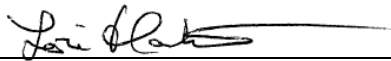


**Element Materials Technology Denver-Longmont
A.K.A. NTS Labs, LLC
Test Report for Electromagnetic Interference (EMI)
Testing of the Vanguard Boost, HP Printer, ATI, and
Headphones**

Prepared For

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Revision History

Rev.	Description	Issue Date
0	Initial Release	05/02/2025

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1.0 Introduction

This document presents the test procedures used and the results obtained during the performance of an Electromagnetic Interference (EMI) test program at Element Materials Technology Denver-Longmont (hereafter referred to as “Element”). The test program was conducted to assess the ability of the specified Equipment Under Test (EUT) to successfully satisfy the requirements defined in the test specification.

2.0 References

The following references listed below form a part of this document to the extent specified herein.

- Test Specification: VVSG 2.0
- SLI Compliance Purchase Order 20250319-01, dated 03/19/2025
- Element Quotation OP0671387, dated 03/19/2025
- ISO/IEC 17025:2017(E) *General Requirements for the Competence of Testing and Calibration Laboratories*, dated 11/2017

3.0 Product Selection and Description

SLI Compliance selected and provided the following test sample(s) to be used as the Equipment Under Test.

Table 3.0-1: Product Identification – Equipment Under Test (EUT)

Item	Qty.	Name/Description	Part Number	Serial Number
1	2	Vanguard Boost	VV-500 2007020	B2520006001, B2520006401
2	1	HP Printer	2Z600F	VNL0341878
3	1	ATI	2007080-A	N/A
4	1	Headphones	Headphones	N/A

3.1 Security Classification

Non-classified

4.0 General Test Requirements

4.1 Test Equipment

The instrumentation used in the performance of these tests is periodically calibrated and standardized within manufacturer's rated accuracies and are traceable to the National Institute of Standards and Technology. The calibration procedures and practices are in accordance with ISO 17025:2017. Certification of calibration is on file subject to inspection by authorized personnel.

4.2 Measurement Uncertainties

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below were calculated using the approach described in CISPR 16-4-2:2003 using a coverage factor of $k=2$, which gives a level of confidence of approximately 95%. The levels were found to be below levels of CISPR and therefore no adjustment of the data for measurement uncertainty is required.

Table 4.2-1: Measurement Uncertainties (Immunity)

Measurement Type	Measurement Unit	Frequency Range	Expanded Uncertainty
Radiated Immunity	V/m	80MHz - 10GHz	.-26.3% to 29.97%
ESD	KV	NA	./+/- 8.6%
Fast Transients	Voltage	NA	./+/- 5.98%
	Time	NA	./+/- 8.6%
Surge	Voltage	NA	./+/- 4.9%
Conducted Immunity (CDN)	Voltage	NA	.-12.6% to 13.3%
Conducted Immunity (BCI)	Voltage	NA	.-13.5% to 15.3%
Voltage Dips / Interrupts	Voltage	NA	./+/- 2.3%
	Time	NA	./+/- 0.08 ms
Magnetic Immunity	Amps	NA	./+/- 0.8%
Pulsed Magnetic Immunity	Amps	NA	./+/- 9.9%

5.0 Test Description and Results

Table 5.0-1: Summary of Test Information & Results

Section	Test	Specification	Test Facility	Test Date	Part #	Serial #	Test Result
5.1	Electrostatic Discharge	VVSG 2.0	Longmont	04/24/2025 - 04/25/2025	2Z600F	VNL0341878	Passed
					2007080-A	N/A	
					Headphones	N/A	
					VV-500 2007020	B2520006001	
5.2	Radiated RF Immunity	VVSG 2.0	Longmont	04/21/2025- 04/22/2025	2Z600F	VNL0341878	Passed
					2007080-A	N/A	
					Headphones	N/A	
					VV-500 2007020	B2520006001	
5.3	Electrical Fast Transient / Burst	VVSG 2.0	Longmont	04/24/2025	2Z600F	VNL0341878	Passed
					2007080-A	N/A	
					Headphones	N/A	
					VV-500 2007020	B2520006001	
5.4	Surge Immunity	VVSG 2.0	Longmont	04/23/2025	2Z600F	VNL0341878	Passed
					2007080-A	N/A	
					Headphones	N/A	
					VV-500 2007020	B2520006001	
5.5	Conducted RF Immunity	VVSG 2.0	Longmont	04/24/2025	2Z600F	VNL0341878	Passed
					2007080-A	N/A	
					Headphones	N/A	
					VV-500 2007020	B2520006001	
5.6	Voltage Dips and Interruptions	VVSG 2.0	Longmont	04/22/2025 - 04/23/2025	VV-500 2007020	B2520006401	Passed
					2007080-A	N/A	
					Headphones	N/A	
					2Z600F	VNL0341878	

The decision rule for Test Results was based on the Test Specification used for testing.

