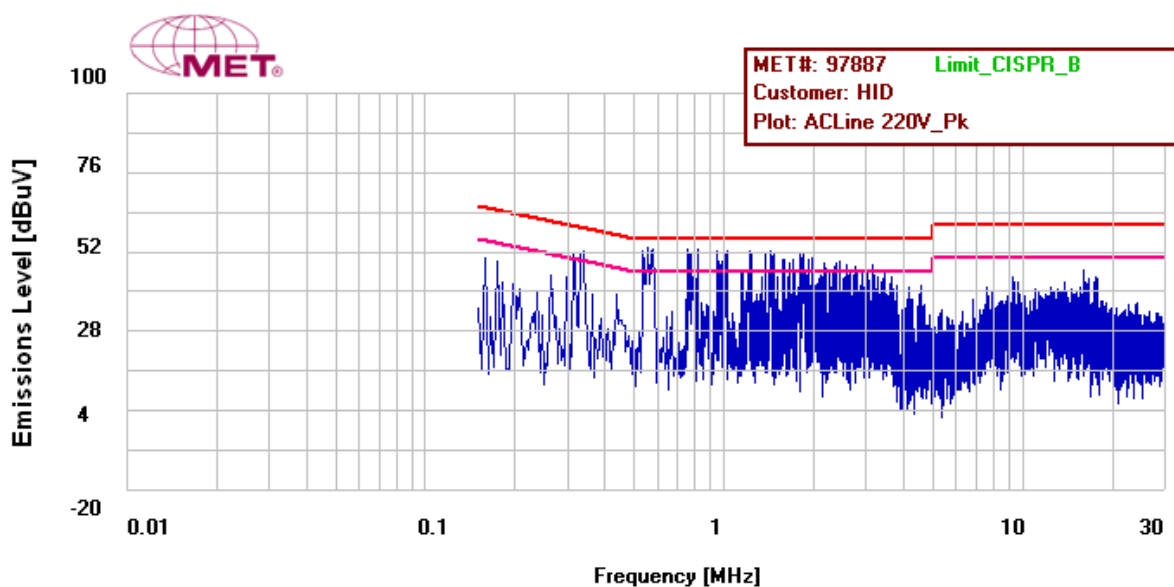
Table 11. Conducted Emissions, 110 VAC 60 Hz, Neutral Line, Test Results



Plot 2. Conducted Emissions, 110 VAC 60 Hz, Neutral Line

Line	Freq (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
ACLine 220V	0.338	51.4	60.63	-9.23	Pass	41.4	50.63	-9.23	Pass
ACLine 220V	0.558	51.8	56	-4.2	Pass	39.6	46	-6.4	Pass
ACLine 220V	0.758	51.1	56	-4.9	Pass	37.5	46	-8.5	Pass
ACLine 220V	0.802	51.5	56	-4.5	Pass	33.6	46	-12.4	Pass
ACLine 220V	0.998	50	56	-6	Pass	31.7	46	-14.3	Pass
ACLine 220V	1.434	49.3	56	-6.7	Pass	35.4	46	-10.6	Pass

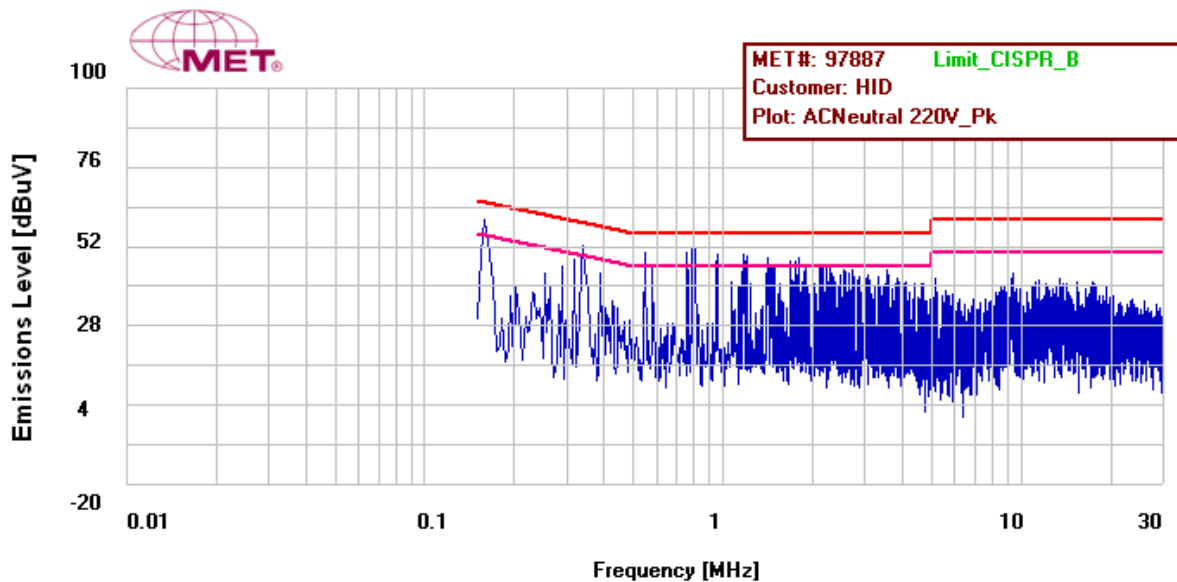
Table 12. Conducted Emissions, 220 VAC 60 Hz, Phase Line, Test Results



Plot 3. Conducted Emissions, 220 VAC 60 Hz, Phase Line

Line	Freq (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
ACNeutral 220V	0.158	56.3	65.77	-9.47	Pass	41.5	55.77	-14.27	Pass
ACNeutral 220V	0.338	50.7	60.63	-9.93	Pass	41	50.63	-9.63	Pass
ACNeutral 220V	0.55	49	56	-7	Pass	37.2	46	-8.8	Pass
ACNeutral 220V	0.794	49.1	56	-6.9	Pass	35.6	46	-10.4	Pass
ACNeutral 220V	1.174	46.1	56	-9.9	Pass	30	46	-16	Pass
ACNeutral 220V	1.418	45.6	56	-10.4	Pass	28.1	46	-17.9	Pass

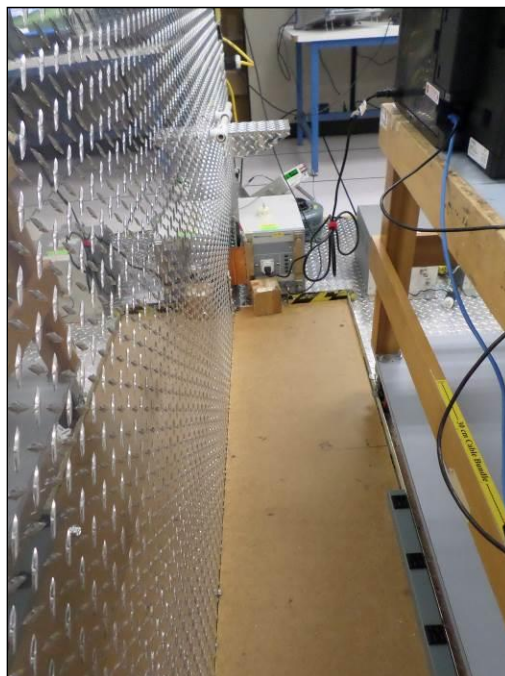
Table 13. Conducted Emissions, 220 VAC 60 Hz, Neutral Line, Test Results



Plot 4. Conducted Emissions, 220 VAC 60 Hz, Neutral Line



Photograph 8. Conducted Emissions, Setup, Front



Photograph 9. Conducted Emissions, Setup, Rear

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 3.2.1.1 Operation within the band 13.553 – 13.567 MHz

Test Requirement(s): § 3.2.1.1: The field strength of any emissions within the band 13.553 – 13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

Test Procedure: The EUT was set to transmit and placed on a 0.8m-high non-reflective (acrylic) table inside a semi-anechoic chamber. The method of testing and test conditions of ANSI C63.4: 2014 and LP0002 appendix were used. The loop antenna was located 3 m from the EUT. Measurements were conducted with the loop antenna at coaxial (parallel) and planar (perpendicular) orientations. The spectrum analyzer RBW was set to 10 kHz and VBW was set to 30 kHz. A peak detector was used.

