Arizona Secretary of State

Certified Vote Tabulating Equipment

Pursuant to A.R.S. § 16-442

Updated 07/22/2020

Company	Voting System/System Component	Software	Hardware/Firmware	EAC System ID #	Date of Certification
Diebold	GEMS 1-18-24 Voting System *See original certification 11/2005	EMP Model D software (4.6.2)	AccuVote-TSX DRE Model D (4.6.4) ExpressPoll 5000 Electronic Poll Book (CardWriter (1.0) component only) Election Media Processor (EMP) Model D software (4.6.2)	N-1-06-22-22-003 N-1-06-22-22-004 N-1-06-22-22-005	6/15/2007
Dominion	EMS 5.5.32.4	EMS-Election Event Designer (5.5.32.4) EMS- Results Tally & Reporting (5.5.32.4) EMS-Audio Studio (5.5.32.4) EMS-Data Center Manager (5.5.32.4) EMS-Application Server (5.5.32.4) EMS-Network Attached Storage (5.5.32.4) EMS-Database Server (5.5.32.4) EMS-Election Data Translator (5.5.32.4) EMS-Adjudication (5.5.32.1) ImageCast Voter Activation (ICVA) (5.5.32.4) ImageCast Central (ICC) (5.5.32.5) ImageCast Precinct2 (ICP2) (5.5.1.8) ImageCast X (ICX) (5.5.13.2)	ICVA Smart Card Reader (ACR39U) ICC Scanner (Canon Dr-G1130) ICC Scanner (InoTec HiPro 821) ICP2 Hardware (PCOS-330A) Ballot Box-Stacking (ICP2) (PCOS-350A) ICX Classic Hardware (Avalue SID-21V-Z37) ICX BMD Printer (HP M402dne) ICX BMD UPS (APC SMT1500C) Accessible Tactile Interface USB (ATI for ICP2 & ICX) (Rev.A)	DVS-DemSuite5.5-B	11/05//2019

[These documents from the U.S. Elections Assistance Commission (EAC) are contained herein.]

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Arizona Secretary of State
Certified Vote Tabulating Equipment
Pursuant to A.R.S. § 16-442

Updated 07/22/2020

Company	Voting System/System Component	Software	Hardware/Firmware	EAC System ID #	Date of Certification
ES&S	EVS 6.0.4.0	ElectionWare (5.0.4.0)	ExpressVote hardware version 1.0 (firmware version 1.5.2.0) ExpressVote hardware version 2.1 (firmware version 2.4.5.0) DS200 hardware versions 1.2 & 1.3, (firmware version 2.17.4.0) DS450 hardware version 1.0 (firmware version 3.1.1.0) DS850 hardware version 1.0 (firmware version 3.1.1.0)	ESSEVS6040	11/05/2019
ES&S	EVS 6.0.2.1.	ElectionWare (5.0.2.0)	ExpressVote hardware version 1.0 (firmware version 1.5.1.0) ExpressVote hardware version 2.1 (firmware version 2.4.3.0) DS200 hardware versions 1.2 & 1.3, (firmware version 2.17.0.0) DS450 hardware version 1.0 (firmware version 3.1.0.0) DS850 hardware version 1.0 (firmware version 3.1.0.0)	ESSEVS6021	05/01/2019

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Updated 07/22/2020

Company	Voting System/System Component	Software	Hardware/Firmware	EAC System ID #	Date of Certification
ES&S	EVS 5.2.2.0	ElectionWare (4.7.1.1) Election Reporting Manager (ERM) (8.12.1.1) Event Log Service (1.5.5.0) Removable Media Service (1.4.5.0) ExpressVote Previewer (1.4.1.2) VAT Previewer (1.8.6.1)	* ExpressVote hardware version 1.0 (firmware version 1.4.1.2) ExpressVote Kiosk hardware version 1.0 DS200 hardware versions 1.2.1, 1.2.3, & 1.3 (firmware version 2.12.2.0) AutoMARK A100 hardware version 1.0 (firmware version 1.8.6.1) AutoMARK A200 hardware version 1.1 (firmware version 1.8.6.1) AutoMARK A300 hardware version 1.3 (firmware version 1.8.6.1) DS850 hardware version 1.0 (firmware version 2.10.2.0) DS450 hardware version 1.0 (firmware version 3.0.0.0) Plastic Ballot Box hardware versions 1.2, 1.3 Metal Ballot Box with/without Diverter hardware versions 1.0, 1.1, 1.2	ESSEVS5220	01/08/2018 * ExpressVote hardware version 1.0 (firmware version 1.4.1.2) is conditionally certified through January 2020.

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Updated 07/22/2020

Company	Voting System/System Component	Software	Hardware/Firmware	EAC System ID #	Date of Certification
ES&S	EVS 5.2.1.0	ElectionWare (4.7.1.0) Election Reporting Manager (ERM) (8.12.1.0) Event Log Service (1.5.5.0) Removable Media Service (1.4.5.0) VAT Previewer (1.8.6.0)	ExpressVote hardware version 1.0 (firmware version 1.4.1.0) ExpressVote Kiosk hardware version 1.0 DS200 hardware versions 1.2.1, 1.2.3, & 1.3 (firmware version 2.12.1.0) AutoMARK A100 hardware version 1.0 (firmware version 1.8.6.0) AutoMARK A200 hardware versions 1.1, 1.3 (firmware version 1.8.6.0) AutoMARK A300 hardware version 1.3 (firmware version 1.8.6.0) DS850 hardware version 1.0 (firmware version 2.10.1.0) Plastic Ballot Box hardware versions 1.2, 1.3 Metal Ballot Box with/without Diverter hardware versions 1.0, 1.1, 1.2	ESSEVS5210	2/18/2016

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Updated 07/22/2020

Company	Voting System/System Component	Software	Hardware/Firmware	EAC System ID #	Date of Certification
ES&S	EVS 5.2.0.0	ElectionWare (4.6.0.0) Election Reporting Manager (ERM) (8.11.0.0) Event Log Service (1.5.5.0) Removable Media Service (1.4.5.0) VAT Previewer (1.8.6.0)	ExpressVote hardware version 1.0 (firmware version 1.4.0.0) DS200 hardware versions 1.2.1, 1.2.3, & 1.3 (firmware version 2.12.0.0) AutoMARK A100 hardware version 1.0 (firmware version 1.8.6.0) AutoMARK A200 hardware versions 1.1, 1.3 (firmware version 1.8.6.0) DS850 hardware version 1.0 (firmware version 2.10.0.0) Plastic Ballot Box hardware versions 1.2, 1.3 Metal Ballot Box with/without Diverter hardware versions 1.0, 1.1, 1.2	ESSEVS5200	12/17/2014