5.1 Electrostatic Discharge

5.1.1 Test Procedure

The EUT was tested in accordance with VVSG 2.0.

5.1.2 Test Result

The EUT passed the defined requirements.

5.1.3 Test Datasheets

Element Materials Technology				
Electrostatic Discharge per IEC / EN 61000-4-2				
Standard Referenced: VVSG 2.0		Date: 4/24/2025		
Temperature: 25°C		Humidity: 39%	Pressure: 834 mb	
Input Voltage: 120Vac/60Hz				
Configuration of Unit: Fully exercising all features of product				
Test Engineer: T. Wittig				
Date	Time	Log Entries	Initials	Result
4/24/2025	1309	Setup for 4-2 ESD testing	TW	Complete
		Bleed-off cables: 832 kohms and 936 kohms	TW	---
	1535	Setup the Vanguard Boost	TW	Complete
4/25/2025	0716	Begin Electrostatic Discharge. IEC 6100042, Per Latest Version and test protocol. +/-8kV Contact, +/-2, 4, 8, 15kV Air.	TW	---
		At -8kV contact discharge to back side plate screws caused EUT to shut down, then at -8kV, reboot occurred	TW	---
	0819	Client staement below:	TW	---
		Update to test plan. Where screws are not connected to the chassie - air discharge will be applied. During ESD Testing the mitigations done were: Added tape to vDrive door alarm. Added tape to case from memory chips	TW	---
		Completed ESD testing	TW	Pass

Element Materials Technology								
Electrostatic Discharge per IEC / EN 61000-4-2								
Standard Referenced: VVSG 2.0				Date: 4/24/2025				
Temperature: 25°C		Humidity: 39%		Pressure: 834 mb				
Input Voltage: 120Vac/60Hz								
Configuration of Unit: Fully exercising all features of product								
Test Engineer: T. Wittig								
Test Location	Voltage Level	Polarity		Number of Pulses	Pulses Per Second	Comments	Criteria Met	Pass/Fail
	(kV)	+	-					
Indirect Discharge Points								
VCP	8	X	X	10	1	Front Side	A	Pass
VCP	8	X	X	10	1	Left Side	A	Pass
VCP	8	X	X	10	1	Right Side	A	Pass
VCP	8	X	X	10	1	Back Side	A	Pass
HCP	8	X	X	10	1	Edge of HCP at Front of UUT	A	Pass
Contact Discharge Points - RED DOTS.								
Photo 1	8	X	X	10	1	ND	-	-
Photo 2	8	X	X	10	1		A	Pass
Photo 3	8	X	X	10	1	ND	-	-
Photo 4	8	X	X	10	1	ND	-	-
Air Discharge Points - BLUE DOTS..								
Photo 1	2, 4, 8, 15	X	X	10	1		A	Pass
Photo 2	2, 4, 8, 15	X	X	10	1		A	Pass
Photo 3	2, 4, 8, 15	X	X	10	1		A	Pass
Photo 4	2, 4, 8, 15	X	X	10	1		A	Pass
ND: No Discharge points found								

