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04/14/2020

HID Global Corporation
611 Center Ridge Dr.
Austin, TX 78753

Dear Robert Cresswell,

Enclosed is the EMC Wireless test report for compliance testing of the HID Global Corporation, OMNIKEY 5127CK Reader Core as 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 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 yours,
EUROFINS E&E NORTH AMERICA

Joel Huna
Documentation Department

Reference: (\HID Global Corporation\EMCA106319-LP0002 LF Rev. 3)

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ACCREDITED
TESTING CERT #0591.06

Electromagnetic Compatibility Criteria
Test Report

for the

HID Global Corporation
OMNIKEY 5127CK Reader Core

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

Report: EMCA106319-LP0002 LF Rev. 3

04/14/2020

Prepared For:

HID Global Corporation
611 Center Ridge Dr.
Austin, TX 78753

Prepared By:
Eurofins E&E North America
13501 McCallen Pass, Austin, TX 78753

Electromagnetic Compatibility Criteria
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OMNIKEY 5127CK Reader Core

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

Giuliano Messina, Project Engineer
Electromagnetic Compatibility Lab

Joel Huna
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. 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.

Jonathan Tavira,
Manager, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	02/24/2020	Initial Issue.
1	02/25/2020	Customer Comments.
2	03/26/2020	Customer Comments.
3	04/14/2020	Customer Comments.

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List of Terms and Abbreviations

AC	**A**lternating **C**urrent
ACF	**A**ntenna **C**orrection **F**actor
Cal	**Cal**ibration
d	**M**easurement **D**istance
dB	**D**eci**b**els
dBµA	**D**eci**b**els above one **micro**amp
dBµV	**D**eci**b**els above one **micro**volt
dBµA/m	**D**eci**b**els above one **micro**amp **per m**eter
dBµV/m	**D**eci**b**els above one **micro**volt **per m**eter
DC	**D**irect **C**urrent
E	**E**lectric Field
DSL	**D**igital **S**ubscriber **L**ine
ESD	**E**lectro**s**tatic **D**ischarge
EUT	**E**quipment **U**nder **T**est
f	**F**requency
FCC	**F**ederal **C**ommunications **C**ommission
GRP	**G**round **R**eference **P**lane
H	Magnetic Field
HCP	**H**orizontal **C**oupling **P**lane
Hz	**H**er**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**h**er**z**
kPa	**k**ilo**pa**scal
kV	**k**ilo**v**olt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**M**ega**h**ertz
µH	**microh**enry
µ	**microf**arad
µs	**micros**econds
NEBS	**N**etwork **E**quipment-**B**uilding **S**ystem
PRF	**P**ulse **R**epetition **F**requency
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare
TWT	**T**raveling **W**ave **T**ube
V/m	**V**olts **per m**eter
VCP	**V**ertical **C**oupling **P**lane

I. Executive Summary

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A. Purpose of Test

An EMC evaluation was performed to determine compliance of the HID Global Corporation OMNIKEY 5127CK Reader Core, 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 OMNIKEY 5127CK Reader Core. 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 OMNIKEY 5127CK Reader Core, 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 1110972109. All tests were conducted using measurement procedure ANSI C63.10-2013 and LP0002 Appendix.

LP0002: 2016 Reference	Description	Compliance
2.2	Antenna Requirement	Compliant
2.3	Conducted Emissions	Compliant
2.8	General Spurious Emissions Limits	Compliant

Figure 1. Executive Summary of EMC LP0002 ComplianceTesting

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

II. Equipment Configuration

A. Overview

Eurofins E&E North America was contracted by HID Global Corporation to perform testing on the OMNIKEY 5127CK Reader Core, under HID Global Corporation's purchase order number 1110972109.

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, OMNIKEY 5127CK Reader Core.

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

Model(s) Tested:	OMNIKEY 5127CK Reader Core	
Model(s) Covered:	OMNIKEY 5127CK Reader Core	
EUT Specifications:	Primary Power: 5VDC	
	Type of Modulations:	FSK
	Equipment Code:	DCD
	EUT Frequency Ranges:	125 kHz
Analysis:	The results obtained relate to all model(s) covered.	
Environmental Test Conditions:	Temperature: 15-35° C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Giuliano Messina	
Report Date(s):	04/14/2020	

Figure 2. EUT Summary Table

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

Figure 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 LP0002, a complete site description is contained at Eurofins E&E North America.

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%

Figure 4. Uncertainty Calculations Summary

E. Description of Test Sample

The HID Global Corporation OMNIKEY 5127CK Reader Core, Equipment Under Test (EUT), is an RF card reader. A user will approach the card reader and present a BLE or RFID credentials to the reader with intention of granting access. The reader will read the credential and send its data to a connected access control panel, which determine whether or not grant the user access of the user

.