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Updated 07/22/2020

Company	Voting System/System Component	Software	Hardware/Firmware	EAC System ID #	Date of Certification
ES&S	EVS 5.0.0.0 Voting System	ElectionWare (4.1.0.0) Event Log Service (1.5.0.0) Election Reporting Manager (ERM) (8.6.0.0) Removable Media Service (1.4.0.0) VAT Previewer (1.8.1.0)	Paper Ballot (3.1.0.0) DS200 hardware version 1.2 (firmware version 2.7.0.0) DS850 hardware version 1.0 (firmware version 2.4.0.0) AutoMARK A100 hardware version 1.0 (firmware version 1.8.1.0) AutoMARK A200 hardware version 1.1 (firmware version 1.8.1.0) AutoMARK A200 hardware version 1.3 (firmware version 1.8.1.0) AutoMARK A300 hardware version 1.3 (firmware version 1.8.1.0) DS200 Plastic Ballot Box (hardware versions 1.2, 1.3) Metal Ballot Box with Diverter (hardware versions 1.0, 1.1, 1.2) Metal Ballot Box without Diverter (hardware versions 1.0, 1.1, 1.2)	ESSEVS5000	6/17/2013
ES&S	Model 650 with the Unity 3.0.1.1 Voting System *See original certification June 15, 2007	Unity 3.0.1.1	Model 650 (2.1.0.0) *Now included as part of the voting system suite previously certified on June 15, 2007	N-2-02-22-22-006 ESSUnity3210	10/19/2011

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Updated 07/22/2020

Company	Voting System/System Component	Software	Hardware/Firmware	EAC System ID #	Date of Certification
ES&S	Unity 3.0.1.1 / AutoMark 1.1 Voting System	Audit Manager (7.3.0.0) Election Data Manager (7.4.4.0) ES&S Image Manager (7.4.2.0) Hardware Programming Manager (5.2.4.0) Data Acquisition Manager (6.0.0.0) Election Reporting Manager (7.1.2.1) AutoMARK AIMS (1.2.18)	Model 100 Optical Scan Tabulator (5.2.1.0) AutoMARK Voter Assist Terminal (1.1.2258)	N-2-02-22-22-006 N-2-02-22-22-007 ESSUnity3210	6/15/2007
Sequoia	AVC Edge 5.0/WinEDS 3.1.038	WinEDS (3.1.038) SPR Host (1.09)	AVC Edge II (5.0.24) VeriVote Printer (4.3) HAAT Model 50 Card Activator (1.0.79L) Optech Insight (APX K2.10, HPX K1.42) Optech Insight with Modem (APX K2.10, HPX K1.42, CPX K1.14) 400-C/WinETP (3.00P/1.12.4) Memory Pack Reader (MPR) (2.15)	N-1-07-22-22-003	8/1/2006
Sequoia	WinEDS 3.1.074 / AVC Edge 5.0 Voting System	WinEDS (3.1.074) SPR Host (1.0.10)	AVC Edge II (5.0.31) with VeriVote VVPAT (4.3) & Edge Audio Unit (5.0 Rev. C) HAAT Model 50 Card Activator (2.1.18) Optech Insight (APX K2.12, HPX K1.44) Optech Insight with Modem (APX K2.12, HPX K1.44, CPX K1.14) 400-C/WinETP (3.00P/1.14.3) Memory Pack Reader (MPR) (2.15)	N-1-07-22-22-004	6/15/2007

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Updated 07/22/2020

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Sequoia	WinEDS 3.1.074 /AVC Edge 5.0 Voting System	WinEDS (3.1.074)	*WinEDS Election Reporting (1.1.7.0) *WinEDS Election Results (1.1.1.0) *EDGE2plus Model 300 DRE (1.2.33) *Additional components of the previously certified voting system	N-1-07-22-22-004	11/19/2007
Unisyn	OpenElect Voting System 2.1	Ballot Layout Manager (2.1) Election Manager (2.1) Tabulator Client (2.1) Tabulator (2.1) Tabulator Reports (2.1) Validator (2.1) Scripter (2.1) Common (2.1) OCS Installer (2.1) Regkey Builder (2.1) OVCS Application (2.1) Unisyn Secure Library (2.1) Logger (2.1) Auditor (2.1)	OVO hardware (version 2.1) OVI-VC (version 2.1) OVCS (version 2.1) OVCSmini (version 2.1) FVT (version 2.1)	UNS10121966-2.1	05/27/2020

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Updated 07/22/2020

Company	Voting System/System Component	Software	Hardware/Firmware	EAC System ID #	Date of Certification
Unisyn	OpenElect Voting System 2.0.A	Ballot Layout Manager (2.0.A) Election Manager (2.0.A) Tabulator Client (2.0.A) Tabulator (2.0.A) Tabulator Reports (2.0.A) Validator (2.0.A) Scripter (2.0.A)	OVO hardware revisions A and E (software version 2.0.A) OVI-VC hardware revisions A and B (software version 2.0.A) OVCS hardware revision ImageFORMULA DR-X10C & M160 (software version 1.3) OVCSmini (software version 2.0.A) FVT hardware revision A (software version 2.0.A)	UNS10121966-2.0.A	9/14/2018
Unisyn	OpenElect 1.3 Voting System	Ballot Layout Manager (1.3) Election Manager (EM) (1.3) Software Server (SS) (1.3) Election Server (ES) (1.3) Tabulator Client (TC) (1.3) Tabulator (Tab) (1.3) Tabulator Reports (TR) (1.3) Scripter (1.3) Validator (1.3)	OVO hardware revisions A and E (software version 1.3) OVI-7 hardware revision F (software verison 1.3) OVI-VC hardware revisions A and B (software version 1.3) OVCS hardware revision v. 1.3 (software version 1.3) Ballot Box - Plastic (hardware version 1.1) Ballot Box - Portable (hardware version 1.2) Ballot Box – Plastic (hardware version 1.3)	04211950-1.3	7/2/2015

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Updated 07/22/2020

Company	Voting System/System Component	Software	Hardware/Firmware	EAC System ID #	Date of Certification
Unisyn	OpenElect 1.2 Voting System	Ballot Layout Manager (1.2) Election Manager (EM) (1.2) Software Server (SS) (1.2) Election Server (ES) (1.2) Tabulator Client (TC) (1.2) Tabulator (Tab) (1.2) Tabulator Reports (TR) (1.2) Scripter (1.2) Validator (1.2)	OVO hardware revision E (software version 1.2) OVI-7 hardware revision F (software verison 1.2) OVI-VC hardware revisions A and B (software version 1.2) Ballot Box - Plastic (hardware version 1.1) Ballot Box - Portable (hardware version 1.2)	UNS10121966-OE-1.2	5/23/2014