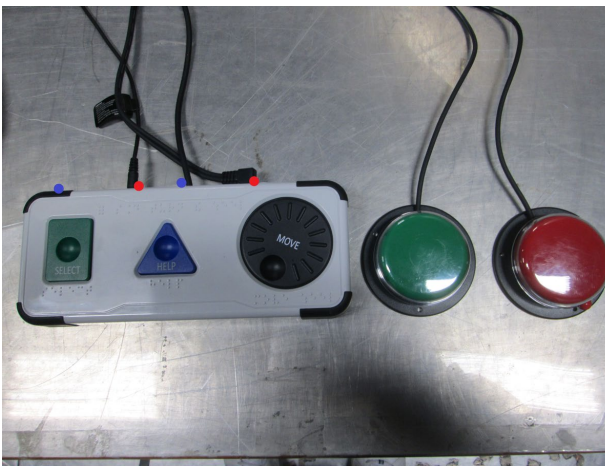
5.1.4 Test Photographs



4-2 Test Setup Photo 1



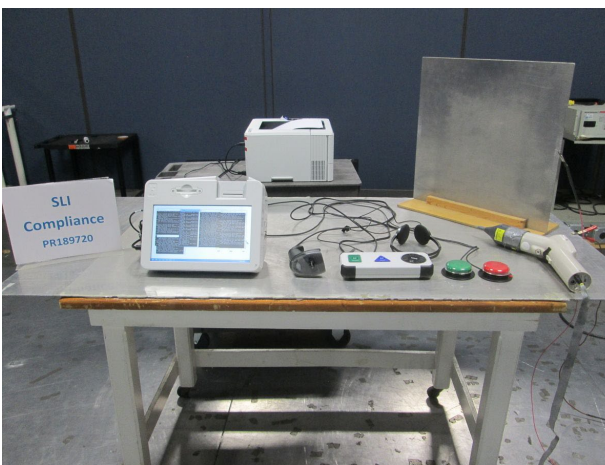
4-2 Test Setup Photo 2



4-2 Test Setup Photo 3



4-2 Test Setup Photo 4



4-2 Test Setup Photo

5.1.5 Test Equipment List

Table 5.1-1: Electrostatic Discharge Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC059917	Ground Plane (Fixed)	National Technical Systems	GP1	02/03/2025	05/03/2025
WC059688	Gun (ESD Simulator)	EMC-Partner	ESD3000DN1	07/09/2024	07/31/2025
WC070450	Meter (Digital Multimeter)	Fluke	87-5	05/13/2024	05/13/2025
WC078486	Meter (Hydrometer)	Extech Instruments	Datalogger 42270	08/12/2024	08/31/2025

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required

5.2 Radiated RF Immunity

5.2.1 Test Procedure

The EUT was tested in accordance with VVSG 2.0.

5.2.2 Test Result

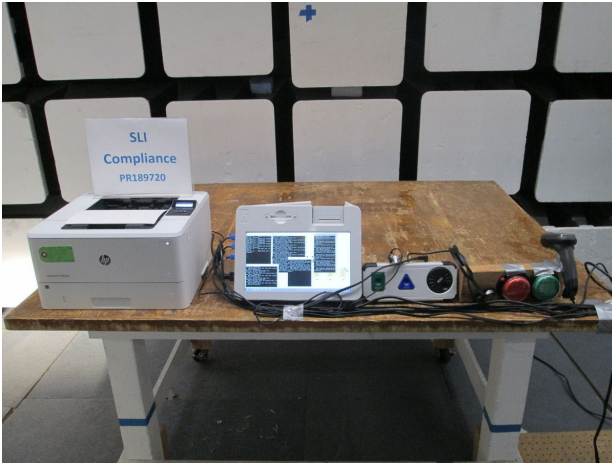
The EUT passed the defined requirements.

5.2.3 Test Datasheets

Element Materials Technology				
Radiated RF Immunity per				
Standard Referenced: VVSG 2.0		Date: 4/21/2025		
Temperature: 27°C		Humidity: 22%	Pressure: 833 mb	
Input Voltage: 120Vac/60Hz				
Configuration of Unit: Fully exercising all features of product				
Test Engineer: T. Wittig				
Date	Time	Log Entries	Initials	Result
4/21/2025	1030	Performed 4-3 pre-test verification	TW	Complete
	1049	Client setup in GP0	TW	Complete
		Waiting for software to download on the previous test (RE Post Test)	TW	---
	1423	Client is replacing the Vangaurd Boost, same model number, SN: B2520006001	TW	---
	1507	Begin 4-3 testing, Front side, V-Pole	TW	---
	1537	Done for the day	TW	---
4/22/2025	0654	Warm up test equipment and EUT	TW	---
	0715	Resume 4-3 testing on H-pole	TW	---
	0729	Front side, H-pole: At 199 MHz, error occurred - could not repeat	TW	---
		Error: Windows was unable to save all the data for the file \logfile.txt; the data has been lost.The error may be caused if the device has been removed or the media is write protected.	TW	---
		Statement from Client: The USB stick test utility generates activity by repeated writing dummy data to an inserted USB drive. As you've noted on Boost, the utility may display a popup that a file wasn't written, but then the utility continues operation. Within the Vanguard application there is redundant storage, with all logs are written to the internal storage on the cFast card with a calculated digital signature and immediately written to the vDrive. Then system verifies the integrity of the data on the drive, and will copy until they are match, ensuring files are copied without error. Also note that Boost is used in the pre-voting stage by a poll worker to issue ballots, so no cast vote records are generated or stored on the device.	TW	---
		Continue sweeping	TW	---
	0754	Complete Front side	TW	---
	0756	Begin Left side	TW	---
	0909	Begin Back side, H-pole at ~230 MHz, error occurred - could not repeat	TW	---
	1017	Begin Right side	TW	---
	1126	Completed 4-3 testing, 80 MHz-1 GHz	TW	Pass

