

04/09/2020

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, Tray S-Pen Display 2020, for consumer devices (b), tested to the requirements of Title 47 of the CFR, Ch. 1, Subchapter A- Part 18 Subpart C for Industrial, Scientific, and Medical (ISM) 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,

A handwritten signature in blue ink that reads "Joel Huna".

Joel Huna  
Documentation Department  
Eurofins E&E North America

Reference: (\InVue Security\EMC106646A-FCC18 [S-PEN HORIZONTAL] Rev. 1)

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



## Electromagnetic Compatibility Test Report

for

**InVue Security  
Tray S-Pen Display 2020**

Tested under

**Title 47 of the CFR, Ch. 1, Subchapter A- Part 18 Subpart C for Industrial, Scientific, and  
Medical (ISM) Equipment**

**Report: EMC106646A-FCC18 [S-PEN HORIZONTAL] Rev. 1**

04/09/2020



Donald Salguero  
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, S Subpart C under normal use and maintenance.



Deepak Giri  
Test Engineer, Electromagnetic Compatibility Lab

## Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	02/05/2020	Initial Issue.
1	04/09/2020	Conducted Emissions Section Added, Radiated Fundamental Emission Updated

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## List of Terms and Abbreviations

AC	Alternating Current
ACF	Antenna Correction Factor
Cal	Calibration
<i>d</i>	Measurement Distance
dB	Decibels
dB $\mu$ A	Decibels above one microamp
dB $\mu$ V	Decibels above one microvolt
dB $\mu$ A/m	Decibels above one microamp per meter
dB $\mu$ V/m	Decibels above one microvolt per meter
DC	Direct Current
E	Electric Field
ESD	Electrostatic Discharge
EUT	Equipment Under Test
<i>f</i>	Frequency
CISPR	Comite International Special des Perturbations Radioelectriques (International Special Committee on Radio Interference)
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
$\mu$ H	microhenry
$\mu$ F	microfarad
$\mu$ s	microseconds
PRF	Pulse Repetition Frequency
RF	Radio Frequency
RMS	Root-Mean-Square
V/m	Volts per meter
VCP	Vertical Coupling Plane

Figure 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
§18.309 Frequency range of measurements (a) for field strength measurements	Compliant	Measured emissions were within applicable limits.
§18.307 Conduction limits (b) all other part 18 consumer devices	Compliant by Similarity	

**Figure 2: Testing Summary**

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

## 2.0 Equipment Configuration

### 2.1 Overview

Eurofins E&E North America was contracted by InVue Security to perform testing on the Tray S-Pen Display 2020, under InVue Security purchase order number 69478.

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, Tray S-Pen Display 2020.

In accordance with §2.948, the following data is presented in support of the verification of the InVue Security, Tray S-Pen Display 2020. 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 Tray S-Pen Display 2020 has been **permanently** discontinued, as per §2.955(b).

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

<b>Model(s) Tested:</b>	Tray S-Pen Display 2020
<b>Model(s) Covered:</b>	Tray S-Pen Display 2020
<b>Primary Power as Tested:</b>	4.75 to 5.25 VDC
<b>Equipment Emissions Class:</b>	B
<b>Highest Clock Frequency:</b>	48 MHz
<b>Evaluated by:</b>	Donald Salguero
<b>Report Date:</b>	02/05/2020

**Figure 3. EUT Overview**



## 2.2 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, 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 Laboratories Inc. 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 E&E North America.

## 2.3 Measurement Uncertainty

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

Figure 4. Uncertainty Calculations Summary

## 2.4 Description of Test Sample

Tray S-Pen Display 2020 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 8. 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 Horizontal	F1754	F1754105	N/A	08

Figure 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

The 'Customer Supplied Calibration Data' column will be marked as either not applicable, not available

