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

July 31, 2019

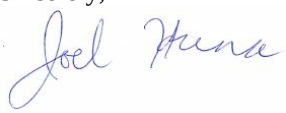
InVue Security
9201 Baybrooke Ln.
Charlotte, North Carolina 28277

Dear Yasu Tamura,

Enclosed is the EMC test report for limited compliance testing of the InVue Security, Custom Davinci S-Pen Vertical Recoiler, for, tested to the requirements of Title 47 of the CFR, Ch. 1 Part 18 for Industrial, Scientific, and Medical (ISM) Equipment, Ultrasonic Devices..

Thank you for using the services of Eurofins MET Labs, 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,



Joel Huna
Documentation Department
Eurofins MET Labs, Inc.

Reference: (\InVue Security\EMC104275B-FCC18)

Electromagnetic Compatibility
Test Report

for

InVue Security
Custom Davinci S-Pen Vertical Recoiler

Tested under

Title 47 of the CFR, Part 18
for Industrial, Scientific, and Medical (ISM) Equipment, Ultrasonic Devices

MET Report: EMC104275B-FCC18

July 31, 2019

Deepak Giri
Test Engineer, EMC 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 applicable limits. 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 Title 47 of the CFR, Part 18, for a Class B Digital Device under normal use and maintenance.

Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	July 31, 2019	Initial Issue.

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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
ESD	**E**lectro**s**tatic **D**ischarge
EUT	**E**quipment **U**nder **T**est
f	**F**requency
CISPR	**C**omite **I**nternational **S**pecial des **P**erturbations **R**adioelectriques (International Special Committee on Radio Interference)
GRP	**G**round **R**eference **P**lane
H	Magnetic Field
HCP	**H**orizontal **C**oupling **P**lane
Hz	**H**ert**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**h**ert**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	**micro**henry
µF	**micro**farad
µs	**micros**econds
PRF	**P**ulse **R**epetition **F**requency
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare
V/m	**V**olts **per m**eter
VCP	**V**ertical **C**oupling **P**lane

Table 1: List of Abbreviations

1.0 Testing Summary

The following tests specified below were performed with the following results.

Reference and Test Description	Results	Comments
Title 47 of the CFR, Part 18 - 18.309 (a) Conducted Emission Limits for Industrial, Scientific, and Medical (ISM) Equipment, Ultrasonic Devices	Compliant	Measured emissions were within applicable limits.
Title 47 of the CFR, Part 18 - 18.305 (b) Radiated Emission Limits for Industrial, Scientific, and Medical (ISM) Equipment, Ultrasonic Devices	Compliant	Measured emissions were within applicable limits.

Table 2: Testing Summary

2.0 Equipment Configuration

2.1 Overview

Eurofins MET Labs, Inc. was contracted by InVue Security to perform testing on the Custom Davinci S-Pen Vertical Recoiler, under InVue Security purchase order number 65639.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the InVue Security, Custom Davinci S-Pen Vertical Recoiler.

In accordance with §2.955(a) (3), the following data is presented in support of the verification of the InVue Security, Custom Davinci S-Pen Vertical Recoiler. InVue Security should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the Custom Davinci S-Pen Vertical Recoiler has been **permanently** discontinued, as per §2.955(b).

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

Model(s) Tested:	Custom Davinci S-Pen Vertical Recoiler
Model(s) Covered:	Custom Davinci S-Pen Vertical Recoiler
Primary Power as Tested:	4.75 to 5.25 VDC
Frequency Range:	531 KHz – 562 KHz
Equipment Emissions Class:	B
Highest Clock Frequency:	48 MHz
Evaluated by:	Deepak Giri
Report Date:	July 31, 2019

Table 3. EUT Overview

2.2 Test Site

All testing was performed at Eurofins MET Labs, Inc., 914 West Patapsco Avenue, Baltimore, MD 21230. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Eurofins MET Labs is a ISO/IEC 17025 accredited site by A2LA, Baltimore #0591.01.

Radiated Emissions measurements were performed in a semi-anechoic chamber. In accordance with §2.948(a)(3), a complete site description is contained at Eurofins MET Labs.

2.3 Measurement Uncertainty

Test Method	Typical Expanded Uncertainty	K	Confidence Level
RF Frequencies	±4.52 Hz	2	95%
RF Power Conducted Emissions	±2.32 dB	2	95%
RF Power Conducted Spurious Emissions	±2.25 dB	2	95%
RF Power Radiated Emissions	±3.01 dB	2	95%

Table 4. Uncertainty Calculations Summary

2.4 Description of Test Sample

Custom Davinci S-Pen Vertical Recoiler and Custom Davinci S-Pen Horizontal Recoiler are a wireless charger for a stylus. It is intended to use in retail store environment. Its main functions are to charge the stylus.