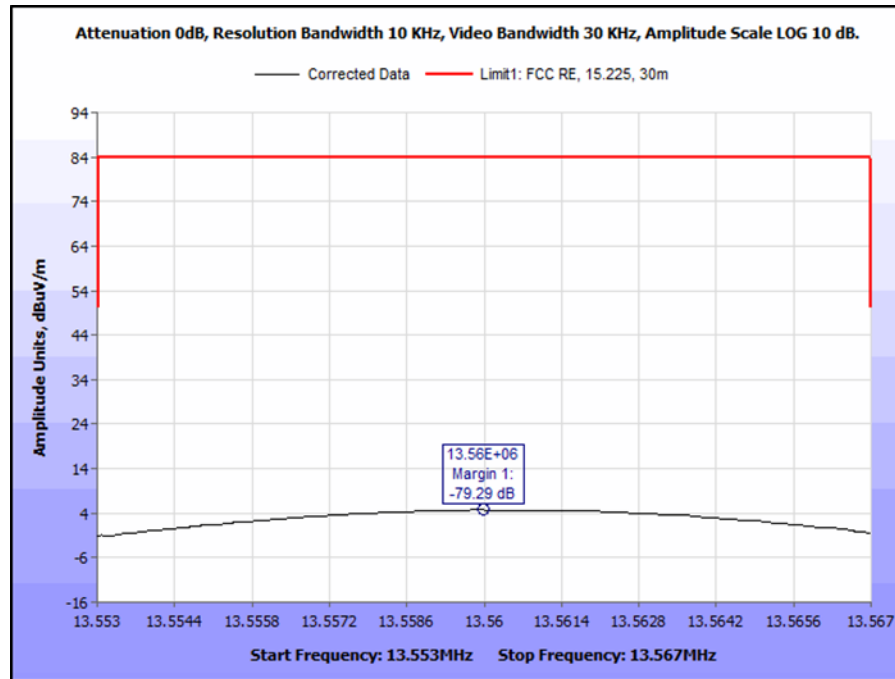
The measurements were made at 3m and then extrapolated to 30m using the following correction factor.

$$40\log(3/30) = -40 \text{ dB}$$

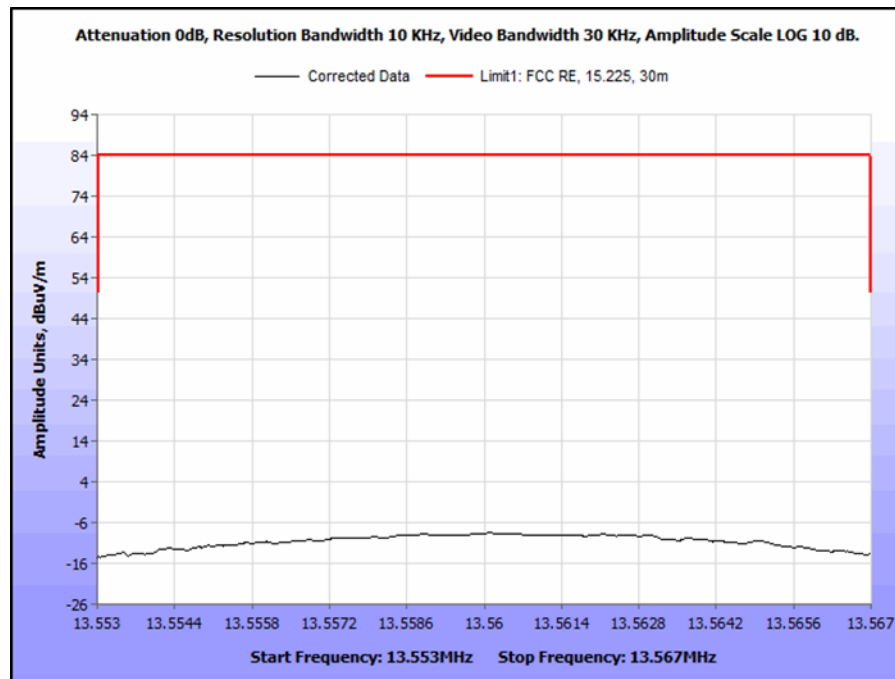
Test Results: The EUT was compliant with the requirements of §3.2.1.1.

Test Engineer(s): Giuliano Messina

Test Date(s): February 12, 2018



Plot 5. Operation Within the Band 13.553 – 13.567 MHz, 0 degrees



Plot 6. Operation Within the Band 13.553 – 13.567 MHz, 90 degrees

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 3.2.1.2 Unwanted Emissions Outside 13.553 – 13.567 MHz

Test Requirement(s): § 3.2.1.2: The field strength of unwanted emissions shall not exceed the general radiated emissions limits in LP0002 § 2.8

Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (m)
0.009 – 0.490 (included)	2,400/Freq. (kHz)	300
0.490 (excluded) – 1.705 (included)	24,000/Freq. (kHz)	30
1.705 (excluded) – 30 (excluded)	30	30
30 (included) – 88 (included)	100	3
88 (excluded) – 216 (included)	150	3
216 (excluded) – 960 (included)	200	3
Above 960 (excluded)	500	3

Table 14. General Radiated Emissions Limits of §2.8

Test Procedures: The EUT was set to transmit and placed on a 0.8m-high non-reflective (acrylic) table inside a semi-anechoic chamber. The method of testing and test conditions of ANSI C63.4: 2014 and LP0002 Appendix were used. For measurements below 30 MHz a loop antenna placed 3m away from the unit was used. For measurements above 30 MHz a biconilog antenna placed 10m away from the unit was used. Measurements were conducted with the loop antenna at coaxial (parallel) and planar (perpendicular) orientations. The Spectrum analyzer RBW was set to 300 Hz for measurements below 150 kHz, 10 kHz for measurements between 150 kHz and 30 MHz, and 100 kHz for measurements above 30 MHz. A peak detector was used below 30 MHz and a quasi-peak detector was used for measurements for above 30 MHz.

The measurements made at 3m with the loop antenna were then extrapolated to 30m or 300 m using the following correction factors.

$$40\log(3/30) = -40 \text{ dB and } 40\log(3/300) = -80 \text{ dB}$$

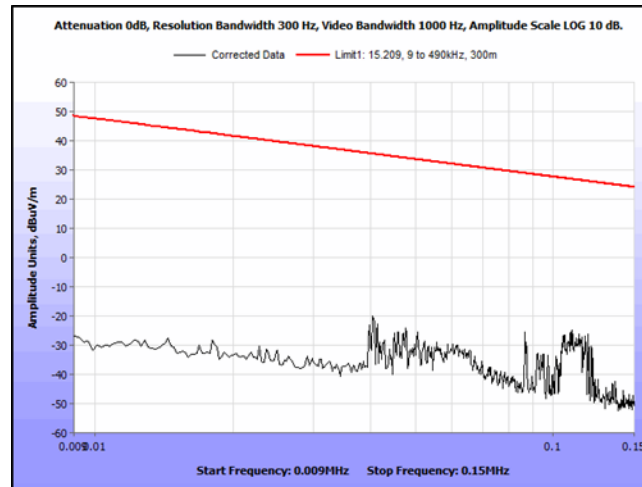
The measurements made at 10m with the biconilog antenna were then extrapolated to the 3m using the following correction factor.