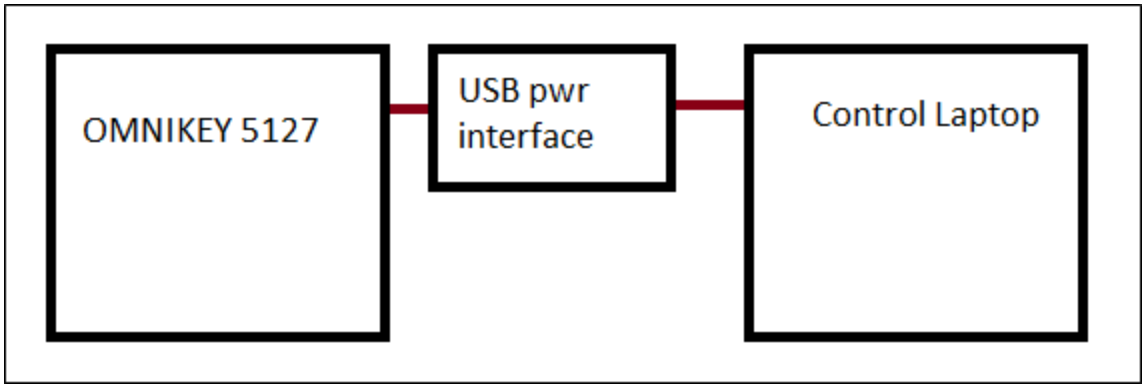

Figure 5. Block Diagram of Test Configuration

F. Equipment Configuration

The EUT was set up as outlined in Figure 5. All cards, racks, etc., incorporated as part of the EUT is included in the following list.

Ref. ID	Name / Description	Model Number	Part Number	Serial Number	Revision
N/A	Smart Card Reader	OMNIKEY 5127CK Reader Core	N/A	N/A	N/A

Figure 6. Equipment Configuration

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
N/A	Laptop	Dell	E6410
N/A	5127CK-Reader Core USB Interface Adapter	HID Global	MDP-03923
N/A	Cable, FFC 10 POS 0.5mm	Wurth Electronik	CBL-00169

Figure 7. Support Equipment

H. Ports and Cabling

Ref. ID	Port Name on EUT	Cable Description	Qty.	Length (m)	Shielded (Y/N)	Termination Point
N/A	Power	Cable, FFC 10 POS 0.5mm	1	0.1	N	Interface Adapter
N/A	NA	USB to TTL Serial Cable	1	1	N	Laptop

Figure 8. Ports and Cabling

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I. Mode of Operation

The EUT was powered via USB connection to the laptop. A customer-supplied interface provided monitoring of the transmitter's functionality.

J. Method of Monitoring EUT Operation

A spectrum analyzer was used to confirm that the EUT accepted control commands and provided the correct output based on those commands.

K. 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.

L. 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.

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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 has a non-standard connector and permanently attached to the unit.

Test Engineer(s): Giuliano Messina

Test Date(s): June 25, 2018

Gain	Type
Coil	1.0 dBi

Figure 9. Antenna List

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Electromagnetic Compatibility Criteria for Intentional Radiators

§2.3 Conducted Emissions

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 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)	§ 2.3, Conducted Limit (dBµV)	
	Quasi-Peak	Average
* 0.15 - 0.5	66 - 56	56 - 46
0.5 - 5	56	46
5 - 30	60	50

Figure 10. 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 non-conductive 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 and LP0002 Appendix* 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. Scans were performed with the transmitter on.

Sample Calculation:

Rr – S = M

where:

Rr = Receiver Reading in dBµV
S = Specification Limit in dBµV
M = Margin to Specification in +/- dB

Sample formula for calculating the Corrected Data for the Conducted Emissions Measurements:

Line	Freq (MHz)	Uncorrected QP** Amplitude (dBµV)	LISN IL (dB)	CBL (dB)	Corrected QP** Amplitude (dBµV)	QP** Limit (dBµV)	Delta (dB)	Results
XYZ	0.18	42.65	10	0.58	53.23	79	-25.77	Pass

*Corrected QP** Amplitude (dBµV) = Uncorrected Amplitude (dBµV) +LISN IL (dB) + CBL (dB)=42.65+10+0.58=53.23*
*** Same Calculation applies to Corrected Avg. amplitude as well.*