2.5 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	Revision
A	N/A	Davinci S-Pen Vertical	F1754	F1754107	N/A	02

Table 5. Equipment Configuration

2.6 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
B	Power Supply	InVue	PS515-US	Not Available
D	Stylus	Confidential	Confidential	Not Available

Table 6. Support Equipment

2.7 Ports and Cabling Information

Ref. ID	Port Name on EUT	Cable Description	Qty.	Length (m)	Max Length (m)	Shielded (Y/N)	Termination Point
1	DCVin	2 conductor, 22 awg	1	1	1.010	No	B.VBUS
3	RFout	Wireless, no cables	1	N/A	N/A	No	C.RFin

Table 7. Ports and Cabling Information

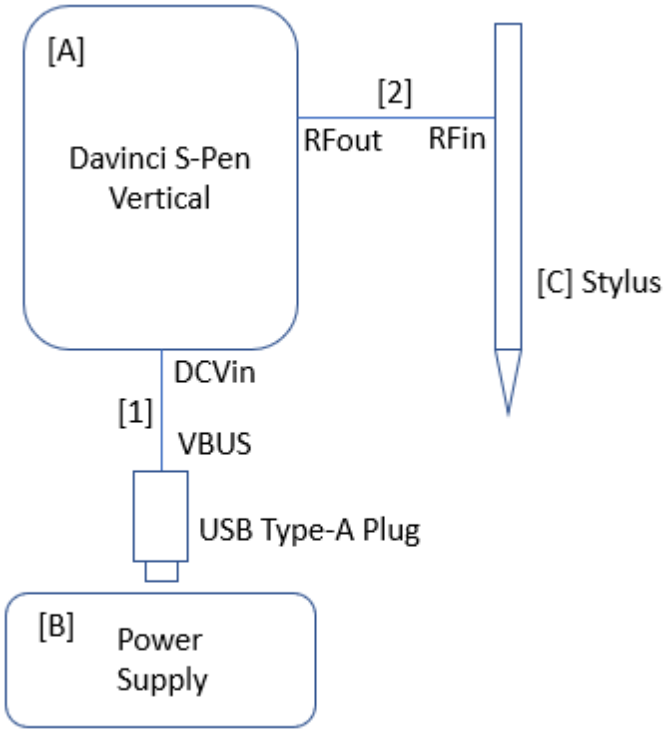


Figure 1. Block Diagram of Test Configuration

2.8 Mode of Operation

The EUT is simulated normal operation by inserting (for a vertical unit) the stylus or putting on top (for a horizontal unit) stylus. Other normal operation is to remove the stylus from the EUT.

2.9 Method of Monitoring EUT Operation

When the stylus is in the correction location for charging, a LED will turn on BLUE. If the wrong location, the LED will turn on RED.

2.10 Modifications

2.10.1 Modifications to the EUT

No modifications were made to the EUT.

2.10.2 Modifications to the Test Standard

No modifications were made to the test standard.

2.11 Disposition of EUT

The test sample including all support equipment (if any), submitted to the Electro-Magnetic Compatibility Lab for testing was returned to InVue Security upon completion of testing.

2.12 Test Software Used

Conducted Emissions - Trace Data Grabber version 01/26/2016
Radiated Emissions- EMC-REG-TDS-11, Radiated Emissions Prescan.xls version 06/29/11

3.0 Electromagnetic Compatibility Emission Criteria

3.1 Conducted Emission Limits

Test Requirement(s): **18.307** For the following equipment, when 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 shall not exceed the limits in the following tables. 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 using a 50 µH/50 Ohms Line Impedance Stabilization Network (LISN).

(b) All other part 18 consumer devices:

Frequency of Emission (MHz)	18.307(a) ISM Conducted Limits (dBµV)	
	Quasi-Peak	Average
0.15 - 0.5	66 to 56*	56 to 46*
0.5 - 5	56	46
5 - 30	60	50
Note 1 — The lower limit shall apply at the transition frequencies. Note 2 — *The limit decreases linearly with the logarithm if the frequency in the range 0.05 MHz to 0.5 MHz.		

Table 8. Conducted Limits for ISM (Ultrasonic Equipment) calculated from FCC Part 18 Section 18.307(a)

18.311 The measurement techniques which will be used by the FCC to determine compliance with the technical requirements of this part are set out in FCC Measurement Procedure MP–5, ‘‘Methods of Measurements of Radio Noise Emissions from ISM equipment’’. Although the procedures in MP–5 are not mandated, manufacturers are encouraged to follow the same techniques which will be used by the FCC.