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U.S. ELECTION ASSISTANCE COMMISSION (/)

DEMOCRACY SUITE 5.5B (MODIFICATION)

Manufacturer

Dominion Voting Systems Corp (/voting-equipment/registered-manufacturers/dominion-voting-systems-corp)

Testing standard

VVSG 1.0 (2005) (/vvsg-10-2005)

Testing Lab

Pro V&V (/voting-equipment/voting-system-test-laboratories-vstl/pro-vv)

Certification Date

09/10/19

Certification Status

Certified System (/taxonomy/term/1122)

Testing Application Date

02/13/19

Application Accepted Date

02/13/19

Correspondence

- ☐ 02/13/2019 - Application form

Test Report

- ☐ 08/07/2019 - Test Plan Rev 02
- ☐ 05/31/2019 - Test Plan Approval
- ☐ 08/13/2019 - Test Plan Rev. 03 (As Run)
- ☐ 08/13/2019 - Dominion Voting Systems D-Suite 5.5-B Test Report Rev 02
- ☐ 08/13/2019 - Attachment A-1 Report_File 7169005633-00
- ☐ 08/13/2019 - Attachment A-2 Report File 7169006118E-00
- ☐ 08/13/2019 - Attachment A-3 Formal Report PR094223
- ☐ 08/13/2019 - Attachment A-4 Formal Report PR097523
- ☐ 08/13/2019 - Initial Decision

Certification

- ☐ 09/06/2019 - Initial Decision
- ☐ 09/12/2019 - Grant of Certification
- ☐ 09/12/2019 - Certificate and Scope of Conformance

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U.S. ELECTION ASSISTANCE COMMISSION (/)

Registered Manufacturers

DOMINION VOTING SYSTEMS CORP

Dominion Voting Systems Corp (/voting-equipment/registered-manufacturers/dominion-voting-systems-corp)

1201 18th Street Suite 210

Denver, Colorado 80202

Type : Corporation

Technical Representative: Ian S. Piper

Website: http://www.dominionvoting.com/ (http://www.dominionvoting.com/)

Voting Systems

Democracy Suite 4.14 Modification (/voting-equipment/democracy-suite-414-modification)
Status: Certified System

Democracy Suite 4.14A Modification (/voting-equipment/democracy-suite-414a-modification)
Status: Certified System

Democracy Suite 4.14-A.1 Modification (/voting-equipment/democracy-suite-414-a1-modification)
Status: Certified System

Democracy Suite 4.14-B Modification (/voting-equipment/democracy-suite-414-b-modification)
Status: Certified System

Democracy Suite 4.14-D Modification (/voting-equipment/democracy-suite-414-d-modification)
Status: Certified System

Democracy Suite 4.14-E Modification (/voting-equipment/democracy-suite-414-e-modification)
Status: Certified System

Assure 1.3 Modification (/voting-equipment/assure-13-modification)
Status: Certified System

Democracy Suite 1.0.0 (/voting-equipment/democracy-suite-100)
Status: Terminated Systems

Sequoia WinEDS 4.0 (/voting-equipment/sequoia-wineds-40)
Status: Terminated Systems

Democracy Suite 5.0-A (/voting-equipment/democracy-suite-50-0)
Status: Certified System

Democracy Suite 5.5 (/voting-equipment/democracy-suite-55)
Status: Certified System

Democracy Suite 5.5-A (Modification) (/voting-equipment/democracy-suite-55-modification)
Status: Certified System

Democracy Suite 5.5B (Modification) (/voting-equipment/democracy-suite-55b-modification)
Status: Certified System

Democracy Suite 5.5-A.1 (/voting-equipment/democracy-suite-55-a1)
Status: Terminated Systems

Democracy Suite 5.0 (/voting-equipment/democracy-suite-50)
Status: Certified System

Democracy Suite 5.5-C (/voting-equipment/democracy-suite-55-c)
Status: Certified System

Democracy Suite 4.0 (/voting-equipment/democracy-suite-40)
Status: Certified System

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U.S. ELECTION ASSISTANCE COMMISSION (/)

Voluntary Voting System Guidelines Version 1.0 (2005)

Interpretation

RFI 2009-01 -- EAC Decision on VVPAT Accessibility	26.68 KB
RFI 2008-12 -- EAC Decision on Ballot Marking Device/Scope of Testing	27.87 KB
RFI 2008-10 -- EAC Decision on Electrical Fast Transient	25.03 KB
RFI 2007-06 -- EAC Decision on Recording and Reporting Undervotes	36.3 KB
RFI 2007-05 -- EAC Decision on Testing Focus and Applicability	30.85 KB
RFI 2007-04 -- EAC Decision on Presentation of Alternative Language	34.66 KB
RFI 2007-03 -- EAC Decision on Summative Usability Testing	24.22 KB
RFI 2007-01 -- EAC Decision on Accessible Design	72.62 KB
RFI 2010-03 -- EAC Decision on Database Coding Conventions	22.7 KB
RFI 2010-03 -- EAC Decision on Database Coding Conventions	22.7 KB
RFI 2010-05 -- EAC Decision on Testing of Modifications to a Certified System	24.02 KB
RFI 2010-06 -- EAC Decision on DRE Accessibility Requirements and Other Accessible Voting Stations	19.58 KB
RFI 2010-08 -- EAC Decision on Calling Sequence	186.78 KB
RFI 2012-01 -- EAC Decision on Ballot Handling - MultiFeed	164.13 KB
RFI 2012-03 -- EAC Decision on Configuration Management of COTS Products	170.23 KB
RFI 2012-02 -- EAC Decision on Transmission of Results (Official and Unofficial Results)	134.93 KB
RFI 2012-04 -- EAC Decision on Software Setup Validation	143.07 KB
RFI 2012-05 -- EAC Decision on Public Telecommunications and Cryptography	189.64 KB
RFI 2012-06 -- EAC Decision on Use of Public Telecommunications Networks and Data Transmission	211.51 KB
RFI 2013-01 -- EAC Decision on the Extensions Clause	198.51 KB
RFI 2013-02 -- EAC Decision on Audio Presentation Volume Levels	166.18 KB
RFI 2013-03 -- EAC Decision on Timestamps	958.46 KB
RFI 2013-04 -- EAC Decision on Usability Testing	1.2 MB
RFI 2015-05 -- EAC Decision on Touchscreen Technology	246.84 KB

Sort Order

2

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U.S. ELECTION ASSISTANCE COMMISSION (/)

Voting System Test Laboratories (VSTL)