Element Materials Technology											
Radiated RF Immunity per											
Standard Referenced: <u>WVSG 2.0</u>					Date: <u>4/21/2025</u>						
Temperature: <u>27°C</u>		Humidity: <u>22.00%</u>			Pressure: <u>833 mb</u>						
Input Voltage: <u>120Vac/60Hz</u>											
Configuration of Unit:		Fully exercising all features of product									
Test Engineer:		<u>T. Wittig</u>									
Frequency (MHz)	Modulation				Step Size (%)	Field (V/m)	Polarity (V or H)	Dwell (sec)	Comments	Criteria Met	Pass / Fail
	Type	%	Freq	Form							
80 - 1000	AM	80	1kHz	Sine	1	10	V	3	Front	A	Pass
80 - 1000	AM	80	1kHz	Sine	1	10	H	3		A	Pass
80 - 1000	AM	80	1kHz	Sine	1	10	V	3	Left	A	Pass
80 - 1000	AM	80	1kHz	Sine	1	10	H	3		A	Pass
80 - 1000	AM	80	1kHz	Sine	1	10	V	3	Back	A	Pass
80 - 1000	AM	80	1kHz	Sine	1	10	H	3		A	Pass
80 - 1000	AM	80	1kHz	Sine	1	10	V	3	Right	A	Pass
80 - 1000	AM	80	1kHz	Sine	1	10	H	3		A	Pass

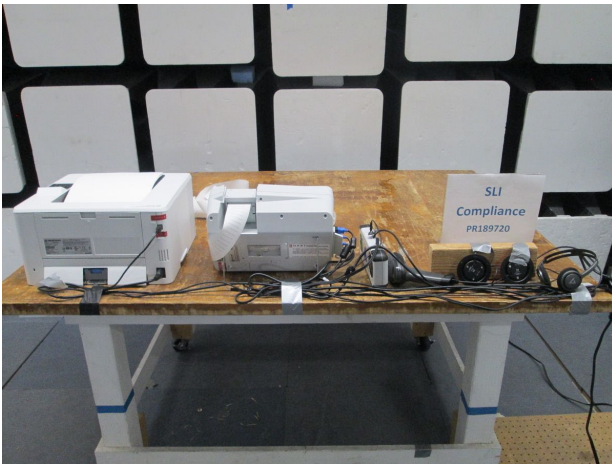
5.2.4 Test Photographs



4-3 Test Setup - Front



4-3 Test Setup - Left



4-3 Test Setup - Back



4-3 Test Setup - Right

5.2.5 Test Equipment List

Table 5.2-1: Radiated RF Immunity Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC059916	Chamber (EMI, Semi-Anechoic)	National Technical Systems	GP0	NCR	NCR
WC059710	Amplifier (Pre/RF/Low Noise)	Ophir RF	5127F	09/17/2012	NCR
WC059805	Antenna (Log Periodic)	ETS-Lindgren	3142B	NCR	NCR
WC059852	Generator (Signal)	Anritsu Wiltron	69367B	03/05/2025	03/21/2026
WC070450	Meter (Digital Multimeter)	Fluke	87-5	05/13/2024	05/13/2025
WC070467	Meter (Power)	Agilent Technologies	E4418B	07/30/2024	07/30/2025
WC070506	Sensor (Power)	Hewlett Packard	E4421A	07/30/2024	07/31/2025
WC076935	Cable (Test)	Teledyne-taber	RF Coax Cable	NCR	NCR
WC078459	Cable (Test)	National Technical Systems	TrueBlue	NCR	NCR
WC078470	Software	ETS-Lindgren	C47213	NCR	NCR
WC078490	Meter (Hydrometer)	Extech Instruments	Datalogger 42270	03/17/2025	03/31/2026
WC084405	Cable (Test)	Fairview Microwave	GP0 RF N-Type	NCR	NCR

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required

5.3 Electrical Fast Transient / Burst

5.3.1 Test Procedure

The EUT was tested in accordance with VVSG 2.0.

5.3.2 Test Result

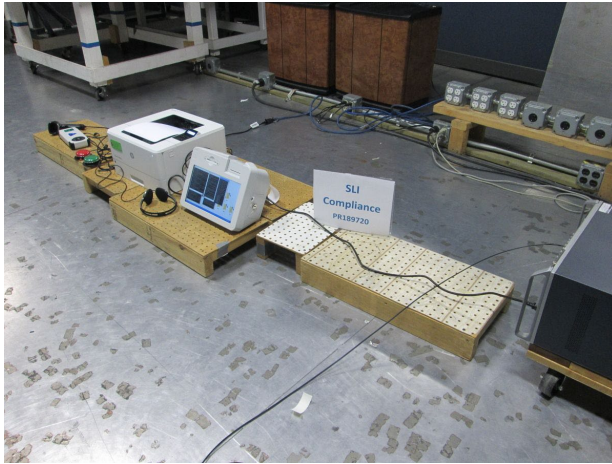
The EUT passed the defined requirements.