Test Procedure: The EUT was setup on a wooden table, 80cm above the ground plane. The method of testing, test conditions, and test procedures of ANSI C63.4 2014 were used. The EUT was powered through a 50Ω/50µH LISN. An EMI receiver, connected to the measurement port of the LISN, scanned the frequency range from 150 kHz to 30 MHz in order to find the peak conducted emissions. All peak emissions within 20 dB of the limit, six highest peaks were re-measured, along with emission close to the limit line by 6 dB were also evaluated using a quasi-peak and average detector.

Environmental Conditions for Conducted Emissions	
Ambient Temperature (°C)	21
Relative Humidity (%)	46

Test Results: The EUT was **compliant** with the of this section. Measured emissions were within applicable limits.

Test Technician(s): Deepak Giri

Test Date(s): June 26, 2019

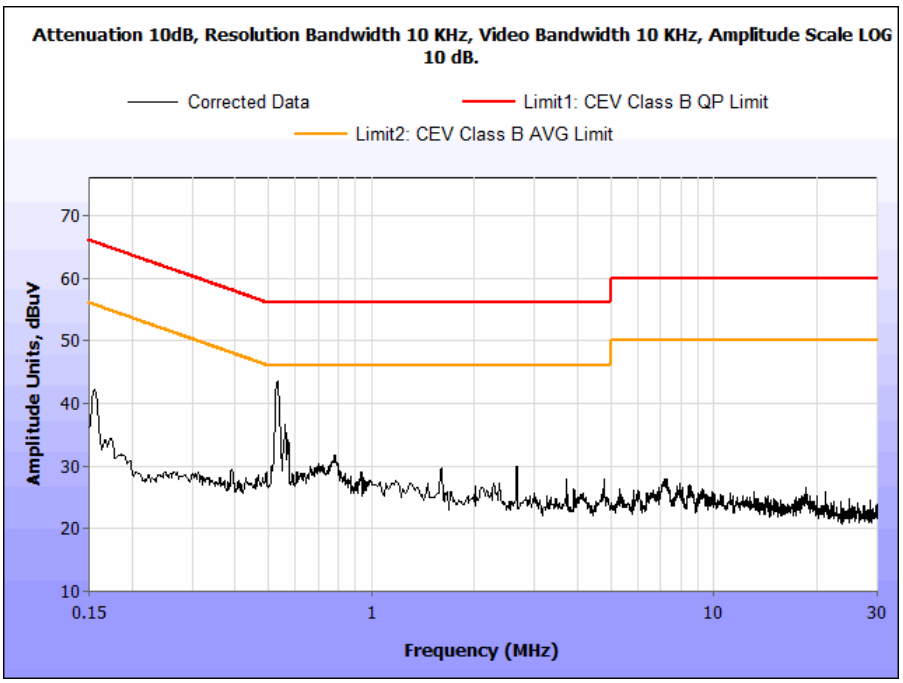
Conducted Emissions at the Mains Terminal Test Data:

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	External Attenuation (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	External Attenuation (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
0.1649	12.59	0	10	22.59	65.21	-42.62	1.93	0	10	11.93	55.21	-43.28
0.2957	9.58	0	10	19.58	60.36	-40.78	1.46	0	10	11.46	50.36	-38.9
0.5312	29.02	0	10	39.02	56	-16.98	22.64	0	10	32.64	46	-13.36
1.5933	16.16	0	10	26.16	56	-29.84	9.11	0	10	19.11	46	-26.89
5.8436	13.95	0	10	23.95	60	-36.05	6.78	0	10	16.78	50	-33.22
18.616	5.12	0	10	15.12	60	-44.88	2.13	0	10	12.13	50	-37.87

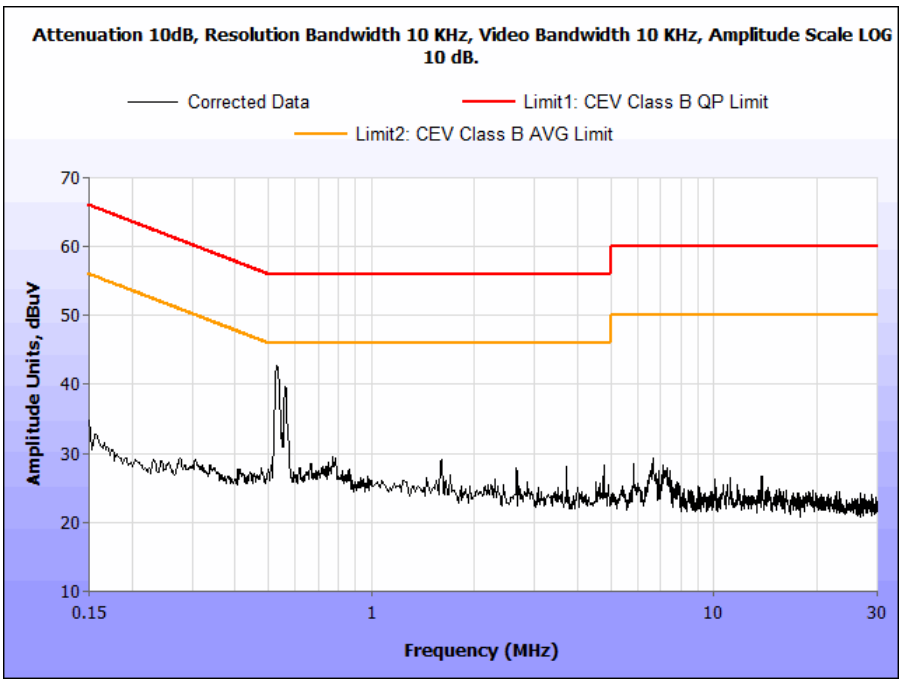
Table 9: Conducted Emissions at the Mains Terminal (120 VAC/60 Hz) Phase Test Results