PRO V&V

BACK TO VOTING SEARCH (/VOTING-EQUIPMENT/VOTING-SYSTEM-TEST-LABORATORIES-VSTL)

Pro V&V (/voting-equipment/voting-system-test-laboratories-vstl/pro-vv)

700 Boulevard South , Suite 102
Huntsville, Alabama 35802
Status: Accredited
Program Manager: , President
Phone: 256-713-1111

Related Documents

- **02/24/2015 - Certificate of Accreditation**
- **08/02/2015 - Pro V&V Letter of Agreement**
- **08/02/2012 - NIST Recommendation Letter - Pro V&V**
- **08/02/2012 - Pro V&V Certification of Conditions and Practices**

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U.S. ELECTION ASSISTANCE COMMISSION (/)

MicroVote EMS 4.41 Voting System (/voting-equipment/microvote-ems-441-voting-system)

Hart Verity Voting 2.5 (/voting-equipment/hart-verity-voting-25)

EVS 6.1.1.0 (/voting-equipment/evs-6110)

EVS 6.0.3.0 (/voting-equipment/evs-6030)

Democracy Suite 5.5-C (/voting-equipment/democracy-suite-55-c)

EVS 6.0.4.3 (/voting-equipment/evs-6043)

MicroVote EMS 4.4 (/voting-equipment/microvote-ems-44)

MicroVote EMS 4.3-A (/voting-equipment/microvote-ems-43)

EVS 5.4.0.0 Modification (/voting-equipment/evs-5400-modification)

EMS Ver. 4.0B Modification (/voting-equipment/ems-ver-40b-modification)

EMS 4.2 Modification (/voting-equipment/ems-42-modification)

OpenElect v.1.2 Modification (/voting-equipment/openelect-v12-modification)

Democracy Suite 4.14-A.1 Modification (/voting-equipment/democracy-suite-414-a1-modification)

EVS 6.0.0.0 (/voting-equipment/evs-6000)

EVS 5.0.0.0 (/voting-equipment/evs-5000)

EVS 5.4.1.0 (/voting-equipment/evs-5410)

EVS 5.2.1.0 Modification (/voting-equipment/evs-5210-modification)

Verity Voting 2.3 (/voting-equipment/verity-voting-23)

Unity 3.4.1.0 Modification (/voting-equipment/unity-3410-modification)

OpenElect 2.1 (/voting-equipment/openelect-21)

Verity Voting 2.2 Modification (/voting-equipment/verity-voting-22-modification)

Verity Voting 2.4 (/voting-equipment/verity-voting-24)

ClearVote 1.4 (/voting-equipment/clearvote-14)

OpenElect v.1.0.1 Modification (/voting-equipment/openelect-v101-modification)

Democracy Suite 4.14 Modification (/voting-equipment/democracy-suite-414-modification)
Democracy Suite 5.0-A (/voting-equipment/democracy-suite-50-0)
Democracy Suite 4.14-E Modification (/voting-equipment/democracy-suite-414-e-modification)
OpenElect 2.0.A (/voting-equipment/openelect-20a)
EVS 5.2.0.3 Modification (/voting-equipment/evs-5203-modification)
EVS 6.0.2.0 (Modification) (/voting-equipment/evs-6020-modification)
Unity 3.2.1.0 Previously Unity 3.0.1.0 & Unity 3.0.1.1 w. ATS 1.3 (/voting-equipment/unity-3210-previously-unity-3010-unity-3011-w-ats-13)
OpenElect 2.0.A.2 (/voting-equipment/openelect-20a2)

Verity Voting 1.0 (/voting-equipment/verity-voting-10)

EVS 6.1.0.0 (/voting-equipment/evs-6100)

EVS 5.2.2.0 Modification (/voting-equipment/evs-5220-modification)

EMS Ver. 4.1 Modification (/voting-equipment/ems-ver-41-modification)

OpenElect v.1.3.0.2 Modification (/voting-equipment/openelect-v1302-modification)

OpenElect v.1.3 Modification (/voting-equipment/openelect-v13-modification)

Democracy Suite 4.14-B Modification (/voting-equipment/democracy-suite-414-b-modification)

EVS 5.2.3.0 (/voting-equipment/evs-5230)

EVS 5.0.1.0 Modification (/voting-equipment/evs-5010-modification)

EVS 5.2.4.0 (/voting-equipment/evs-5240)

EVS 5.2.1.1 Modification (/voting-equipment/evs-5211-modification)

EVS 6.0.4.0 (/voting-equipment/evs-6040)

Unity 3.4.1.4 Modification (/voting-equipment/unity-3414-modification)

Verity Voting 2.3.3 (/voting-equipment/verity-voting-233)

EMS Ver. 4.0 (/voting-equipment/ems-ver-40)

Verity Voting 2.2.1 (/voting-equipment/verity-voting-221)

OpenElect v.1.1 Modification (/voting-equipment/openelect-v11-modification)

Democracy Suite 4.14A Modification (/voting-equipment/democracy-suite-414a-modification)

Democracy Suite 5.5 (/voting-equipment/democracy-suite-55)

Assure 1.3 Modification (/voting-equipment/assure-13-modification)

Verity Voting 2.2.2 (/voting-equipment/verity-voting-222)

EVS 5.2.0.4 Modification (/voting-equipment/evs-5204-modification)

EVS 6.0.2.1 (Modification) (/voting-equipment/evs-6021-modification)

Unity 3.4.0.0 Modification (/voting-equipment/unity-3400-modification)

Democracy Suite 5.5B (Modification) (/voting-equipment/democracy-suite-55b-modification)

Verity Voting 2.0 Modification (/voting-equipment/verity-voting-20-modification)

ClearVote 2.0 (/voting-equipment/clearvote-20)

Democracy Suite 5.0 (/voting-equipment/democracy-suite-50)

OpenElect v.1.0 (/voting-equipment/openelect-v10)

Democracy Suite 4.0 (/voting-equipment/democracy-suite-40)

OpenElect 2.0 (/voting-equipment/openelect-20)

Democracy Suite 4.14-D Modification (/voting-equipment/democracy-suite-414-d-modification)

OpenElect 1.3.0.2A (/voting-equipment/openelect-1302a)

EVS 5.2.0.0 Modification (/voting-equipment/evs-5200-modification)

ClearVote 1.5 (/voting-equipment/clearvote-15)
Unity 3.2.0.0 Rev. 3 Modification (/voting-equipment/unity-3200-rev-3-modification)
Democracy Suite 5.5-A (Modification) (/voting-equipment/democracy-suite-55-modification)
Assure 1.2 (/voting-equipment/assure-12)
Verity Voting 2.3.4 (/voting-equipment/verity-voting-234)