Conducted Emissions Voltage Test Setup

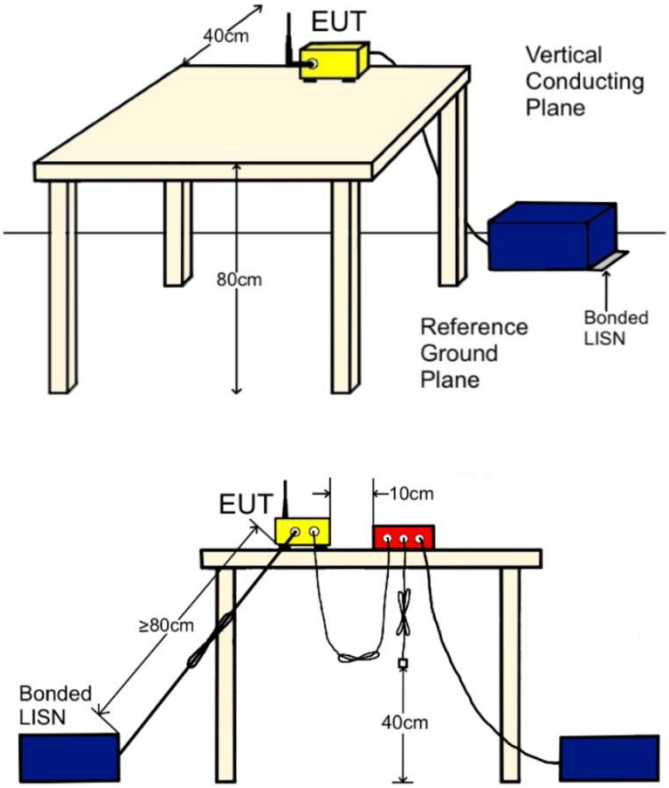

Figure 11: CEV Test Setup

Test Results:	The EUT was compliant with the requirement(s) of this section. Measured emissions were within applicable limits.
Test Engineer(s):	Giuliano Messina and Jonathan Tavira
Test Date(s):	July 16, 2018

Meas. Location	Meas. m	Limit	Pass/Fail
Bonding measurement from LISN ground to ground plane	1.19 mΩ	< 2.5 mΩ	Pass

Figure 12. Conducted Emissions, Bonding Measurements

Line	Freq (MHz)	QP Amplitude (dBµV)	QP Limit (dBµV)	Delta (dB)	Pass	Average Amplitude (dBµV)	Average Limit (dBµV)	Delta (dB)	Pass	Notes
ACLine	0.154	48.8	65.782	-16.982	Pass	32.5	55.782	-23.282	Pass	None
ACLine	0.174	45.2	64.771	-19.571	Pass	30.2	54.771	-24.571	Pass	None
ACLine	0.190	44.5	64.042	-19.542	Pass	27.7	54.042	-26.342	Pass	None
ACLine	0.206	41.9	63.372	-21.472	Pass	27.3	53.372	-26.072	Pass	None
ACLine	0.410	28.8	57.671	-28.871	Pass	21.7	47.671	-25.971	Pass	None
ACLine	20.678	30.3	60	-29.7	Pass	25.2	50	-24.8	Pass	None
ACNeutral	0.174	45.5	64.771	-19.271	Pass	30.6	54.771	-24.171	Pass	None
ACNeutral	0.206	41	63.372	-22.372	Pass	27.1	53.372	-26.272	Pass	None
ACNeutral	0.242	36.1	62.038	-25.938	Pass	24	52.038	-28.038	Pass	None
ACNeutral	0.394	27.2	58.001	-30.801	Pass	19.9	48.001	-28.101	Pass	None
ACNeutral	0.426	30.5	57.354	-26.854	Pass	21.4	47.354	-25.954	Pass	None
ACNeutral	18.938	27.2	60	-32.8	Pass	22.1	50	-27.9	Pass	None