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	External Attenuation (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	External Attenuation (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
0.1573	42.78	0	10	52.78	65.61	-12.83	18.77	0	10	28.77	55.61	-26.84
0.2036	16.16	0	10	26.16	63.46	-37.3	9.21	0	10	19.21	53.46	-34.25
0.5315	28.76	0	10	38.76	56	-17.24	18.48	0	10	28.48	46	-17.52
0.5571	6.38	0	10	16.38	56	-39.62	1.32	0	10	11.32	46	-34.68
1.593	16.09	0	10	26.09	56	-29.91	5.67	0	10	15.67	46	-30.33
7.248	10.16	0	10	20.16	60	-39.84	2.89	0	10	12.89	50	-37.11

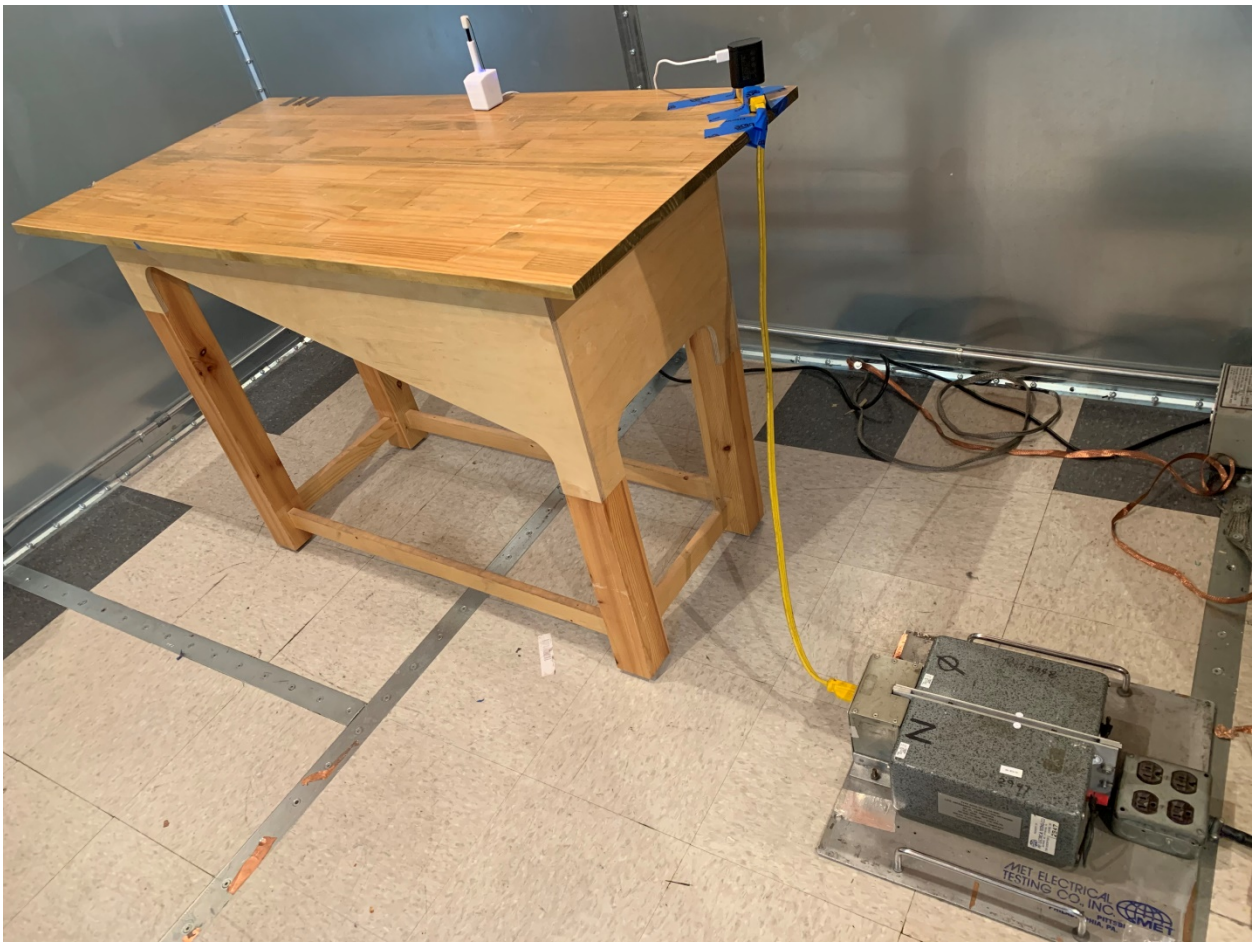
Table 10: Conducted Emissions at the Mains Terminal (120 VAC/60 Hz) Neutral Test Results