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U.S. ELECTION ASSISTANCE COMMISSION (/)

DEMOCRACY SUITE 4.14-A.1 MODIFICATION

Manufacturer

Dominion Voting Systems Corp (/voting-equipment/registered-manufacturers/dominion-voting-systems-corp)

Testing standard

VVSG 1.0 (2005) (/vvsg-10-2005)

Testing Lab

NTS Huntsville (formally Wyle Laboratories) (/voting-equipment/voting-system-test-laboratories-vstl/nts-huntsville-formally-wyle-laboratories)

Certification Date

06/16/14

Certification Status

Certified System (/taxonomy/term/1122)

Testing Application Date

03/26/14

Application Accepted Date

03/26/14

Testing Documents

- ☐ 04/28/2014-Draft Test Report (NTS)
- ☐ 04/04/2014-Draft Test Plan (NTS)

Correspondence

- ☐ 03/26/2014-Approval Letter of Voting System Testing Application Package

Certification

- ☐ 05/22/2014-EAC Initial Decision Granting Certification
- ☐ 04/18/2014-Approval Letter - Test Plan Rev. A

- ☐ 06/16/2014-EAC Final Decision Granting Certification
- ☐ 05/21/2014-Final Test Report - Rev. B (NTS)
- ☐ 05/16/2014-Approved Test Report - Rev. A (NTS)
- ☐ 06/09/2014-Test Report Addendum (NTS)
- ☐ 06/09/2014-Dominion Obfuscation Process Modification
- ☐ 06/16/2014-Certificate of Conformance
- ☐ 04/16/2014-Approved Test Plan - Rev. A (NTS)

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U. S. ELECTION ASSISTANCE COMMISSION
VOTING SYSTEM TESTING AND CERTIFICATION PROGRAM
1335 East West Highway, Suite 4300
Silver Spring, MD 20910

2/12/2018

Application for System Testing: DVS1902
OMB Control #3265-0004

Form EAC 002C

This form provides manufacturers with the means to apply for a certification of a voting system. Completion of a voting system application is a required step in the EAC Voting System Testing and Certification Program. This form is prescribed by Section 4.3 of the Manual. For more information on registration requirements please see Section 4.3.

This form is generally self-explanatory, however the numbers and the instructions below correspond to the numbered sections of the form.

1. Manufacturer Name: Full legal name of the manufacturer.
2. Manufacturer Code: The three letter identification code provided by the EAC upon manufacturer registration.
3. Version of Standards to be Used for Testing: Select the version of the EAC approved voting system standards to which the candidate system or modification is to be tested and certified.

4-5. Provide information as requested.

6. EAC Accredited VSTL: Provide the name of the EAC accredited voting system test laboratory that will perform testing on the candidate system.
7. Requested EAC Certification Number: Provide the certification number to be carried by the candidate system following certification. This number must begin with the three letter manufacturer identification code and be unique only to the specific candidate voting system. The number may be alpha-numeric and contain no more than 20 characters.
8. Configuration: A complete list of each configuration of the system's components which could be fielded as the certified voting system.
9. Coding Convention Declaration: Each voting system component is to have a single coding convention selected for every programming language used in the candidate voting system. This information shall include system component, language used, convention declared, and source of convention.
10. Brief Description of the System or System Modification: Describe the system, carefully listing all components submitted for certification. Include whether this application is for a new system or a modification to a previously EAC certified system.
11. Implementation Statement: The Manufacturer must submit with the application form a copy of the voting system's Implementation Statement, which must meet the requirements of the VVSG (VVSG 2005 - Version 1.0, Vol. I, Section 1.6.4). If an existing system is being submitted with a modification, the Manufacturer must submit a copy of a revised Implementation Statement.

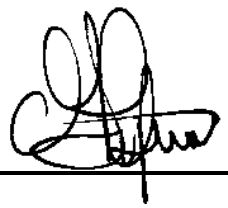
12. Functional Diagram: The Manufacturer must submit with the application form a high-level Functional Diagram of the voting system which includes all of its components. The diagram must portray how the various components relate and interact.
13. System Overview: The Manufacturer must submit with the application form a copy of the voting system's System Overview documentation submitted to the VSTL as a part of the Technical Data Package. This document must meet the requirements of the VVSG (VVSG 2005 - Version 1.0, Vol. II, Section 2.2).

Submitted info:

1. **Manufacturer Name:** Dominion Voting Systems
2. **Manufacturer Code:** DVS
3. **Version of Standards to be Used for Testing:** VVSG2005
4. **Voting System Name:** Democracy Suite
5. **System Model/Version Number:** 5.5-B
6. **EAC Accredited VSTL:** ProV&V
7. **Requested EAC Certification number:** DVS-DemSuite5.5-B
8. **Configuration:** See attached *Component List (D-Suite 5.5-B).pdf*
9. **Coding Convention Declaration:** N/A
10. **Brief Description of System or System Modification:**

The Dominion Democracy Suite 5.5-B Voting System is a modification to the certified Democracy Suite 5.5 Voting System. The purpose of this modification is to provide the changes described below:

- Addition of ImageCast Evolution
- Addition of InoTec HiPro 821 scanner
- Addition of Canon DR-M260 scanner
- Addition of ImageCast Precinct 2 (PCOS-330A)

11. **Implementation Statement:** See attached *Implementation Statement (D-Suite 5.5-B).pdf*
12. **Functional Diagram:** See attached *Functional Diagram (D-Suite 5.5-B).png*
13. **System Overview:** See attached *2.02 Democracy Suite System Overview-5.5-B.pdf*
14. **Signature:** 

700 Boulevard South
Suite 102
Huntsville, AL 35802
Phone (256)713-1111
Fax (256)713-1112

Test Plan for EAC 2005 VVSG Certification Testing Dominion Voting Systems Democracy Suite (D-Suite) Version 5.5-B Voting System

EAC Project Number: DVS-DemSuite5.5-B

Version: Rev. 02

Date: 08/05/2019

EAC Lab Code 1501

NVLAP LAB CODE 200908-0

SIGNATURES

Approved by: _____ 8/5/19
Michael Walker, VSTL Project Manager — Date

Approved by: _____ 8/5/19
Wendy Owens, VSTL Program Manager — Date

REVISIONS

Revision	Description	Date
NR	Initial Release	03/28/2019
01	Updates per EAC Comments. Added ICP2 component and associated edits.	05/16/2019
02	As-Run Version	08/05/2019