Figure 13. Conducted Emissions, Test Results

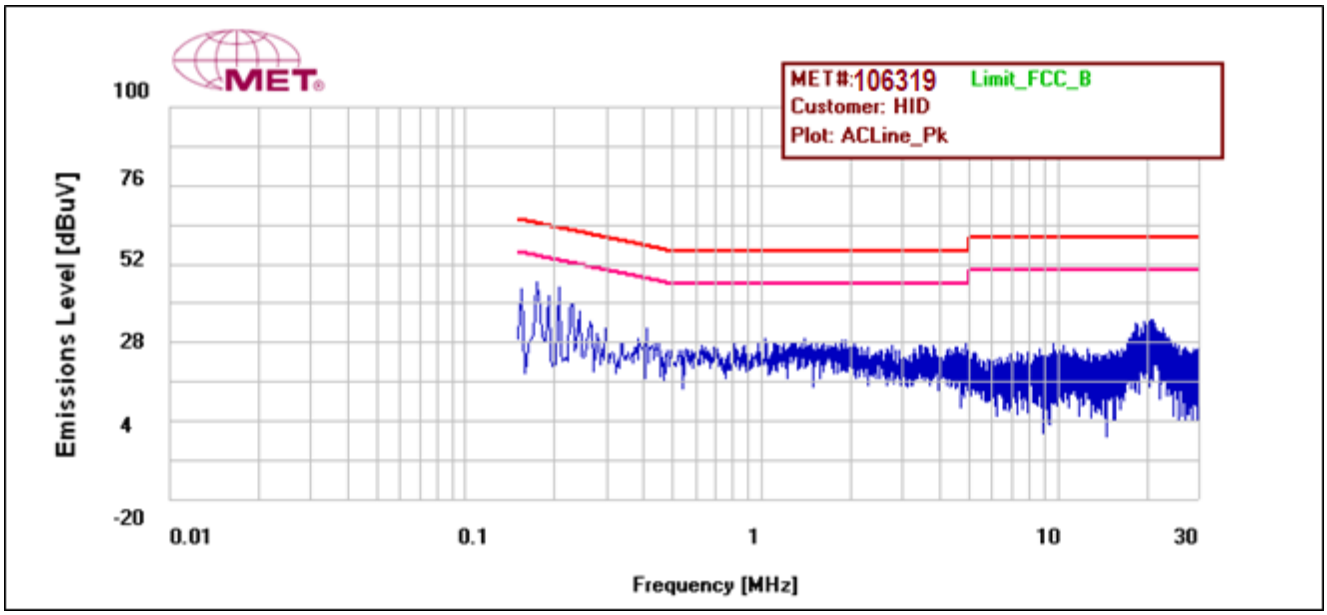

Figure 14. Conducted Emissions, Line

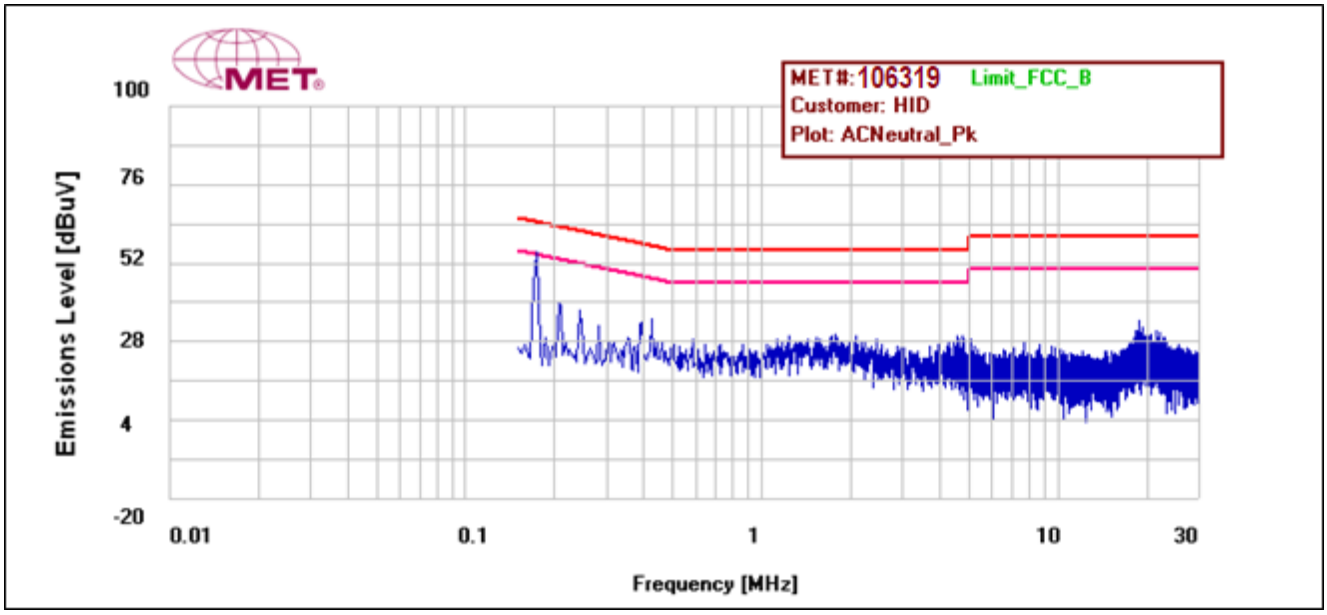

Figure 15. Conducted Emissions, Neutral

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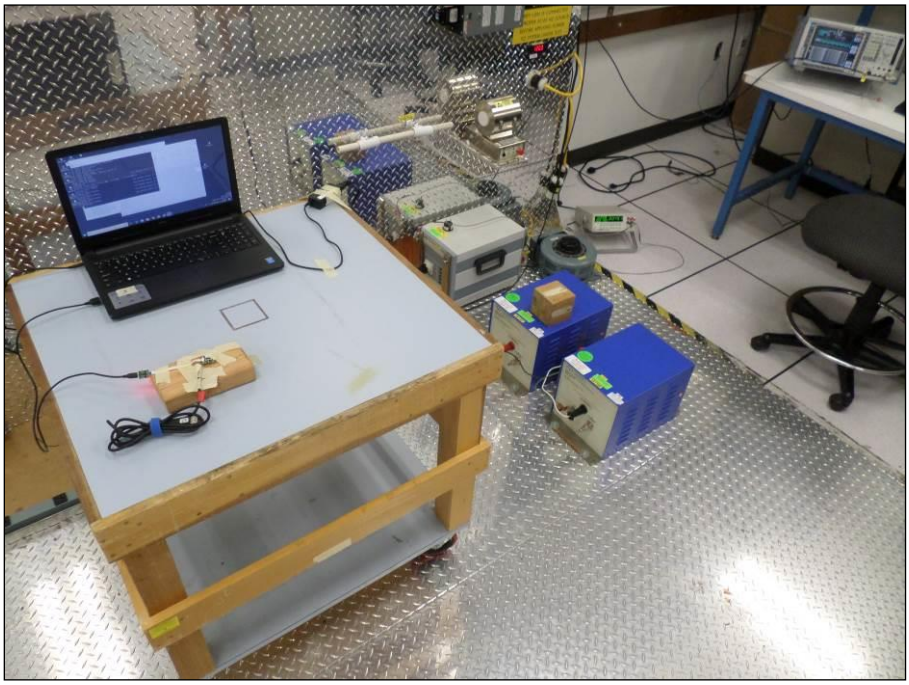


Figure 16. Conducted Emissions, Overall Test Setup

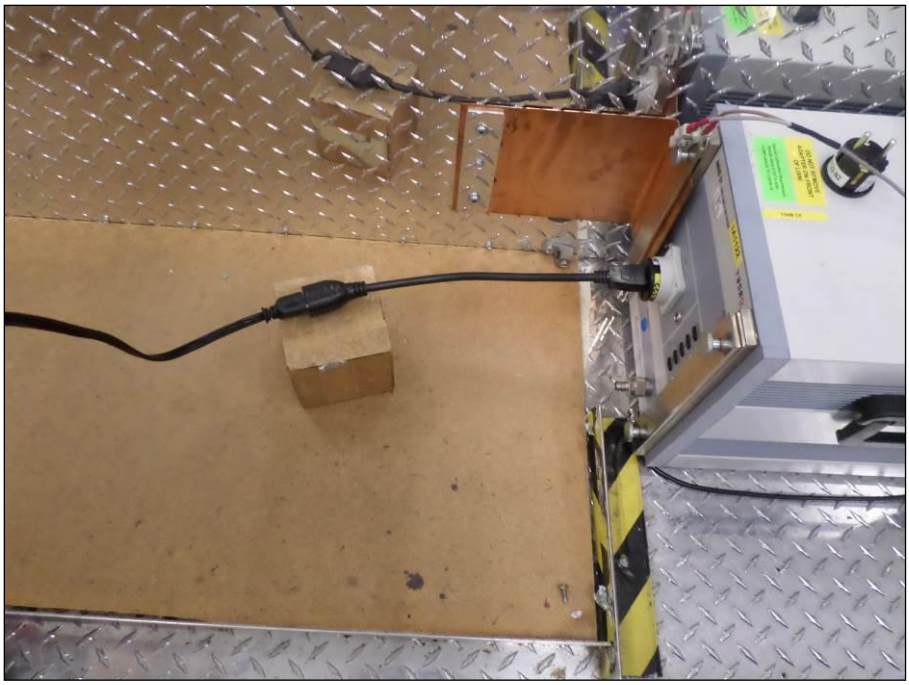


Figure 17. Conducted Emissions, LISN Connection

Electromagnetic Compatibility Criteria for Intentional Radiators

§2.8 General Spurious Emissions Requirements

Test Requirement(s): **§2.8:** Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the table below.

.

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

Figure 18. Radiated Emissions Limits Calculated from §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 C63.10: 2013 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 for scanned measurements.