$$20\log(10/3) = +10.46 \text{ dB}$$

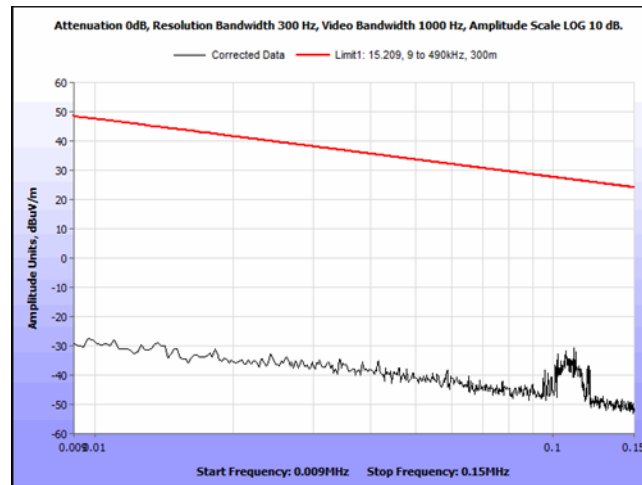
Test Results: The EUT was compliant with the requirements of § 3.2.1.2

Test Engineer(s): Giuliano Messina

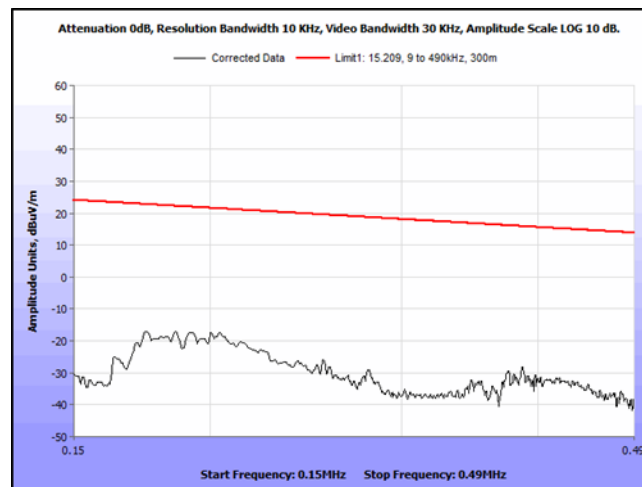
Test Date(s): February 12, 2018



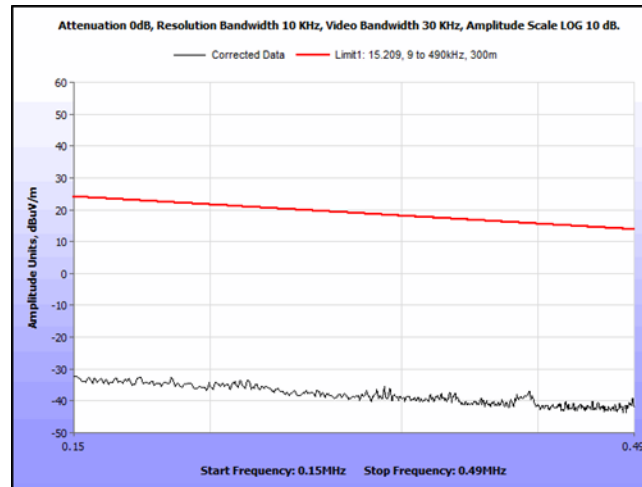
Plot 7. Spurious Emissions, Outside the Bands, 9 – 150 kHz, 0 degrees



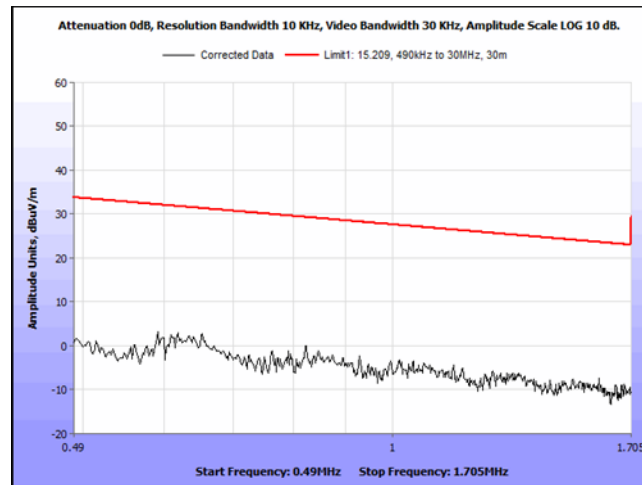
Plot 8. Spurious Emissions, Outside the Bands, 9 – 150 kHz, 90 degrees



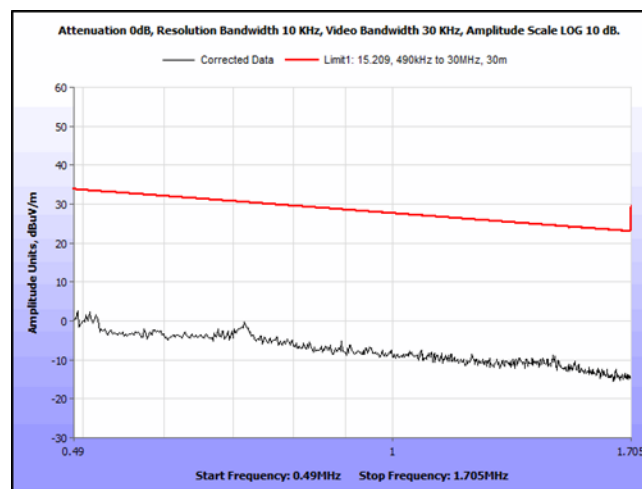
Plot 9. Spurious Emissions, Outside the Bands, 150 – 490 kHz, 0 degrees



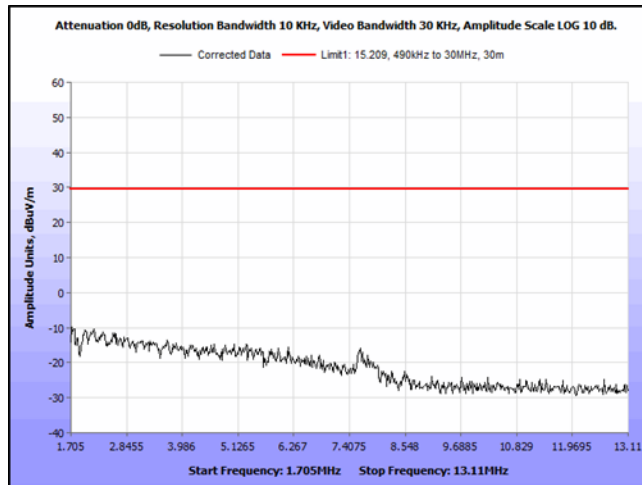
Plot 10. Spurious Emissions, Outside the Bands, 150 – 490 kHz, 90 degrees



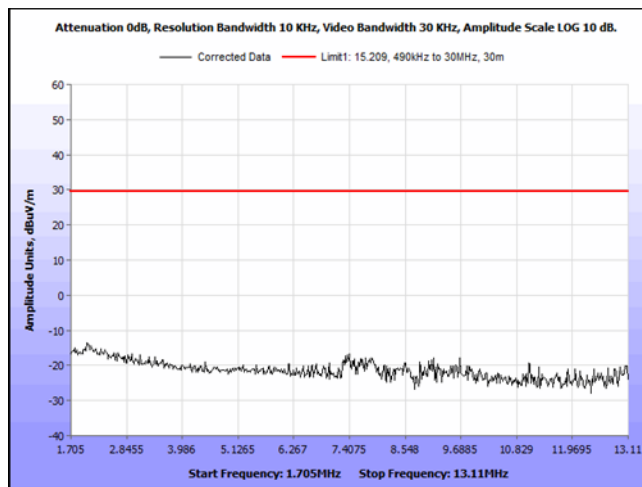
Plot 11. Operation, Outside the Band, 0.490 – 1.705 MHz, 0 degrees