5.3.3 Test Datasheets

Element Materials Technology				
Electrical Fast Transient/Burst per IEC / EN 61000-4-4				
Standard Referenced: VVSG 2.0		Date: 4/24/2025		
Temperature: 21°C		Humidity: 33%		Pressure: 834 mb
Input Voltage: 120Vac/60Hz				
Configuration of Unit: Fully exercising all features of product				
Test Engineer: T. Wittig				
Date	Time	Log Entries	Initials	Result
4/24/2025	0715	Setup and performed 4-4 pre-test verification	TW	Complete
		Setup Vanguard Boost on 10 CM spacers on GP	TW	Complete
	0746	Begin Electrical Fast Transient / Burst IEC 61000-4-4, Per Latest Version and test protocol. Mains: +/-2kV, I/O: +/-1kV.	TW	Complete
		During EFT testing, screen flicker was observed, Error occurred: Windows was unable to save all the data for the file \logfile.txt; the data has been lost. The error may be caused if the device has been removed or the media is write protected. See staement from Client below	TW	---
		The USB stick test utility generates activity by repeated writing dummy data to an inserted USB drive. As you've noted on Boost, the utility may display a popup that a file wasn't written, but then the utility continues operation. Within the Vanguard application there is redundant storage, with all logs are written to the internal storage on the cFast card with a calculated digital signature and immediately written to the vDrive. Then system verifies the integrity of the data on the drive, and will copy until they are match, ensuring files are copied without error. Also note that Boost is used in the pre-voting stage by a poll worker to issue ballots, so no cast vote records are generated or stored on the device.		---
	0827	Completed 4-4 testing on the Boost	TW	Pass

Element Materials Technology														
Electrical Fast Transient/Burst per IEC / EN 61000-4-4														
Standard Referenced:		VVSG 2.0				Date: 4/24/2025								
Temperature:		21°C		Humidity:		33%		Pressure:					834 mb	
Input Voltage:				120Vac/60Hz				Capacitive Coupling Clamp Verification					N/A	
Configuration of Unit:		Fully exercising all features of product												
Test Engineer:		T. Wittig												
Voltage (kV)	Polarity +/-	Time (sec)	Injection Type	L1	L2	L3	N	PE	Rep Freq.	Comments	Criteria Met	Pass/Fail		
2.0	±	60	CDN	X					100 kHz	AC Mains	A	Pass		
2.0	±	60	CDN				X		100 kHz		A	Pass		
2.0	±	60	CDN					X	100 kHz		A	Pass		
2.0	±	60	CDN	X			X	X	100 kHz		A	Pass		

5.3.4 Test Photographs



4-4 Test Setup

5.3.5 Test Equipment List

Table 5.3-1: Electrical Fast Transient / Burst Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC059917	Ground Plane (Fixed)	National Technical Systems	GP1	02/03/2025	05/03/2025
WC059668	Oscilloscope (Digital)	Tektronix	TDS2002B	06/28/2024	06/28/2025
WC059768	Generator (Spike/Transient)	Thermo Fisher Scientific	EMC Pro Plus	12/03/2024	12/04/2025
WC070450	Meter (Digital Multimeter)	Fluke	87-5	05/13/2024	05/13/2025
WC070508	Software	Keytek	CEWare	NCR	NCR
WC078486	Meter (Hydrometer)	Extech Instruments	Datalogger 42270	08/12/2024	08/31/2025

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required

5.4 Surge Immunity

5.4.1 Test Procedure

The EUT was tested in accordance with VVSG 2.0.

5.4.2 Test Result

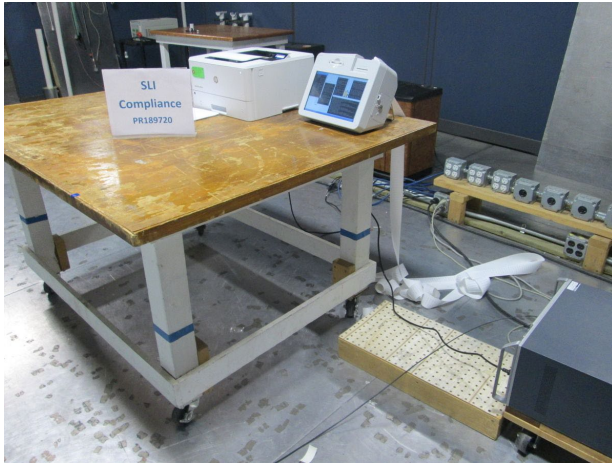
The EUT passed the defined requirements.