Figure 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

Figure 7. Ports and Cabling Information

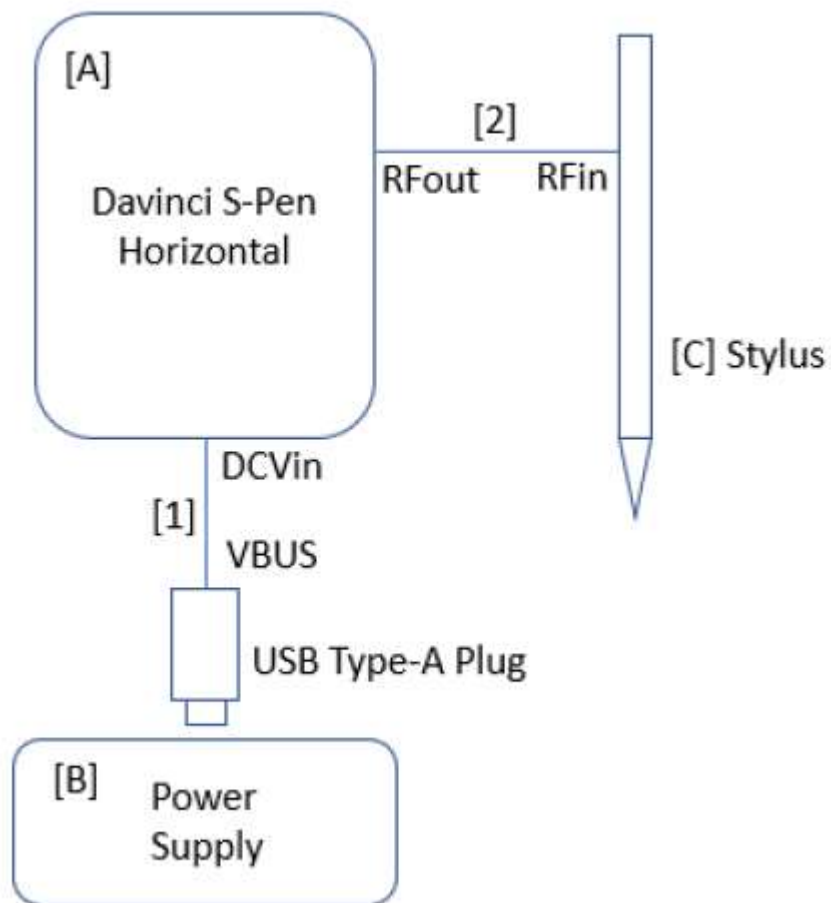


Figure 8. Block Diagram of Test Configuration

## **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 changing 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 Radiated Emission: Limits of Electromagnetic Radiation Disturbance

**Test Method:** ANSI C63.4- American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

**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 1300
	Any non-ISM frequency	Below 500 500 or more	15 15× SQRT(power/500)	300 1300
Industrial heaters and RF stabilized arc welders	On or below 5,725 MHz Above 5,725 MHz	Any Any	10 ( <sup>2</sup> )	1,600 ( <sup>2</sup> )
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 3300
	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	<sup>4</sup> 30 <sup>4</sup> 30

<sup>1</sup> 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.

<sup>2</sup> Reduced to the greatest extent possible.

<sup>3</sup> 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.

- <sup>4</sup> 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 general procedures of ANSI C63.4-2014 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz" as well as 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, the positions of the interface cables were varied, and the antenna height was varied in order to find the maximum radiated emissions.

Measurements were taken at 3m, and corrected to a limit reference at 300m with:

- $20\text{Log}(d_1/d_2)$  for emissions above 30MHz
- $40\text{Log}(d_1/d_2)$  for emissions between 9kHz and 30MHz