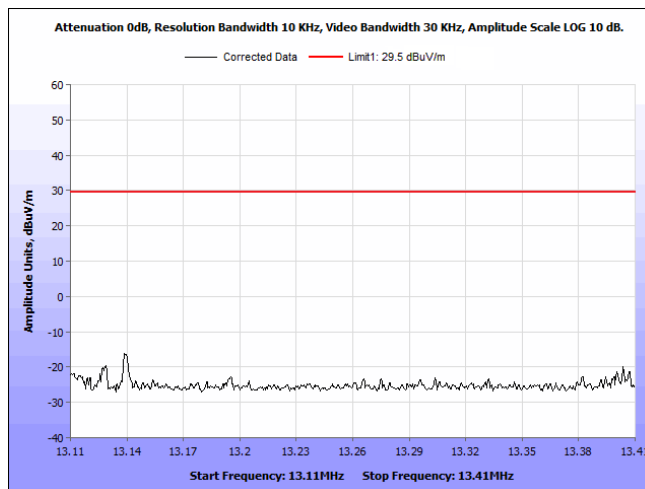
Plot 12. Operation, Outside the Band, 0.490 – 1.705 MHz, 90 degrees



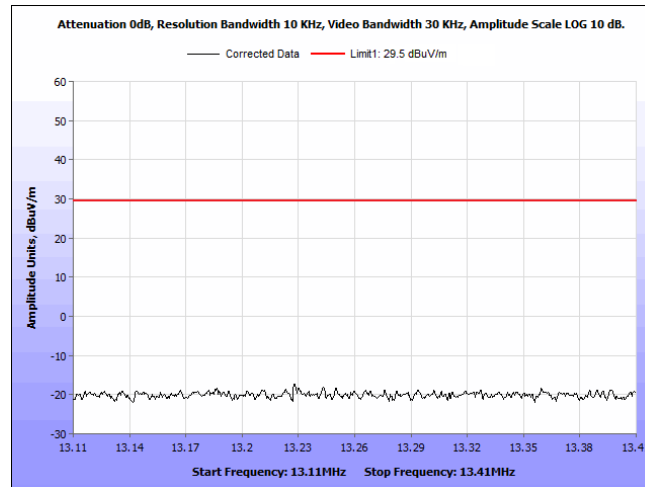
Plot 13. Spurious Emissions, Outside the Bands, 1.705 – 13.11 MHz, 0 degrees



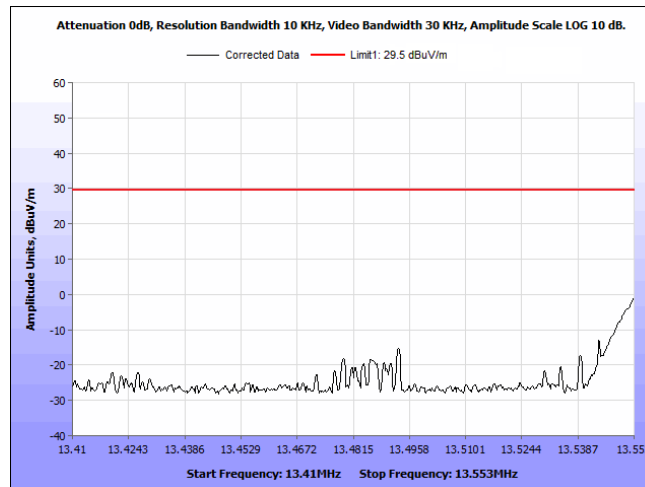
Plot 14. Spurious Emissions, Outside the Bands, 1.705 – 13.11 MHz, 90 degrees



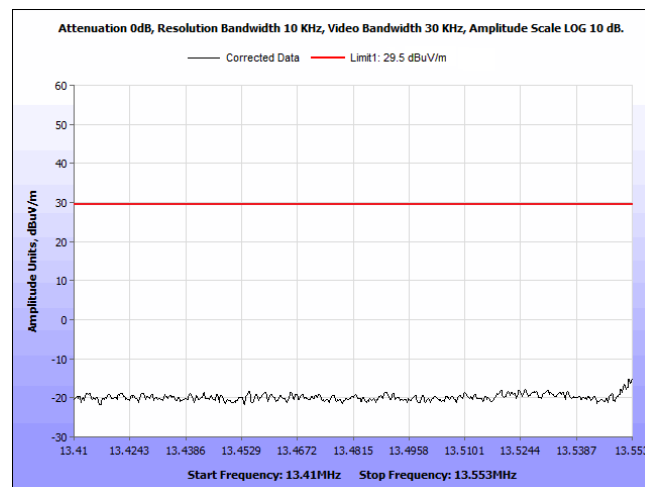
Plot 15. Spurious Emissions, Outside the Bands, 13.110 – 13.410 MHz, 0 degrees



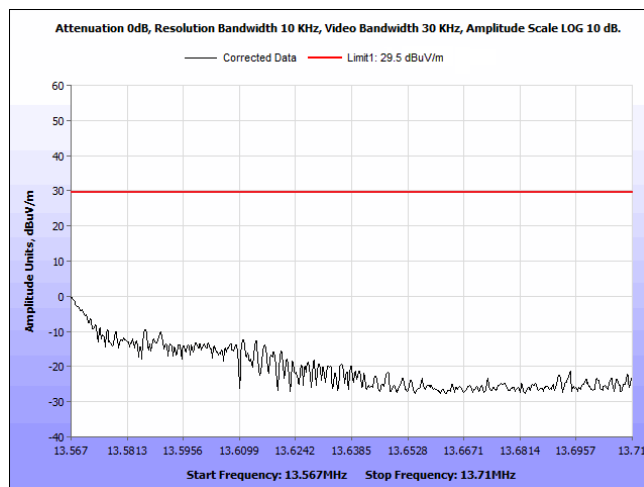
Plot 16. Spurious Emissions, Outside the Bands, 13.110 – 13.410 MHz, 90 degrees



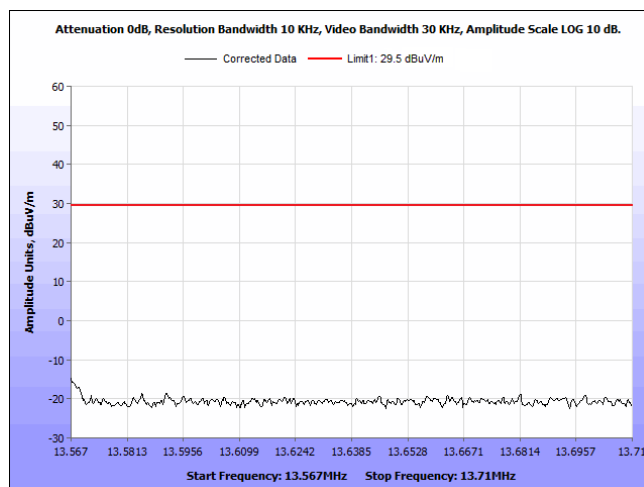
Plot 17. Spurious Emissions, Outside the Bands, 13.410 – 13.553 MHz, 0 degrees



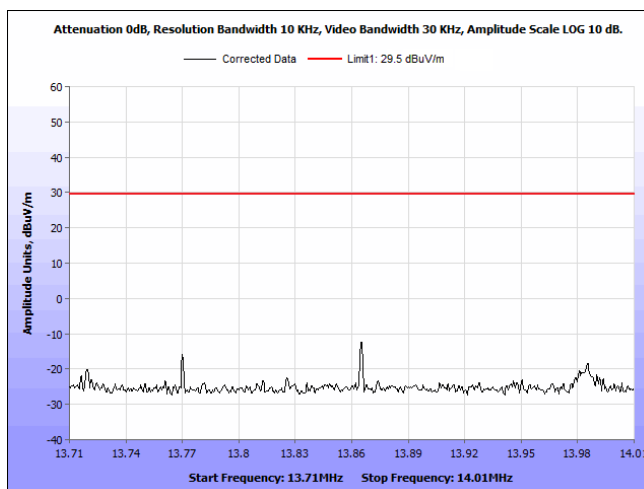
Plot 18. Spurious Emissions, Outside the Bands, 13.410 – 13.553 MHz, 90 degrees