5.4.3 Test Datasheets

Element Materials Technology				
Surge Immunity per IEC / EN 61000-4-5				
Standard Referenced: VVSG 2.0		Date: 4/23/2025		
Temperature: 25°C	Humidity: 16%	Pressure: 836 mb		
Input Voltage: 120Vac/60Hz				
Configuration of Unit: Fully exercising all features of product				
Test Engineer: T. Wittig				
Date	Time	Log Entries	Initials	Result
4/23/2025	1000	Performed 4-5 pre-test verification	TW	Complete
		Setup Vanguard Boost for surge testing	TW	Complete
	1013	Begin Surge Immunity IEC 6100045, Per Latest Version and test protocol. Mains: +/-2kV CM, +/-2kV DM, (0, 90, 180, 270)	TW	---
	1543	Completed 4-5 testing	TW	Pass

Element Materials Technology												
Surge Immunity per IEC / EN 61000-4-5												
Standard Referenced:		VVSG 2.0		Date:		4/23/2025						
Temperature:		25°C		Humidity:		16%						
Input Voltage:		120Vac/60Hz		Pressure:		836 mb						
Configuration of Unit:		Fully exercising all features of product										
Test Engineer:		T. Wittig										
Voltage (kV)	Polarity +/-	L1	L2	L3	N	PE	Phase (deg)	Number of Pulses	Delay (sec)	Comments	Criteria Met	Pass/Fail
0.5	±	X			X		0	5	30	Differential Mode	A	Pass
0.5	±	X			X		90	5	30		A	Pass
0.5	±	X			X		180	5	30		A	Pass
0.5	±	X			X		270	5	30		A	Pass
0.5	±	X				X	0	5	30	Common Mode Line	A	Pass
0.5	±	X				X	90	5	30		A	Pass
0.5	±	X				X	180	5	30		A	Pass
0.5	±	X				X	270	5	30		A	Pass
0.5	±				X	X	0	5	45	Common Mode Neutral	A	Pass
0.5	±				X	X	90	5	45		A	Pass
0.5	±				X	X	180	5	45		A	Pass
0.5	±				X	X	270	5	45		A	Pass
1.0	±	X			X		0	5	60	Differential Mode	A	Pass
1.0	±	X			X		90	5	60		A	Pass
1.0	±	X			X		180	5	60		A	Pass
1.0	±	X			X		270	5	60		A	Pass
1.0	±	X				X	0	5	60	Common Mode Line	A	Pass
1.0	±	X				X	90	5	60		A	Pass
1.0	±	X				X	180	5	60		A	Pass
1.0	±	X				X	270	5	60		A	Pass
1.0	±				X	X	0	5	60	Common Mode Neutral	A	Pass
1.0	±				X	X	90	5	60		A	Pass
1.0	±				X	X	180	5	60		A	Pass
1.0	±				X	X	270	5	60		A	Pass
2.0	±	X			X		0	5	60	Differential Mode	A	Pass
2.0	±	X			X		90	5	60		A	Pass
2.0	±	X			X		180	5	60		A	Pass
2.0	±	X			X		270	5	60		A	Pass
2.0	±	X			X		0	5	60	Common Mode Line	A	Pass
2.0	±	X			X		90	5	60		A	Pass
2.0	±	X			X		180	5	60		A	Pass
2.0	±	X			X		270	5	60		A	Pass
2.0	±				X	X	0	5	60	Common Mode Neutral	A	Pass
2.0	±				X	X	90	5	60		A	Pass
2.0	±				X	X	180	5	60		A	Pass
2.0	±				X	X	270	5	60		A	Pass

5.4.4 Test Photographs



4-5 Test Setup

5.4.5 Test Equipment List

Table 5.4-1: Surge Immunity Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC059917	Ground Plane (Fixed)	National Technical Systems	GP1	02/03/2025	05/03/2025
WC059668	Oscilloscope (Digital)	Tektronix	TDS2002B	06/28/2024	06/28/2025
WC059768	Generator (Spike/Transient)	Thermo Fisher Scientific	EMC Pro Plus	12/03/2024	12/04/2025
WC070450	Meter (Digital Multimeter)	Fluke	87-5	05/13/2024	05/13/2025
WC070508	Software	Keytek	CEWare	NCR	NCR
WC078487	Meter (Hydrometer)	Extech Instruments	Datalogger 42270	08/12/2024	08/31/2025

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required

5.5 Conducted RF Immunity

5.5.1 Test Procedure

The EUT was tested in accordance with VVSG 2.0.