TABLE OF CONTENTS

1.0 INTRODUCTION **1**

1.1 Description and Overview of EAC System Being Modified 1

1.1.1 Baseline Certified System 4

1.1.2 Description of Modification 14

1.1.3 Initial Assessment 14

1.1.4 Regression Test 15

1.2 References 15

1.3 Terms and Abbreviations 15

1.4 Project Schedule 16

1.5 Scope of Testing 17

1.5.1 Block Diagram 18

1.5.2 System Limits 19

1.5.3 Supported Languages 20

1.5.4 Supported Functionality 21

1.5.5 VVSG 21

1.5.6 RFIs 21

1.5.7 NOCs 22

2.0 PRE-CERTIFICATION TESTING AND ISSUES 22

2.1 Evaluation of Prior VSTL Testing 22

2.2 Evaluation of Prior Non-VSTL Testing 22

2.3 Known Field Issues 22

3.0 MATERIALS REQUIRED FOR TESTING 22

3.1 Software 22

3.2 Equipment 23

3.3 Test Materials 23

3.4 Proprietary Data 24

4.0 TEST SPECIFICATIONS **24**

4.1 Requirements (Strategy of Evaluation) 24

4.1.1 Rational for 'Not Applicable' requirements 27

4.2 Hardware Configuration and Design 27

4.3 Software System Functions 27

4.4 Test Case Design 27

4.4.1 Hardware Qualitative Test Case Design 28
4.4.2 Hardware Environmental Test Case Design 29
4.4.3 Software Module Test Case Design and Data 29
4.4.4 Software Functional Test Case Design and Data 29
4.4.5 System-Level Test Case Design 30
4.5 Security Functions 30
4.6 TDP Evaluation 31
4.7 Source Code Review 37
4.8 QA & CM System Review 37
4.9 Physical Configuration Audit (PCA) 37
4.10 Functional Configuration Audit (FCA) 38
4.11 Accuracy 38
4.12 Volume & Stress 39
4.13 System Integration 39
5.0 TEST DATA 39
5.1 Test Data Recording 39
5.2 Test Data Criteria 39
6.0 TEST PROCEDURES AND CONDITIONS 39
6.1 Facility Requirements 40
6.2 Test Set-Up 40
6.3 Test Sequence 40
6.4 Test Operations Procedure 40

PROJECT SCHEDULE A-1

1.0 INTRODUCTION

The purpose of this Test Plan is to document the procedures that Pro V&V, Inc. will follow to perform certification testing during a system modification campaign for the Dominion Voting Systems Democracy Suite (D-Suite) 5.5-B Voting System to the requirements set forth for voting systems in the U.S. Election Assistance Commission (EAC) 2005 Voluntary Voting System Guidelines (VVSG), Version 1.0. Prior to submitting the voting system for testing, Dominion Voting Systems submitted an application package to the EAC for certification of the D-Suite 5.5-B Voting System. The application was accepted by the EAC and the project was assigned the unique Project Number of DVS-DemSuite5.5-B.

At test conclusion, the results of all testing performed as part of this test campaign will be submitted to the EAC in the form of a national certification test report.

1.1 Description and Overview of EAC Certified System Being Modified

The EAC Certified System that is the baseline for the submitted modification is described in the following subsections. All information presented was derived from the previous Certification Test Report, the EAC Certificate of Conformance and/or the System Overview.

The D-Suite 5.5-B Voting System is a paper-based optical scan voting system with a hybrid paper/DRE option consisting of the following major components: The Election Management System (EMS), the ImageCast Central (ICC), the ImageCast Precinct (ICP and ICP2), the ImageCast X (ICX) DRE w/ Reports Printer, ImageCast X (ICX) DRE w/VVPAT, the ImageCast Evolution (ICE), and the ImageCast X (ICX) BMD. The D-Suite 5.5-B Voting System configuration is a modification from the EAC approved D-Suite 5.5 system configuration.

The following subsections describe the baselined D-Suite 5.5 Voting System.

Election Management System (EMS)

The D-Suite 5.5 EMS consists of various components running as either a front-end/client application or as a back-end/server application. A listing of the applications and a brief description of each is presented below.

Front-end/Client applications:

- EMS Adjudication: Represents the client component responsible for adjudication, including reporting and generation of adjudicated result files from ImageCast Central tabulators and adjudication of write-in selections from ImageCast Precinct and ImageCast Central tabulators. This client component is installed on both the server and the client machines.

- EMS Audio Studio: A client application that represents an end-user helper application used to record audio files for a given election project. As such, it is utilized during the pre-voting phase of the election cycle.

- EMS Election Data Translator: End-user application used to export election data from election project and import election data into election project.

- EMS Election Event Designer: A client application that integrates election definition functionality together with ballot styling capabilities and represents a main pre-voting phase end-user application

- ImageCast Voter Activation: An application, installed on a workstation or laptop at the polling place, which allows the poll workers to program smart cards for voters. The smart cards are used to activate voting sessions on ImageCast X.

- EMS Results Tally and Reporting: A client application that integrates election results acquisition, validation, tabulation, reporting, and publishing capabilities and represents the main post-voting phase end-user application.

Back-end/Server applications:

- EMS Adjudication Service: Represents a server side application which provides ballot information such as contests, candidates and their coordinates from EMS to the Adjudication application.

- EMS Application Server: Represents a server side application responsible for executing long running processes, such as rendering ballots, generating audio files and election files, etc.

- EMS Database Server: Represents a server side RDBMS repository of the election project database which holds all the election project data, including pre-voting and post-voting data.

- EMS Data Center Manager: A server application that represents a system level configuration application used in EMS back-end data center configuration.

- EMS File System Service: A back-end application that acts as a stand-alone service that runs on client machines, enabling access to low level operating system API for partitioning CF cards, reading raw partition on ICP CF card, etc.

- EMS NAS Server: Represents a server side file repository of the election project file based artifacts, such as ballots, audio files, reports, log files, election files, etc.

- Smart Card Helper Service: A service that is installed on a workstation or laptop at the polling place, and provides required data format for programming smart cards for ImageCast devices, or, for jurisdiction's voting registration system in case of integration.

ImageCast Precinct (ICP)

The ICP device is a hybrid precinct optical scan paper/DRE ballot counter designed to provide six major functionalities: ballot scanning, second chance voting, accessible voting, ballot review, tabulation, and poll worker functions.

For ballot scanning functionality the ICP scans marked paper ballots, interprets voter marks on the paper ballots and stores the ballots for tabulation when the polls are closed.

Second Chance voting refers to scenarios in which an error has been detected on the voter's paper ballot (e.g., blank ballot, undervoted ballot, overvoted ballot, misread ballot, cross-over voted ballot), and the ICP notifies the voter by displaying a message or providing an audio visual cue, that one of these situations has been detected, and offers the voter an opportunity to reject and fix their ballot, or to cast the ballot as-is.