**Test Results:**

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

**Test Technician(s):**

Donald Salguero

**Test Date(s):**

01/15/2020

## Radiated Emissions Limits Test Results:

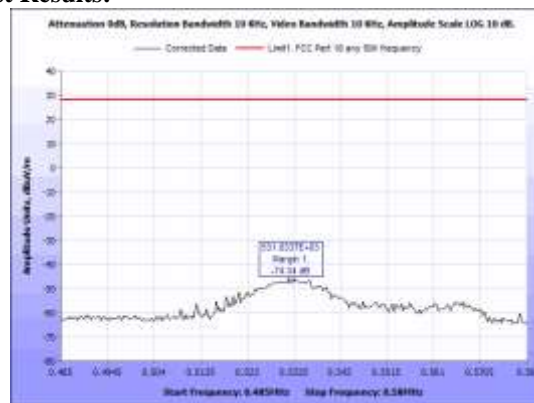


Figure 9. Field Strength Limits, Fundamental Emission, Cumulative

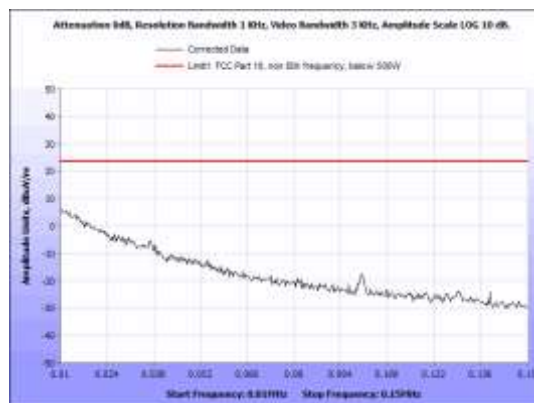


Figure 10. Field Strength Limits, H Unit, 0.01 - 0.15 MHz, Parallel

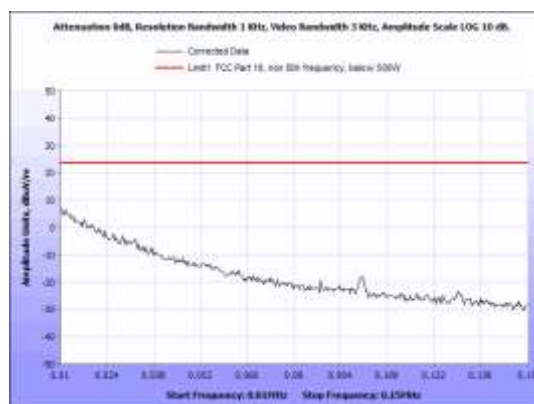


Figure 11. Field Strength Limits, H Unit, 0.01 - 0.15 MHz, Perpendicular

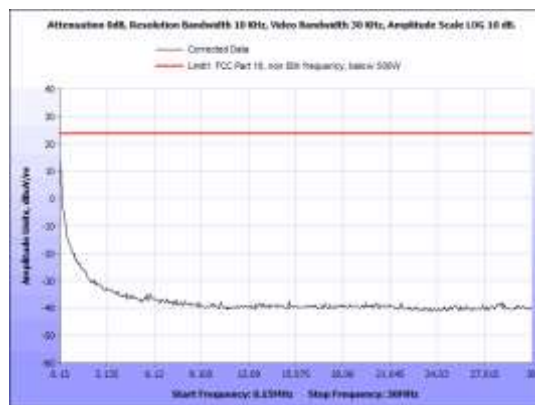


Figure 12. Field Strength Limits, H unit, 0.150 - 30 MHz, Parallel

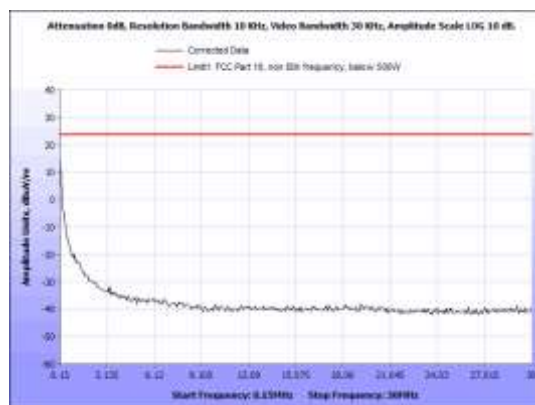


Figure 13. Field Strength Limits, H unit, 0.150 - 30 MHz, Perpendicular

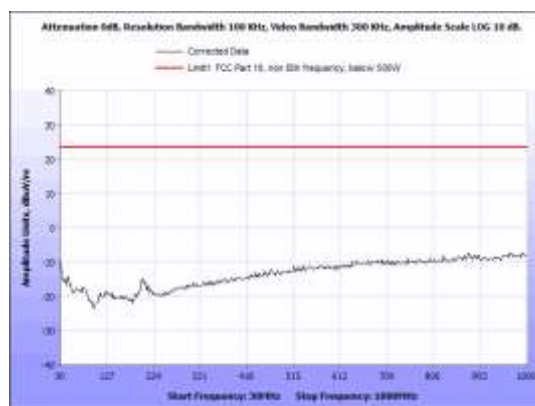


Figure 14. Field Strength limits, H unit, 30 - 1000 MHz





**Figure 15. Field Strength Limits, Horizontal Units, Radiated Emissions below 30 MHz – Parallel**



**Figure 16: Field Strength Limits, Horizontal Units, Radiated Emissions below 30 MHz – Perpendicular**



**Figure 17. Field Strength Limits, Horizontal unit, Radiated Emissions above 30 MHz**

## 3.2 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  $\mu$ H/50 Ohms Line Impedance Stabilization Network (LISN).

(b) All other part 18 consumer devices:

Frequency of Emission (MHz)	18.307(a) ISM Conducted Limits (dB $\mu$ V)	
	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.		

### Conducted Limits from FCC Part 18 Section 18.307(b)

**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 50 $\Omega$ /50 $\mu$ H 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 by similarity** with the limits of this section. EUT is low power version of the device covered by FCC ID:2AFR8F1754A.

## 4.0 Test Equipment

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

Test Name: Radiated Emissions				Test Date(s): 01/15/2020	
MET Asset #	Nomenclature	Manufacturer	Model	Last Cal Date	Cal Due Date
1T4800	Antenna, Loop	EMCO	6512	5/2/2019	11/2/2020
1T4753	Antenna - Bilog	Sunol Sciences	JB6	8/30/2018	2/29/2020
1T4409	EMI Receiver	Rohde & Schwarz	ESIB7	1/4/2019	1/4/2021
1T4300B	Semi-Anechoic 3m Chamber sVSWR	EMC TEST SYSTEMS	NONE	6/30/2019	12/30/2020
1T4300	SEMI-ANECHOIC CHAMBER (NSA)	EMC TEST SYSTEMS	NONE	6/30/2019	6/30/2020
Note: Functionally verified test equipment is verified using calibrated instrumentation at the time of testing.					

**Figure 18: Test Equipment List**