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

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

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

20log(10/3) = +10.46 dB

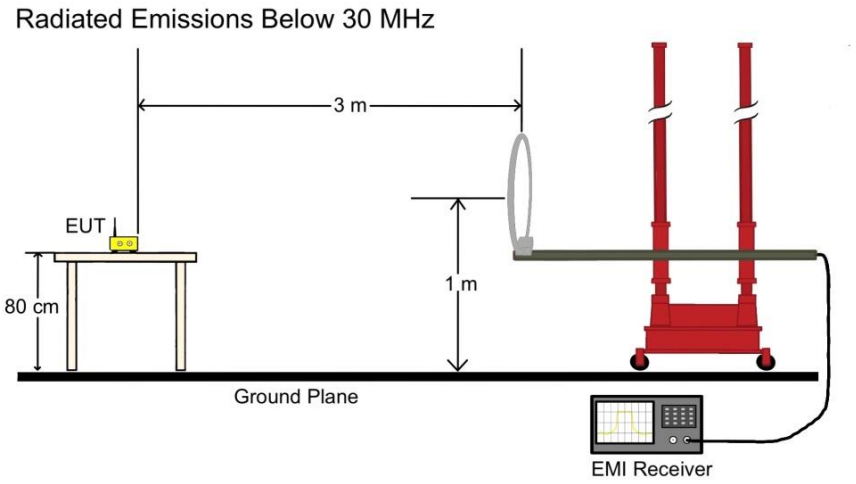


Figure18: Radiated Emissions, Test Setup

Test Results: The EUT was compliant with the requirements of **§ 2.8.** Measured emissions were within applicable limits.