Accessible voting allows voters with disabilities to listen to an audio representation of a ballot and use a hand held controller called an Audio Tactile Interface (ATI) to make vote selections, which are then saved directly to the ICP when the voter casts their Accessible Voting ballot.

The Ballot Review feature allows a voter to review their vote selections using an audio or visual representation, which displays or presents the voter with a complete listing of all contests contained on the ballot and an indication of the results which will be recorded for each contest once the voter's ballot is cast.

The Tabulation of paper ballots and Accessible Voting ballots cast by voters is performed when the polls are closed on the ICP unit and the unit tabulates the results, generates results files for aggregation into RTR, and prints a results report containing the results of the ballots cast.

For poll worker functions the ICP contains a small touch-screen LCD to allow the poll worker to initiate polling place activities, diagnostics and reports.

ImageCast Central (ICC) Count Scanner

The ICC is a high-speed, central ballot scan tabulator based on Commercial off the Shelf (COTS) hardware, coupled with the custom-made ballot processing application software. It is used for high speed scanning and counting of paper ballots.

ImageCast X (ICX)

The Democracy Suite ImageCast X (ICX) consists exclusively of COTS available hardware and operating system, while the applications installed on top customize its behavior to turn it into a Ballot Marking Device (BMD) or a Direct-Recording Electronic (DRE) device with or without a Voter Verifiable Paper Audit Trail (VVPAT). ICX application is the application that verifies voter's session eligibility, using the smart card and then presents the appropriate ballot to the voter. When a voter is satisfied with choices selected, ICX application verifies them and produces an Electronic Mobile Ballot or stores the votes onto a memory device. The ICX is designed to perform the following functions:

- Ballot marking and printing of electronic mobile ballots (in BMD mode)
- Ballot review and second chance voting
- Accessible voting and ballot marking
- Saving voting results (in DRE mode)
- Printing votes on a voter verifiable paper audit trail device (when VVPAT is in use)

1.1.1 Baseline Certified System

The baseline system for this modification is the D-Suite 5.5 Voting System. The tables below describe the certified equipment and firmware versions. Detailed descriptions of the D-Suite 5.5 test campaign are contained in Pro V&V Report No.TR-01-01-DVS-2017-02.01 Rev. B, which is available for viewing on the EAC's website at www.eac.gov.

This subsection lists the proprietary and COTS software to be provided by the manufacturer as part of the test campaign.

Table 1-1. Democracy Suite 5.5 EMS Software Component Descriptions

Software	Version	Filename	Configuration	
			Standard	Express
EMS Election Event Designer (EED)	5.5.12.1	setup.exe: EED_FED_CERT_Setup_x64.msi	X	X
EMS Results Tally and Reporting (RTR)	5.5.12.1	setup.exe: RTR_FED_CERT_Setup_x64.msi	X	X
EMS Application Server	5.5.12.1	setup.exe: APPS_FED_CERT_Setup_x64.msi	X	X
EMS File System Service (FSS)	5.5.12.1	setup.exe: FSSSetup.msi	X	X
EMS Audio Studio (AS)	5.5.12.1	setup.exe: EMSAudioStudioSetup.msi	X	X
EMS Data Center Manager (DCM)	5.5.12.1	DemocracySuiteEMS_DCM.exe	X	X
EMS Election Data Translator (EDT)	5.5.12.1	setup.exe: EDTSetup_x86.msi EDTSetup_x64.msi	X	X
ImageCast Voter Activation (ICVA)	5.5.12.1	setup.exe: ICVASetup.msi	X	X
EMS Adjudication (Adj.)	5.5.8.1	DVS ImageCast Adjudication Client Setup.msi	X	X
EMS Adjudication Service	5.5.8.1	DVS Adjudication Services Setup.msi	X	X
Smart Card Helper Service	5.5.12.1	setup.exe: SmartCardServiceSetup.msi	X	X

Table 1-2. Democracy Suite 5.5 ImageCast Precinct Software Component Descriptions

Firmware/Software	Version	Filename
Election Firmware	5.5.3-0002	cf2xx.sig
Firmware Updater	5.5.3-0002	firmUp.enc
Firmware Extractor	5.5.3-0002	FirmwareExtract.enc
Kernel (uClinux)	5.5.3-0002	image.bin.gz
Boot Loader (COLILO)	20040221	colilo.bin
Asymmetric Key Generator	5.5.3-0002	Keygen.enc
Asymmetric Key Exchange Utility	5.5.3-0002	KeyExchange.enc
Firmware Extractor (Uses Technician Key)	5.5.3-0002	TechExtract.enc

Table 1-3. Democracy Suite 5.5 ImageCast Central Software Component Descriptions

Firmware/Software	Version	Filename
ImageCast Central Application	5.5.3.0002	ICCSetup.exe

Table 1-4. Democracy Suite 5.5 ImageCast X Software Component Descriptions

Firmware/Software	Version	Filename
ICX Application	5.5.10.25	ICX.apk

Table 1-5. Democracy Suite 5.5 EMS Client/Server Software Component Descriptions

Firmware/Software	Version	Filename	Configuration	
			Standard	Express
Microsoft Windows Server	2012 R2 Standard	Physical Media from Microsoft	X	
Microsoft Windows	10 Professional	Physical Media from Microsoft	X	X
.NET Framework	3.5	Physical Media from Microsoft	X	X
Microsoft Visual J#	2.0	vjredist64.exe vjredist.exe	X	X
Microsoft Visual C++ 2013 Redistributable	2013	vcredist_x64.exe vcredist_x86.exe	X	X
Microsoft Visual C++ 2015 Redistributable	2015	vc_redist.x64.exe vc_redist.x86.exe	X	X
Java Runtime Environment	7u80	jre-7u80-windows-x64.exe jre-7u80-windows-i586.exe	X	X
Java Runtime Environment	8u144	jre-8u144-windows-x64.exe jre-8u144-windows-i586.exe	X	X
Microsoft SQL Server 2016 Standard	2016 Standard	Physical Media from Microsoft	X	

Table 1-5. Democracy Suite 5.5 EMS Client/Server Software Component Descriptions *(continued)*