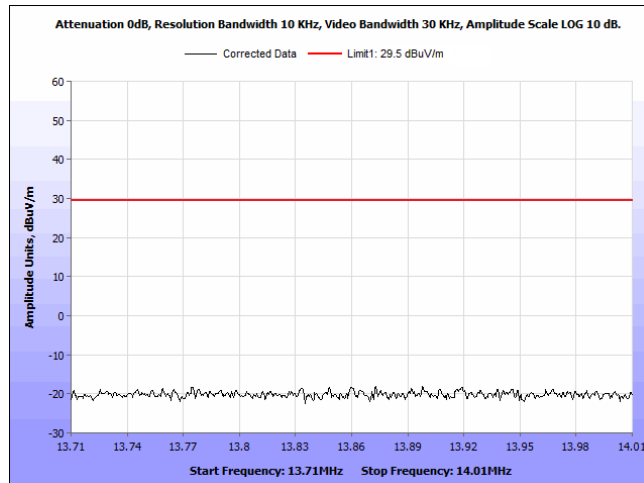
Plot 19 Spurious Emissions, Outside the Bands, 13.567 – 13.710 MHz, 0 degrees



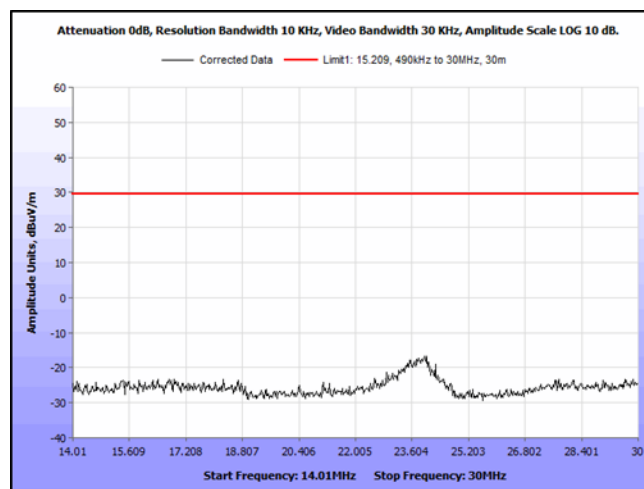
Plot 20. Spurious Emissions, Outside the Bands, 13.567 – 13.710 MHz, 90 degrees



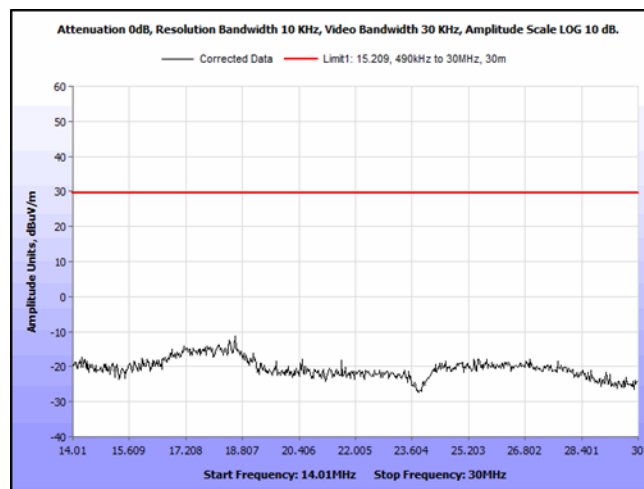
Plot 21. Spurious Emissions, Outside the Bands, 13.710 – 14.010 MHz, 0 degrees



Plot 22. Spurious Emissions, Outside the Bands, 13.710 – 14.010 MHz, 90 degrees



Plot 23. Spurious Emissions, Outside the Bands, 14.010 – 30 MHz, 0 degrees



Plot 24. Spurious Emissions, Outside the Bands, 14.010 – 30 MHz, 90 degrees

Frequency (Hz)	Meter Reading (dBuV)	RBW (Hz)	Measurement Sensor Factor Amplitude (dBuV)	Cable 1 Insertion Loss Factor (dB)	Preamplifier Factor (dB)	Corrected Measurement dBuV/m	Limit 1, 15.209 QP dBuV/m	Margin 1 (dB)
64.8237E+06	69.7	120000	8.67	0.02	-39.52	38.87	40	-1.13
78.0737E+06	69.6	120000	8	0.01	-39.91	37.7	40	-2.3
85.2083E+06	69.2	120000	8.21	0.09	-40.05	37.45	40	-2.55

Table 15. Spurious Emission Limits, Outside the Bands, 30 – 135.6 MHz, QP

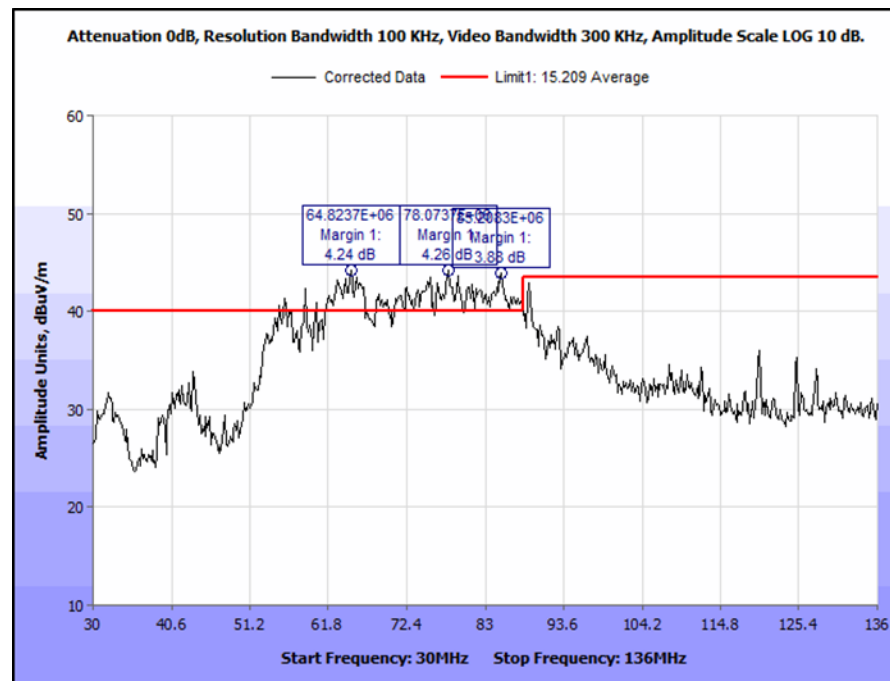
Position of maximum emissions:

Azimuth: 226

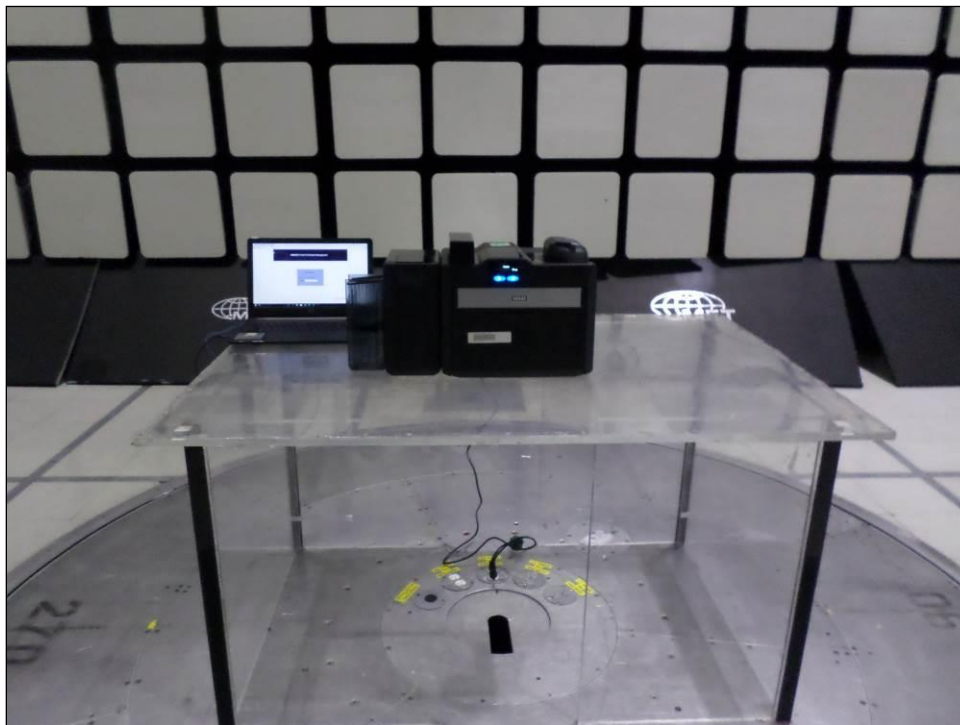
Height: 100

Orientation: V

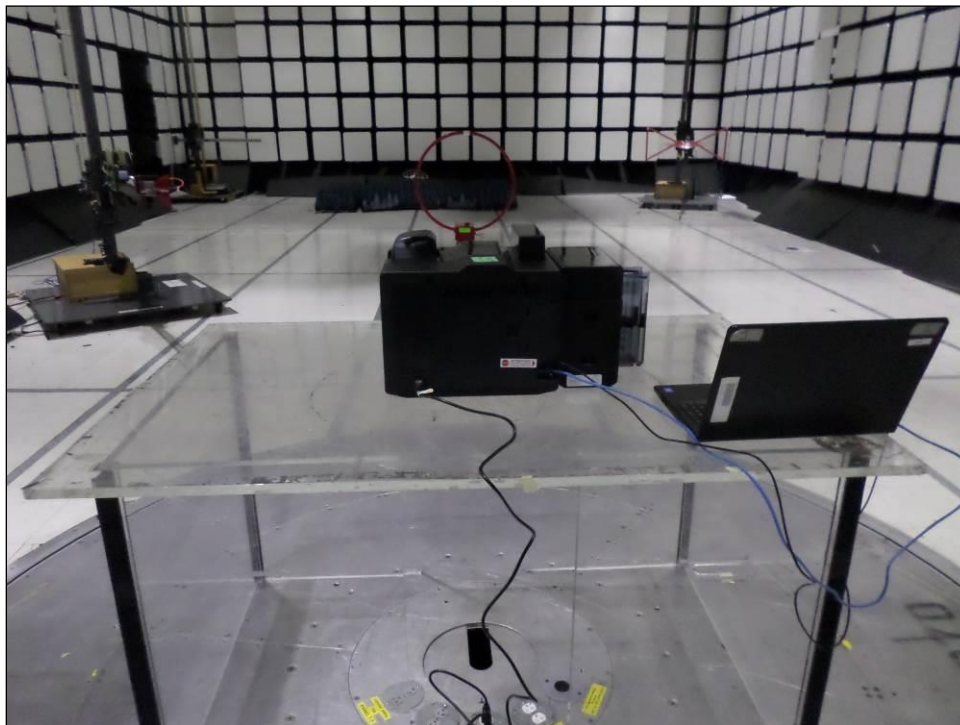
Note: Ferrite needed on middle of Ethernet cable for 64.82MHz – fair rite 0444164951



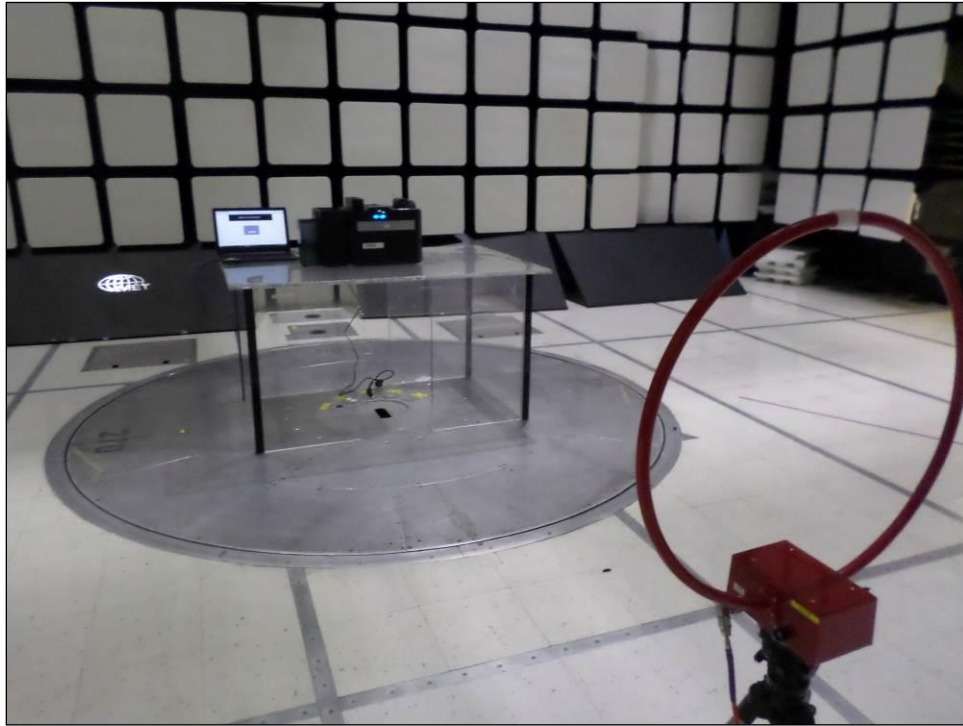
Plot 25. Spurious Emissions, Outside the Bands, 30 – 135.6 MHz



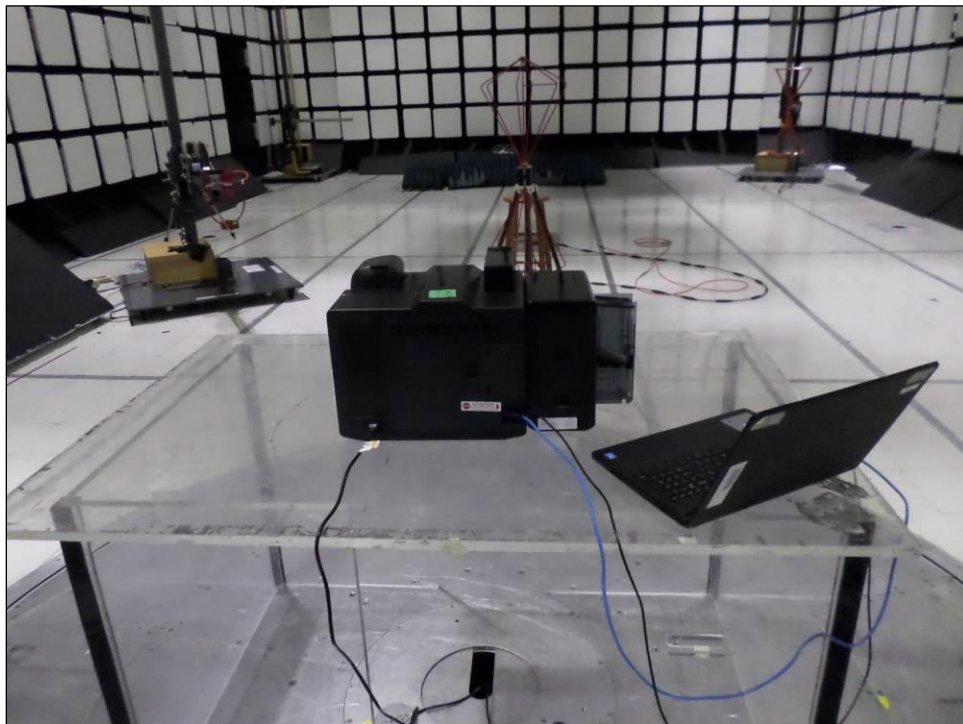
Photograph 10. Spurious Emissions, Front Setup