Plots 1. Conducted Emissions at the Mains Terminal Test Data – (120VAC) Line Plot



Plots 2. Conducted Emissions at the Mains Terminal Test Data – (120VAC) Neutral Plot



Photograph 1: Conducted Emissions at the Mains Terminal Test Setup

3.2 Radiated Emission: Limits of Electromagnetic Radiation Disturbance

Test Standard: **Title 47 of the Code of Federal Regulations (CFR), Part 18 Subpart C**

Test Requirement(s): 18.305 Field strength limits:
(a) ISM equipment operating on a frequency specified in § 18.301 is permitted unlimited radiated energy in the band specified for that frequency.
(b) The field strength levels of emissions which lie outside the bands specified in § 18.301, unless otherwise indicated, shall not exceed the following:

Equipment	Operating frequency	RF Power generated by equipment (watts)	Field strength limit (uV/m)	Distance (meters)
Any type unless otherwise specified (miscellaneous)	Any ISM frequency	Below 500 500 or more	25 25×SQRT(power/500)	300 [1]300
	Any non-ISM frequency	Below 500 500 or more	15 15×SQRT(power/500)	300 [1]300
Industrial heaters and RF stabilized arc welders	On or below 5,725 MHz Above 5,725 MHz	Any Any	10 ([2])	1,600 ([2])
Medical diathermy	Any ISM frequency Any non-ISM frequency	Any Any	25 15	300 300
Ultrasonic	Below 490 kHz	Below 500 500 or more	2,400/F(kHz) 2,400/F(kHz)×SQRT(power/500)	300 [3]300
	490 to 1,600 kHz Above 1,600 kHz	Any Any	24,000/F(kHz) 15	30 30
Induction cooking ranges	Below 90 kHz On or above 90 kHz	Any Any	1,500 300	[4]30 [4]30

[1] Field strength may not exceed 10 µV/m at 1600 meters. Consumer equipment operating below 1000 MHz is not permitted the increase in field strength otherwise permitted here for power over 500 watts.
[2] Reduced to the greatest extent possible.
[3] Field strength may not exceed 10 µV/m at 1600 meters. Consumer equipment is not permitted the increase in field strength otherwise permitted here for over 500 watts.
[4] Induction cooking ranges manufactured prior to February 1, 1980, shall be subject to the field strength limits for miscellaneous ISM equipment.

18.311 The measurement techniques which will be used by the FCC to determine compliance with the technical requirements of this part are set out in FCC Measurement Procedure MP–5, ‘‘Methods of Measurements of Radio Noise Emissions from ISM equipment’’. Although the procedures in MP–5 are not mandated, manufacturers are encouraged to follow the same techniques which will be used by the FCC.

Test Procedures: The EUT was placed on a non-metallic table, 80 cm above the ground plane (See Photograph 2 - 5) inside a semi-anechoic chamber. Measurements were made with a loop antenna.

Radiated Emission measurements were made in accordance with the procedures delineated in FCC Measurement Procedure MP-5, “Methods of Measurements of Radio Noise Emissions from ISM equipment”.

For each point of measurement, the turntable was rotated, , and the antenna height was varied in order to find the maximum radiated emissions. Plots were captured at both planar and co-axial mode with loop antenna, and horizontal and vertical polarity with biconical antenna. Emission were measured cumulatively by rotating EUT in its 3 axis.
Final measurements were made at 3m. Multiple measurements were performed The limit line was corrected for 3m using 40 Log($^{d1}/_{d2}$) from 300m.