5.5.2 Test Result

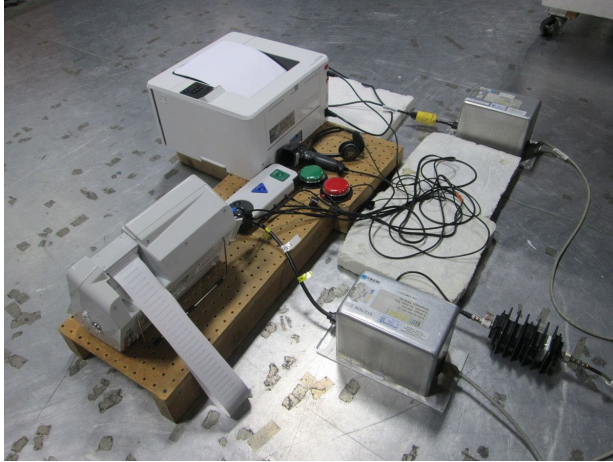
The EUT passed the defined requirements.

5.5.3 Test Datasheets

Element Materials Technology				
Conducted RF Immunity per IEC / EN 61000-4-6				
Standard Referenced: EN 61000-4-6			Date: 4/24/2025	
Temperature: 23°C		Humidity: 33%	Pressure: 834 mb	
Input Voltage: 120Vac/60Hz				
Configuration of Unit: Fully exercising all features of product				
Test Engineer: T. Wittig				
Date	Time	Log Entries	Initials	Result
4/24/25	0854	Setup for 4-6 testing	TW	Complete
	0917	Begin Conducted RF Immunity IEC 61000-4-6, Per Latest Version and test protocol. 10Vrms, 0.15 80 MHz, 1% Step, 80% AM, 1kHz sine, 3s dwell.	TW	---
		AC mains: at 43.5 MHz, blank display screen occurred, repeated 3x	TW	---
		Swept thru range, and susceptibility occurred from 43.5-58.7 MHz	TW	---
		Client added ferrite PN:	TW	---
	1230	Re-start 4-6 testing from 150 kHz to 80 MHz	TW	---
		At 47.6 MHz, blank screen occurred, client changed position of ferrite (s) and swept thru 43-58 MHz 3x	TW	---
	1351	Re-start 4-6 testing from 150 kHz to 80 MHz	TW	---
		Modification for compliance: Added a ferrite (043167281 fair-rite) to the display cable. Moved existing ferrite closer to ground wire on the display cable	TW	---
	1451	Completed 4-6 testing on the AC mains of the Vanguard Boost	TW	Pass

Element Materials Technology								
Conducted RF Immunity per IEC / EN 61000-4-6								
Standard Referenced: EN 61000-4-6				Date: 4/24/2025				
Temperature: 23°C		Humidity: 33%		Pressure: 834 mb				
Input Voltage: 120Vac/60Hz								
Configuration of Unit: Fully exercising all features of product								
Test Engineer: T. Wittig								
Frequency (MHz)	Modulation			Level	Dwell	Comments	Criteria Met	Pass/ Fail
	Type	%	Freq	(V/m)	(sec)			
0.150 - 80.0	AM	80	1KHz	10	3	AC Mains (Boost)	A	Pass

5.5.4 Test Photographs



4-2 Test Setup Photo

5.5.5 Test Equipment List

Table 5.5-1: Conducted RF Immunity Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC059917	Ground Plane (Fixed)	National Technical Systems	GP1	02/03/2025	05/03/2025
WC059655	Generator (Signal)	Hewlett Packard	8648A	11/26/2024	11/30/2025
WC059657	Amplifier (Pre/RF/Low Noise)	Instruments For Industry	M100	NCR	NCR
WC059661	Network (Coupling/Decoupling)	EMC Integrity	EMCI-CDN-M3-16	12/09/2024	01/30/2026
WC059662	Network (Coupling/Decoupling)	EMC Integrity	EMCI-CDN-M3-16	01/15/2025	01/30/2026
WC059695	Attenuator (Coaxial)	Aeroflex/Weinschel	40-6-34	01/09/2025	01/30/2026
WC059700	Coupler (Bi-Directional)	Werlatone	C9475-13	01/09/2025	01/30/2026
WC070450	Meter (Digital Multimeter)	Fluke	87-5	05/13/2024	05/13/2025
WC078469	Software	ETS-Lindgren	C47213	NCR	NCR
WC078486	Meter (Hydrometer)	Extech Instruments	Datalogger 42270	08/12/2024	08/31/2025

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required

5.6 Voltage Dips and Interruptions

5.6.1 Test Procedure

The EUT was tested in accordance with VVSG 2.0.