Test Engineer(s): Giuliano Messina

Test Date(s): June 25, 2018

Radiated Spurious Emissions Test Results

Radiated Spurious Emissions, Test Results

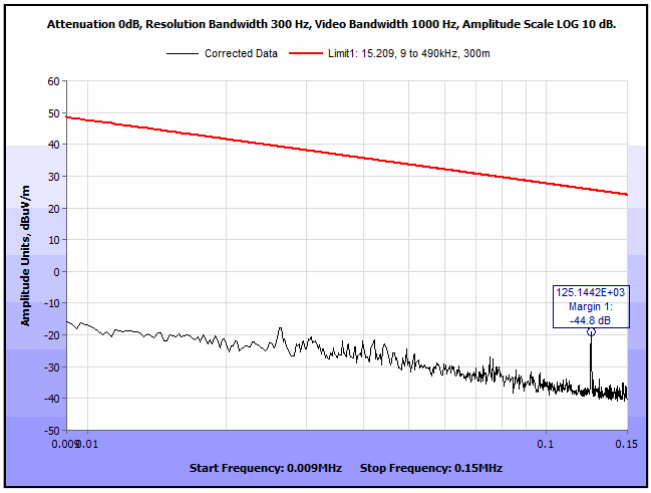


Figure 19. Radiated Emissions, 0.009 – 0.150 MHz, 0 degrees

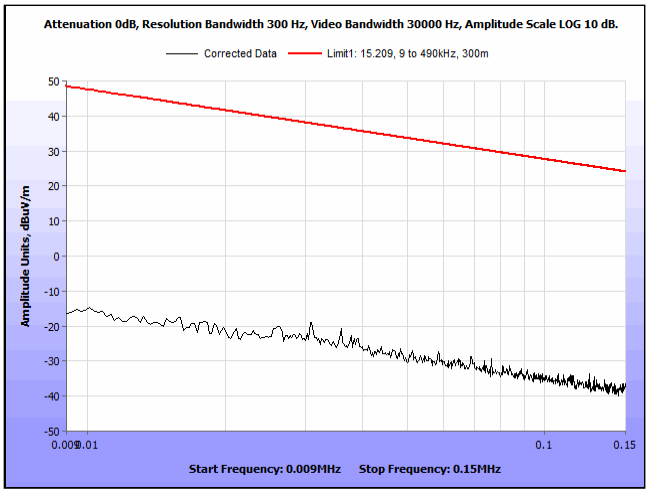


Figure 20. Radiated Emissions, 0.009 – 0.150 MHz, 90 degrees

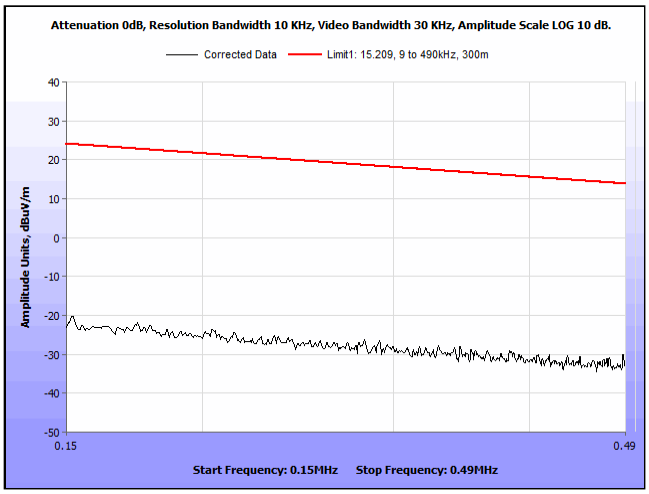


Figure 21. Radiated Emissions, 0.150 – 0.490 MHz, 0 degrees

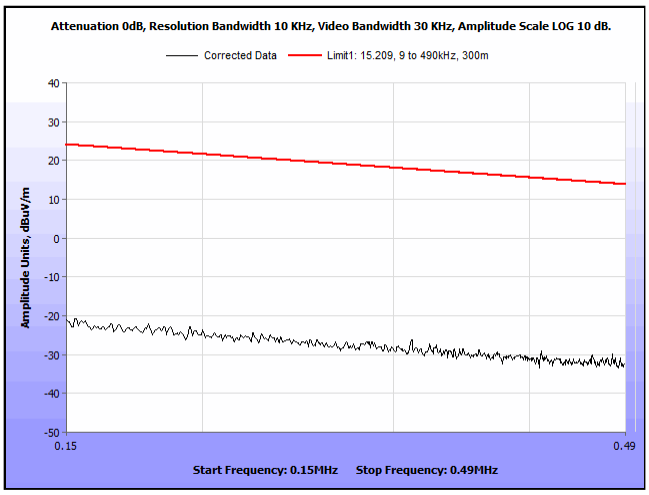


Figure 22. Radiated Emissions, 0.150 – 0.490 MHz, 90 degrees

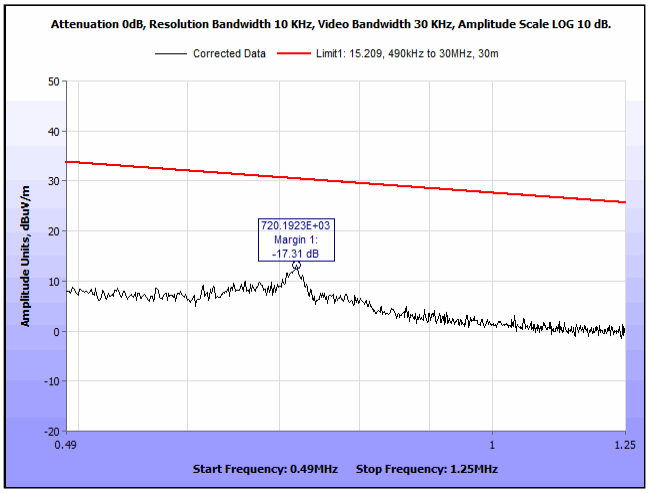
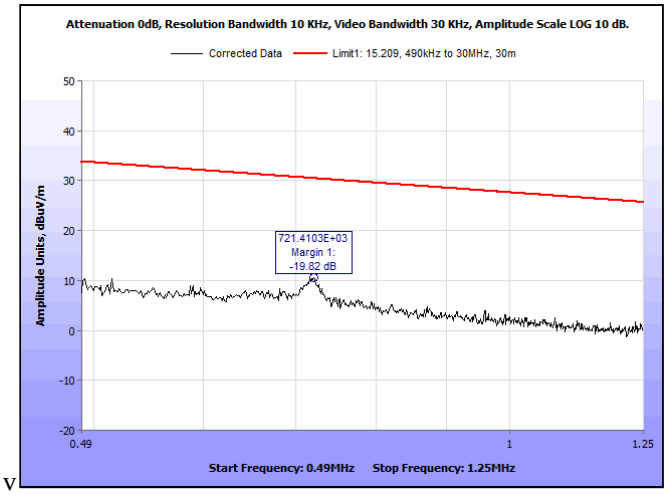