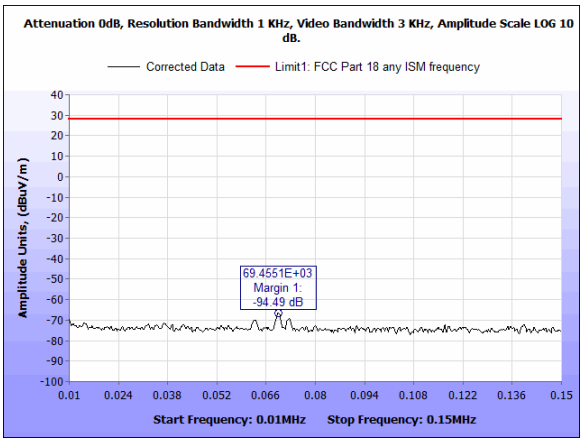
Environmental Conditions for Radiated Emissions	
Ambient Temperature (°C)	21
Relative Humidity (%)	46

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

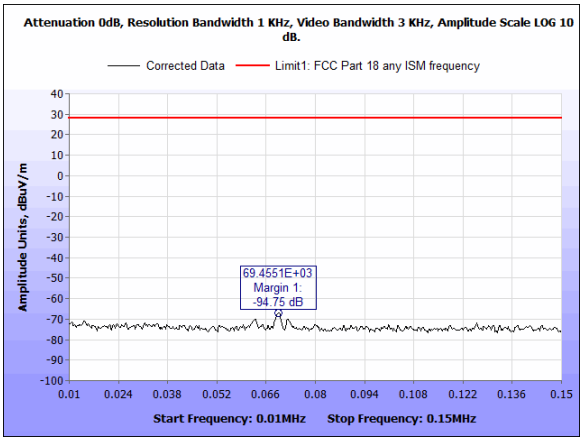
Test Technician(s): Deepak Giri

Test Date(s): July 11, 2019

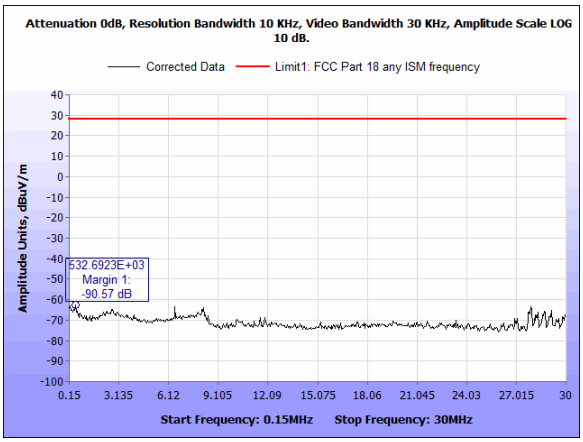
Note 1: The following sample calculation was used to correct the amplitude (Corrected Amplitude (dBuV/m)= Uncorrected Data+ACF+Cable Loss-Distance Correction Factor).



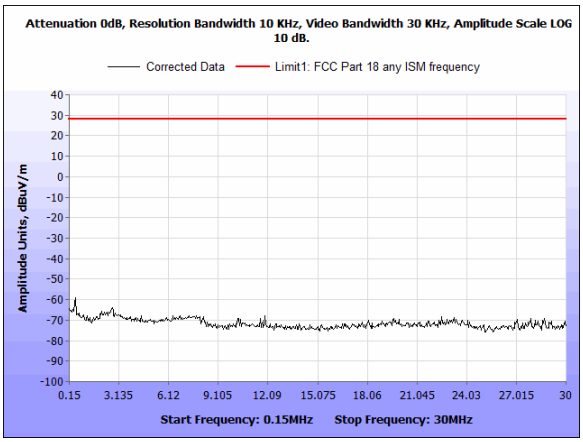
Plots 3. Radiated Emission – (10 kHz – 150 kHz) 0 degree



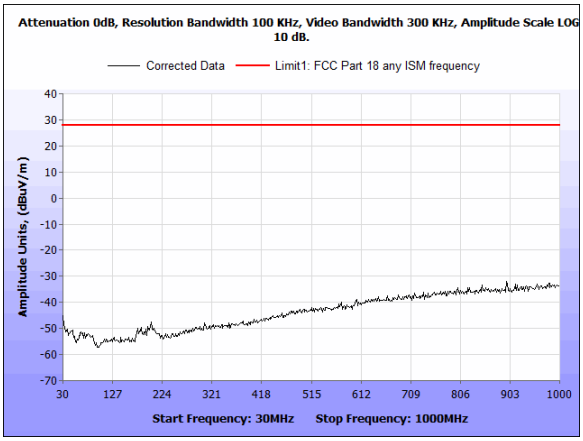
Plots 4. Radiated Emission – (10 kHz – 150 kHz) 90 degree