5.6.2 Test Result

The EUT passed the defined requirements.

5.6.3 Test Datasheets

Element Materials Technology

Voltage Dips and Interrupts per IEC / EN 61000-4-11

Standard Referenced: VVSG 2.0

Date: 4/22-4/23 2025

Temperature: 25°C

Humidity: 17%

Pressure: 832 mb

Input Voltage: 120Vac/60Hz

Configuration of Unit: Fully exercising all features of product

Test Engineer: T. Wittig

Date	Time	Log Entries	Initials	Result
4/22/2025	1318	Setup for Voltage Dips and Interruptions - IEC 61000-4-11, Per Latest test protocol. Electric power increases of 7.5% and reductions of 12.5% of nominal specified power.	TW	Complete
	1324	Begin 129Vac Line Voltage Variations (+7.5% of nominal 120V)	TW	---
	1425	Begin 105Vac Line Voltage Variations (-12.5% of nominal 120V)	TW	---
	1530	Completed power increases of 7.5% and reductions of 12.5%	TW	Pass
4/23/2025	0701	Powered up test equipment - ready	TW	---
	0711	Client bringing up EUT equipment for continuance of 4-11 testing	TW	---
		Voltage Dips and Interruptions IEC 61000411, Per Latest test protocol. Surge of +/-15% line variation of nominal line voltage	TW	---
	0724	Begin Surges of +15% line variations of nominal voltage (138V)	TW	---
	0827	Begin Surges of -15% line variations of nominal voltage (102V)	TW	---
		Setup for Voltage Dips and Interruptions IEC 61000411, Per Latest Version and test protocol.30% nom @10ms/ 60% nom @100ms & 1 sec/>95% interrupt @5 sec.	TW	---
	0842	Performed 4-11 pre-test verification	TW	---
	0933	Begin Voltage Dips and Interruptions IEC 6100041	TW	---
	0941	Completed 4-11 in full	TW	Pass

Element Materials Technology											
Voltage Dips and Interrupts per IEC / EN 61000-4-11											
Standard Referenced:		VWSG 2.0									
Date:		4/22-4/23 2025									
Temperature:		25°C		Humidity:		17%		Pressure:		832 mb	
Input Voltage:		120Vac/60Hz									
Configuration of Unit:		Fully exercising all features of product									
Test Engineer:		T. Wittig									
% Nominal	No. of Cycles	Phase Angle (deg)				Time between dropouts	Number of tests	Comments	Criteria Met	Pass / Fail	
		0	90	180	270						
100%	0.6	x				10	3		A	Pass	
70%	0.6		x			10	3		A	Pass	
70%	0.6			x		10	3		A	Pass	
70%	0.5				x	10	3		A	Pass	
40%	6	x				10	3		A	Pass	
40%	6		x			10	3		A	Pass	
40%	6			x		10	3		A	Pass	
40%	6				x	10	3		A	Pass	
40%	60	x				10	3		A	Pass	
40%	60		x			10	3		A	Pass	
40%	60			x		10	3		A	Pass	
40%	60				x	10	3		A	Pass	
0%	300	x				10	3		A	Pass	
0%	300			x		10	3		A	Pass	
Line Voltage Variation Testing											
129Vac Line Voltage Variations (+7.5% of nominal 120V)									A	Pass	
105Vac Line Voltage Variations (-12.5% of nominal 120V)									A	Pass	
Surges of +15% line variations of nominal voltage (138V)									A	Pass	
Surges of -15% line variations of nominal voltage (102V)									A	Pass	

5.6.4 Test Photographs



4-11 Test Setup

5.6.5 Test Equipment List

Table 5.6-1: Voltage Dips and Interruptions Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC059917	Ground Plane (Fixed)	National Technical Systems	GP1	02/03/2025	05/03/2025
WC059668	Oscilloscope (Digital)	Tektronix	TDS2002B	06/28/2024	06/28/2025
WC059768	Generator (Spike/Transient)	Thermo Fisher Scientific	EMC Pro Plus	12/03/2024	12/04/2025
WC070450	Meter (Digital Multimeter)	Fluke	87-5	05/13/2024	05/13/2025
WC070508	Software	Keytek	CEWare	NCR	NCR
WC078487	Meter (Hydrometer)	Extech Instruments	Datalogger 42270	08/12/2024	08/31/2025

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required

End of Test Report