Figure 23. Radiated Emissions, 0.490 – 1.250 MHz, 0 degrees



V

Figure 24. Radiated Emissions, 0.490 – 1.250 MHz, 90 degrees

Radiated Spurious Emissions Test Setup

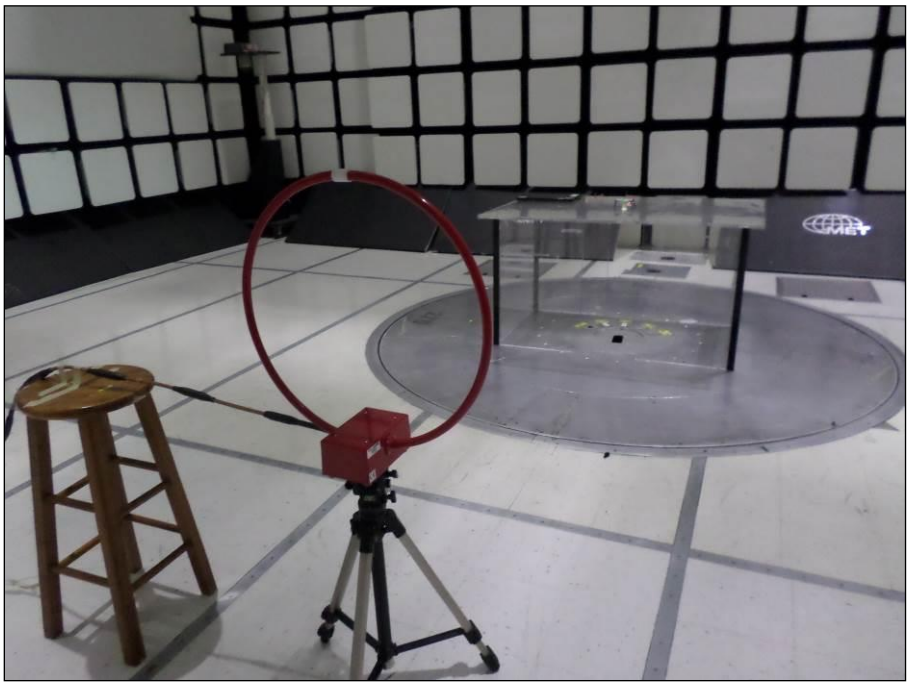


Figure 25. Radiated Emissions, 0.009 MHz – 1.250 MHz, Antenna View

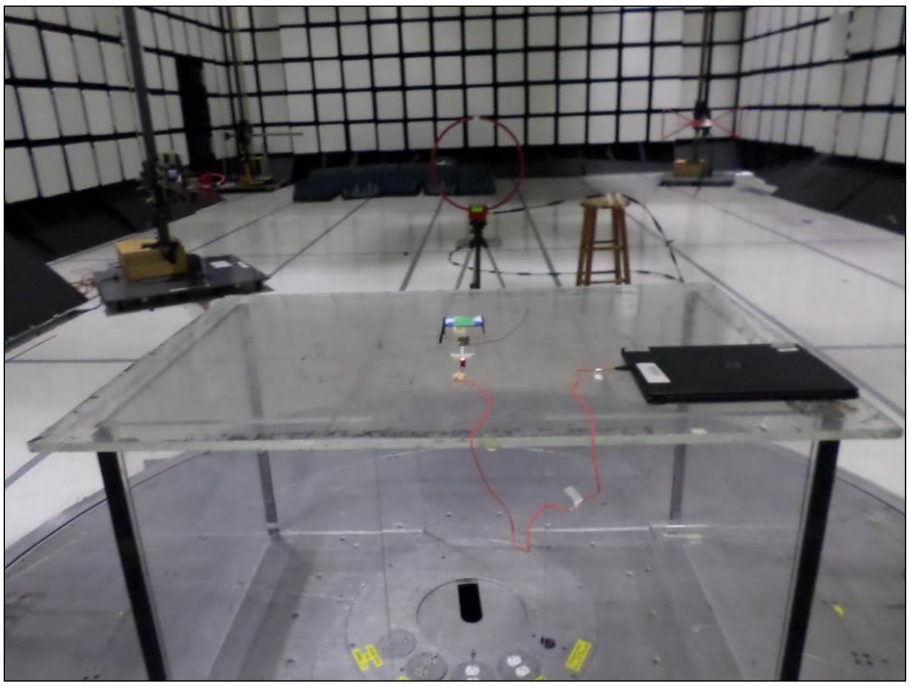


Figure 26. Radiated Emissions, 0.009 – 1.250 MHz, Rear View

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.

MET Asset #	Nomenclature	Manufacturer	Model	Last Cal Date	Cal Due Date
1A1176	Loop Antenna	ETS-Lindgren	6502	1/31/2018	7/31/2019
1A1184	Spectrum Analyzer	Agilent	E4407B	4/20/2018	4/20/2019
1A1083	EMI Test Receiver	Rohde & Schwarz	ESU40	9/12/2017	10/12/2018
1A1106	10m Chamber (FCC)	ETS	Semi-Anechoic	See Note	
1A1073	Multi Device Controller	ETS EMCO	2090	See Note	
1A1074	System Controller	Panasonic	WV-CU101	See Note	

Figure 27. Test Equipment List

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

End of Report

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