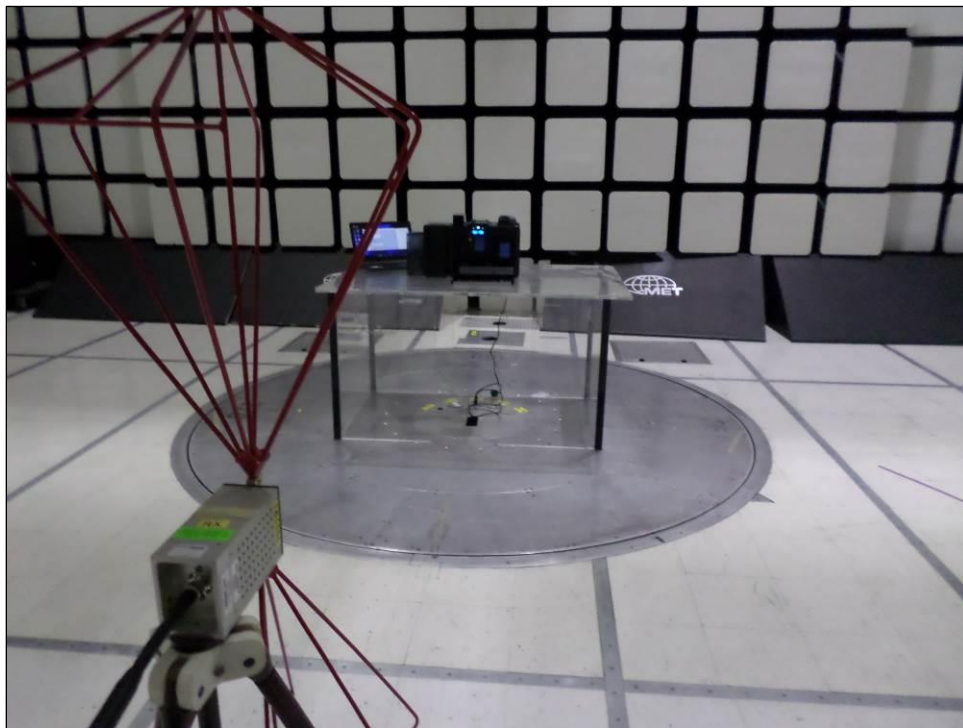
Photograph 11. Spurious Emissions, 9 kHz – 30 MHz, Front Setup



Photograph 12. Spurious Emissions, 9 kHz – 30 MHz, Antenna Setup



Photograph 13. Spurious Emissions, Above 30 MHz, Rear Setup



Photograph 14. Spurious Emissions, Above 30 MHz, Antenna Setup

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 3.2.1.3 Frequency Tolerance

Test Requirement(s): § 3.2.1.3: The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ 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.

Test Procedure: Measurements are in accordance with 3.2.1.3. 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 -20° to 50°C.

Note: manufacturer has declared that the highest operating temperature for the device is 32°C.

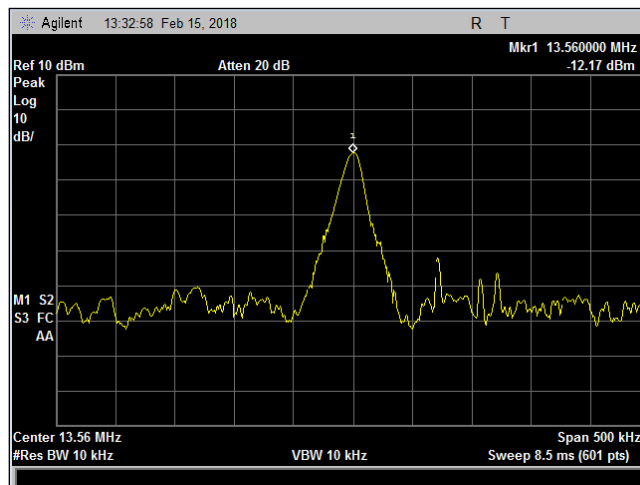
Test Results: The EUT was found **compliant** with §3.2.1.3 requirement(s) of this section.

Test Engineer(s): Giuliano Messina

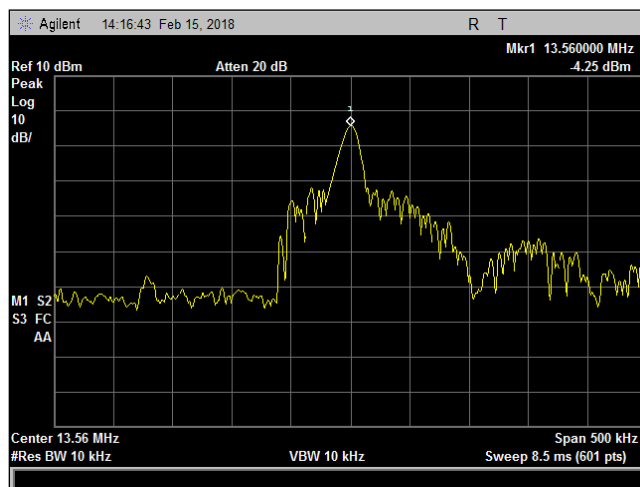
Test Date(s): March 7, 2018

V variation (%)	Temperature (°C)	Nominal Freq (MHz)	Result (MHz)	PPM
15	-20	13.56	13.56	0
15	20	13.56	13.56	0
15	32	13.56	13.56	0
0	-20	13.56	13.56	0
0	20	13.56	13.56	0
0	32	13.56	13.56	0
-15	-20	13.56	13.56	0
-15	20	13.56	13.56	0
-15	32	13.56	13.56	0

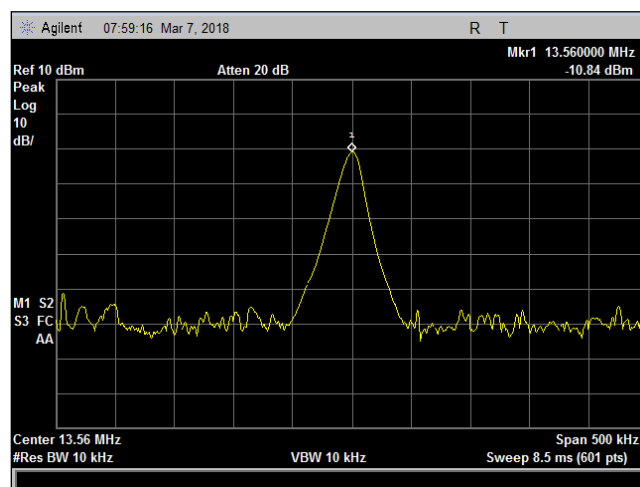
Table 16. Frequency Stability, Test Results



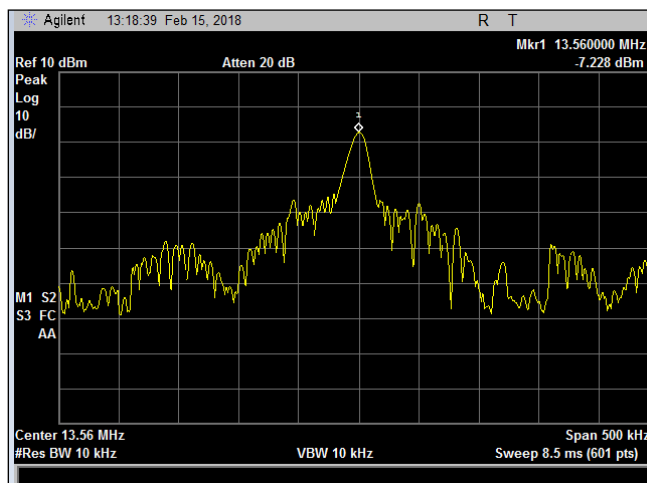
Plot 26. Frequency Stability, +15 pct, 20 degrees