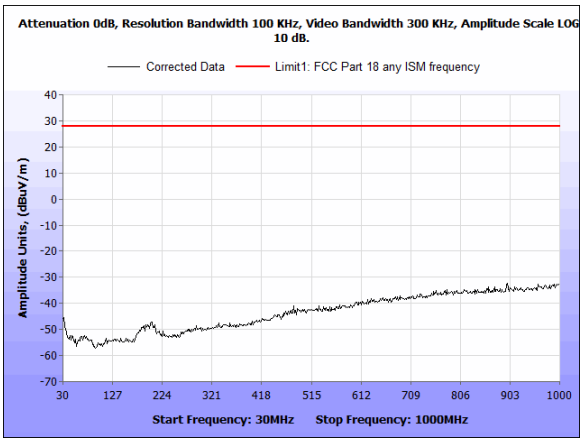
Plots 5. Radiated Emission – (150 kHz – 30 MHz) 0 degree



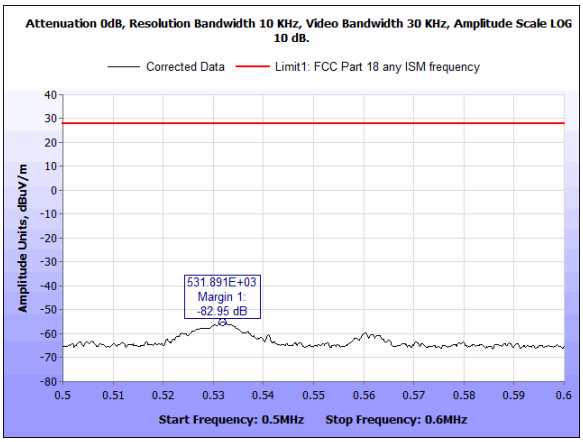
Plots 6. Radiated Emission – (150 kHz – 30 MHz) 90 degree



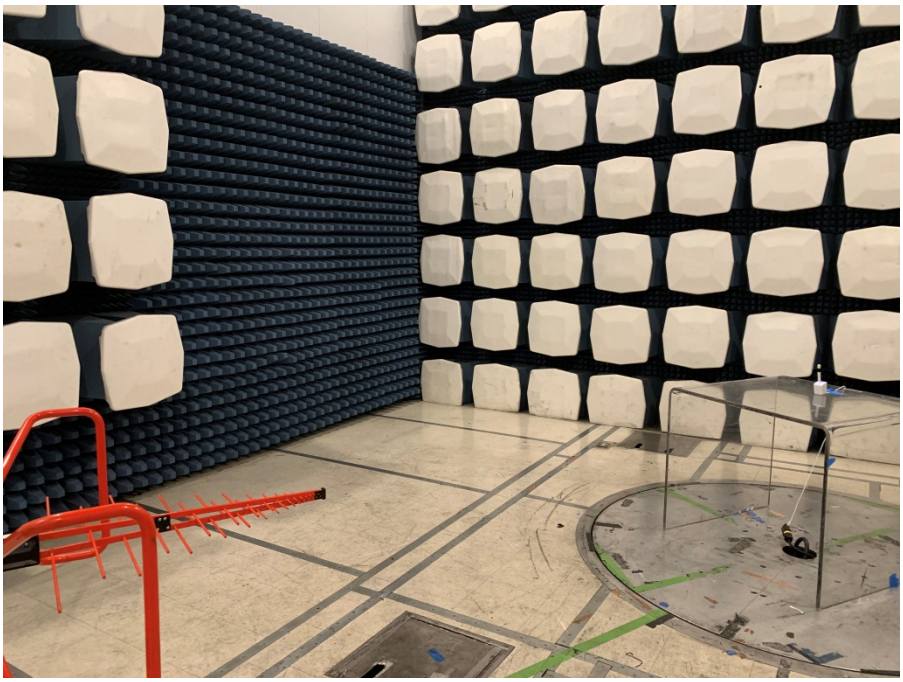
Plots 7. Radiated Emission – (30 MHz - 1 GHz) Horizontal



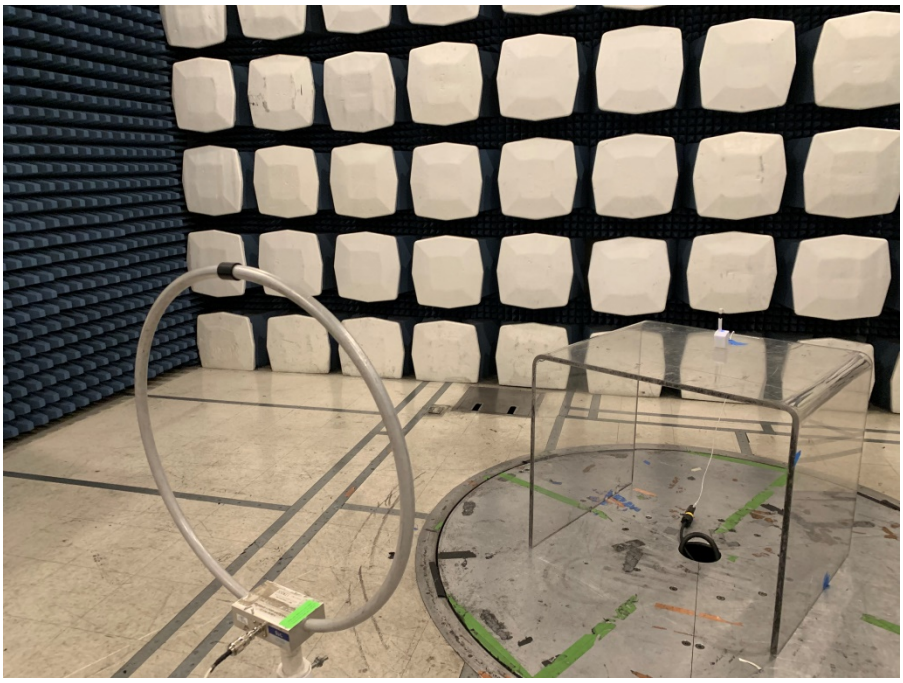
Plots 8. Radiated Emission – (30 MHz - 1 GHz) Vertical