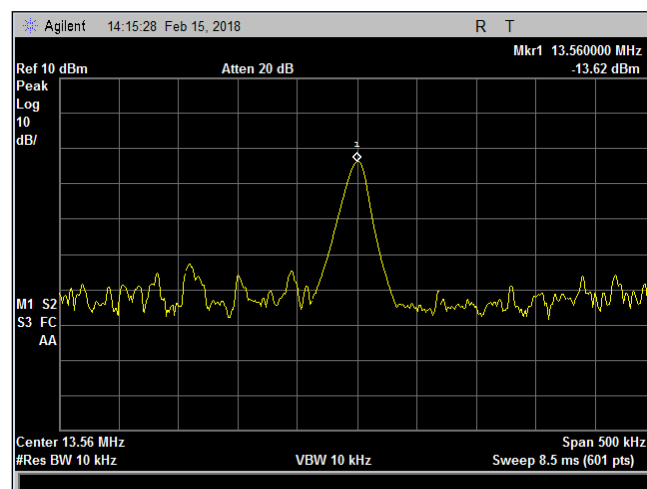
Plot 27. Frequency Stability, +15 pct, -20 degrees



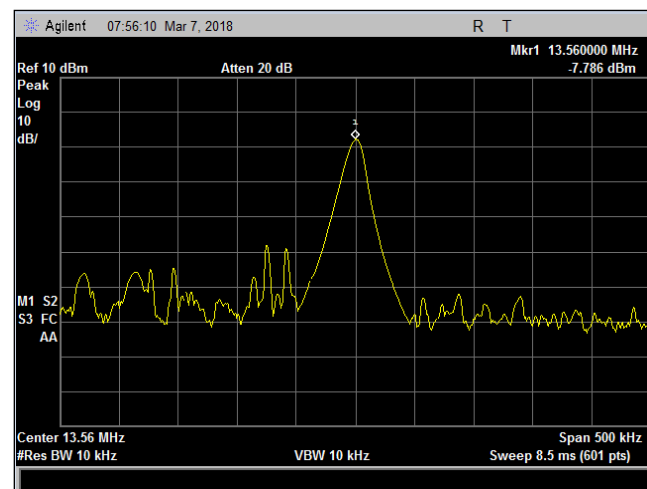
Plot 28. Frequency Stability, +15 pct, 32 degrees



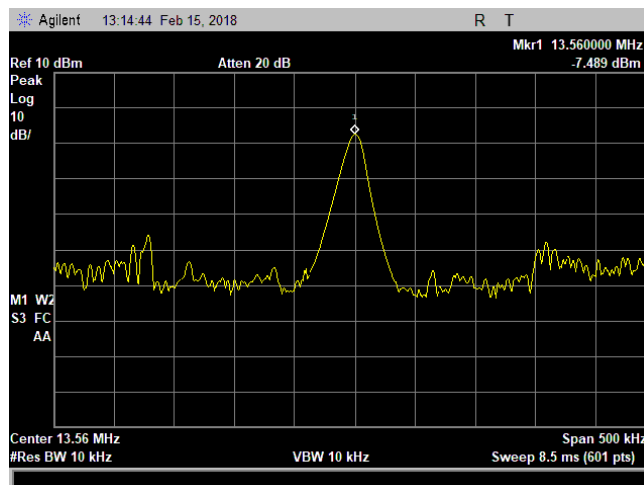
Plot 29. Frequency Stability, -15 pct, 20 degrees



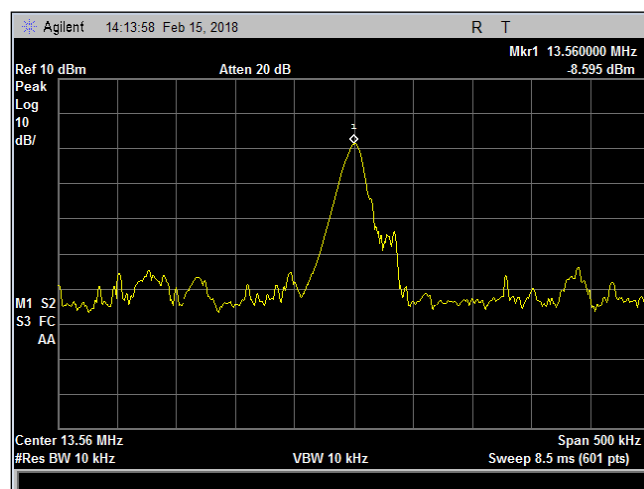
Plot 30. Frequency Stability, -15 pct, -20 degrees



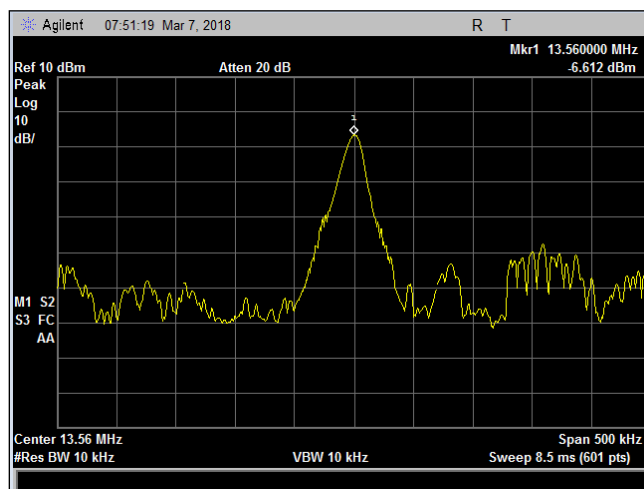
Plot 31. Frequency Stability, -15 pct, 32 degrees



Plot 32. Frequency Stability, Vnom, 20 degrees



Plot 33. Frequency Stability, Vnom, -20 degrees



Plot 34. Frequency Stability, Vnom, 32 degrees

IV. Test Equipment

Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2005.

Asset	Equipment	Manufacturer	Model	Calibration Date	Calibration Due Date
1A1065	EMI Receiver	Rohde & Schwarz	ESCI	3/14/2017	3/14/2018
1A1177	Pulse Limiter	Rohde & Schwarz	ESH3Z2	2/21/2017	8/21/2018
1A1119	Test Area	Custom Made	N/A	2/15/2018 - See Note	
1A1123	LISN	Teseq	NNB 51	8/25/2017	8/25/2018
1A1149	Milliohm Meter	GW Instek	GOM-802	4/27/2017	4/27/2018
1A1079	Conducted Comb Generator	COM-Power Corp	CGC-255	2/15/2018 - See Note	
1A1083	EMI Test Receiver	Rohde & Schwarz	ESU40	9/12/2017	9/12/2018
1A1185	Biconical Antenna	ETS-Lindgren	3109	11/30/2017	5/30/2019
1A1176	Loop Antenna	ETS-Lindgren	6502	1/31/2018	7/31/2019
1A1106	10m Chamber (FCC)	ETS	Semi-Anechoic	2/12/2018 - See Note	
1A1099	Generator	COM-Power Corp	CGO-51000	2/12/2018 - See Note	
1A1195	Preamplifier	A.H. Systems	PAM-0018P	2/12/2018 - See Note	
1A1044	Generator	COM-Power Corp	CG-520	2/12/2018 - See Note	
1A1073	Multi Device Controller	ETS EMCO	2090	2/12/2018 - See Note	
1A1074	System Controller	Panasonic	WV-CU101	2/12/2018 - See Note	
1A1075	System Controller	Panasonic	WV-CU101	2/12/2018 - See Note	
1A1080	Multi Device Controller	ETS EMCO	2090	2/12/2018 - See Note	
1A1184	Spectrum Analyzer	Agilent Technologies	E4407B	5/9/2017	5/9/2018
3A3015	Temperature Chamber	Thermotron	SM-16C	8/18/2017	8/18/2018

Table 17. Test Equipment List

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

End of Report