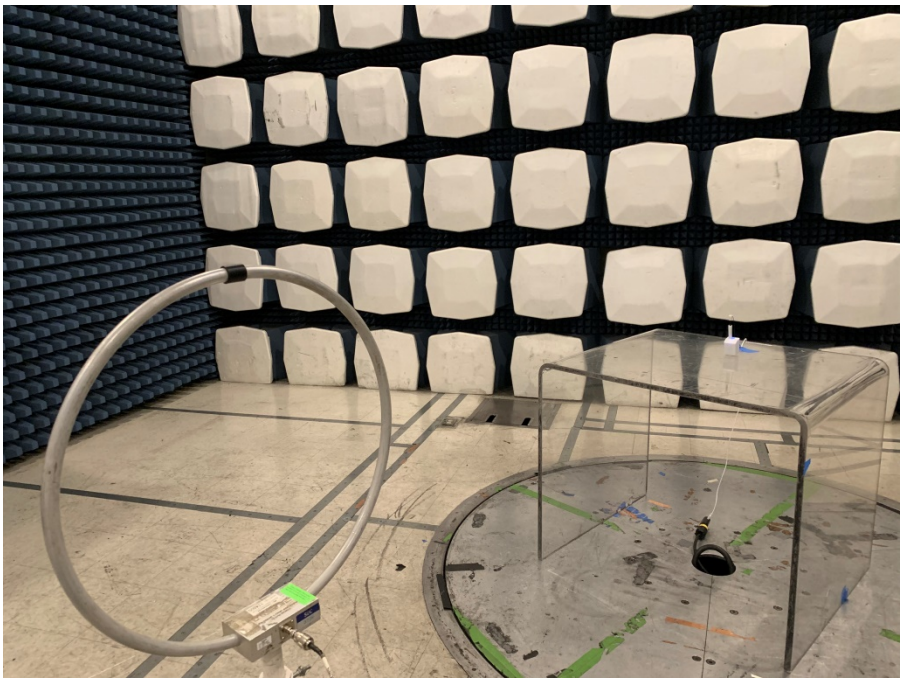
Plots 9. Radiated Emission – Field strength of fundamental 531 KHz – 562 KHz



Photograph 2: Radiated Emission, Test Setup, Below 1 GHz



Photograph 3: Radiated Emission, Test Setup, Below 30 MHz, 0 degrees



Photograph 4: Radiated Emission, Test Setup, Below 30 MHz, 90 degrees

4.0 Test Equipment

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

Test Name: Conducted Emissions (AC Power)					**Test Date(s):** June 26, 2019
MET Asset #	**Nomenclature**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
1T4771	PSA Spectrum Analyzer	Agilent Technologies	E4446A	05/16/2018	11/16/2019
1T2947	LISN	Solar Electronics Company	8028-50-TS-24-BNC	08/31/2018	02/29/2020
1T2948	LISN	Solar Electronics Company	8028-50-TS-24-BNC	08/31/2018	02/29/2020
Test Name: Radiated Emissions					**Test Date(s):** July 11, 2019
MET Asset #	**Nomenclature**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
1S2501	EMI Test Receiver 20Hz-40GHz	Rohde & Schwarz	ESU40	3/26/2019	3/26/2020
1T4300	SEMI-ANECHOIC CHAMBER (NSA)	EMC TEST SYSTEMS	NONE	6/30/2019	6/30/2020
1T4753	Antenna - Bilog	Sunol Sciences	JB6	8/30/2018	2/29/2020
1T4800	Antenna, Loop	EMCO	6512	05/02/2019	11/02/2020
Note: Functionally verified test equipment is verified using calibrated instrumentation at the time of testing.					

Table 11: Test Equipment List