Firmware/Software	Version	Filename	Configuration	
			Standard	Express
Microsoft SQL Server 2016 Service Pack 1	2016 SP1	SQLServer2016SP1-KB3182545-x64-ENU.exe	X	
Microsoft SQL Server 2016 SP1 Express	2016 SP1	SQLEXPRADV_x64_ENU.exe		X
Cepstral Voices	6.2.3.801	Allison (English): Cepstral_Allison_windows_6.2.3.801.exe Alejandra (Spanish): Cepstral_Alejandra_windows_6.2.3.801.exe	X	X
Arial Narrow Fonts	2.37a	ARIALN.TTF ARIALNB.TTF ARIALNBI.TTF ARIALNI.TTF	X	X
Maxim iButton Driver	4.05	install_1_wire_drivers_x86_v405.msi install_1_wire_drivers_x64_v405.msi	X	X
Adobe Reader DC	AcrobatDC	AcroRdrDC1501020060_en_US.exe	X	X
Microsoft Access Database Engine	2010	AccessDatabaseEngine.exe AccessDatabaseEngine_x64.exe	X	X
Open XML SDK 2.0 for Microsoft Office	2.0	OpenXMLSDKv2.msi	X	X

Table 1-6. Democracy Suite 5.5 EMS Software Platform Unmodified COTS Component Descriptions

Firmware/Software	Version	Filename
Infragistics NetAdvanatage Win Forms 2011.1	2011 Vol.1	NetAdvantage_WinForms_20111.msi
Infragistics NetAdvanatage WPF 2012.1	2012 Vol.1	NetAdvantage_WPF_20121.msi
TX Text Control Library for .NET	16.0	TXText Control.NET for Windows Forms 16.0.exe
SOX	14.3.1	sox.exe , libgomp-1.dll, pthreadgc2.dll, zlib1.dll
NLog	1.0.0.505	NLog.dll
iTextSharp	5.0.5	itextsharp.dll

Table 1-6. Democracy Suite 5.5 EMS Software Platform Unmodified COTS Component Descriptions *(continued)*

Firmware/Software	Version	Filename
OpenSSL	1.0.2k & 2.0.14 FIPS	openssl.exe, libeay32.dll, ssleay32.dll
SQLite	1.0.103.0	System.Data.SQLite.DLL (32-bit and 64-bit)
Lame	3.99.4	lame.exe
Speex	1.0.4	speexdec.exe and speexenc.exe
Ghostscript	9.04	gsdll32.dll (32-bit and 64-bit)
One Wire API for .NET	4.0.2.0	OneWireAPI.NET.dll
Avalon-framework-cvs-20020806	20020806	avalon-framework-cvs-20020806.jar
Batik	0.20-5	batik.jar
Fop	0.20-5	fop.jar
Microsoft Visual J# 2.0 Redistributable Package-Second Edition(x64)	2.0	vjc.dll , vjsjbc.dll, vjslibcw.dll, vjsnativ.dll , vjssupuilib.dll , vjsvwaux.dll
Entity framework	6.1.3	EntityFramework.dll
Spreadsheetlight	3.4.3	SpreadsheetLight.dll, SpreadsheetLight.xml
Open XML SDK 2.0 For Microsoft Office	2.0.5022.0	DocumentFormat.OpenXml.dll, DocumentFormat.OpenXml.xml

Table 1-7. Democracy Suite 5.5 ImageCast Precinct Unmodified COTS Component Descriptions

Firmware/Software	Version	Filename
OpenSSL 1.0.2k	1.0.2k	openssl-1.0.2k.tar.gz
OpenSSL FIPS 2.0.10	2.0.10	openssl-fips-2.0.10.tar.gz
Zlib	1.2.3	Zlib-1.2.3.tar.gz

Table 1-8. Democracy Suite 5.5 ImageCast X Unmodified COTS Component Descriptions

Firmware/Software	Version	Filename
Google Text-to-Speech Engine	3.11.12	ARM: com.google.android.tts_3.11.12-210311121_minAPI19(armeabi-v7a)(nodpi).apk x86: com.google.android.tts_3.11.12-210311123_minAPI15(x86)(nodpi).apk
ICX Prime Android 5.1.1 Image	0405	0405_5.1.1-01.12_user_android_x86.iso
ICX Classic Android 4.4.4 Image	0.0.98	byt_t_crv2_64-ota-BCX18-V0.0.98.zip

Table 1-9. Democracy Suite 5.5 ImageCast Central Software Build Library Source Code (Unmodified COTS)

Firmware/Software	Version	Filename
OpenSSL 1.0.2k	1.0.2k	openssl-1.0.2k.tar.gz
OpenSSL FIPS 2.0.10	2.0.10	openssl-fips-2.0.10.tar.gz

Table 1-10. Democracy Suite 5.5 ImageCast Central Runtime Software Components (Unmodified COTS)

Firmware/Software	Version	Filename
1-Wire Driver (x86)	4.05	install_1_wire_drivers_x86_v405.msi
1-Wire Driver (x64)	4.05	install_1_wire_drivers_x64_v405.msi
Canon DR-G1130 TWAIN Driver	1.2 SP6	G1130_DRIT_V12SP6.exe
Canon DR-M160II TWAIN Driver	1.2 SP6	M160II_DRIT_V12SP6.exe
Visual C++ 2013 Redistributable (x86)	12.0.30501	vcredist_x86.exe

Table 1-11. Democracy Suite 5.5 ImageCast Precinct Modified COTS Software Component Descriptions

Firmware/Software	Version	Filename
uClinux	20070130	uClinux-dist-20070130.tar.gz
COLILO Bootloader	20040221	Colilo20040221.tar.gz

Table 1-12. Democracy Suite 5.5 ImageCast X Modified COTS Software Component Descriptions

Firmware/Software	Version	Filename
Zxing Barcode Scanner	4.7.5	BS-4.7.5.zip
SoundTouch	1.9.2	Soundtouch-1.9.2.tar.gz

Table 1-13. Democracy Suite 5.5 EMS Software Build Environment Component Descriptions

Firmware/Software	Version	Filename
Windows 10 Professional	10 Professional	Physical Media from Microsoft
.NET Framework 3.5	3.5	Physical Media from Microsoft
Internet Information Server (IIS)	10.0	Physical Media from Microsoft
7-Zip	9.20 (64 Bit)	7z920-x64.msi
Visual Studio 2015 Professional with Update 3	2015 Update 3	en_visual_studio_professional_2015_with_update_3_x86_x64_web_installer_8922978.exe

Table 1-13. Democracy Suite 5.5 EMS Software Build Environment Component Descriptions
(continued)

Firmware/Software	Version	Filename
.NetDiscUtils	0.10	DiscUtilsBin-0.10.zip
Infragistics NetAdvantage Win Forms 2011.1	2011.1	NetAdvantage_WinForms_20111.msi
Infragistics Net Advantage – WPF 2012.1	2012.1	NetAdvantage_WPF_20121.msi
TX Text Control 16.0.NET	16	TX Text Control.NET for Windows Forms 16.0.exe
Speex	1.0.4	speex_win32_1.0.4_setup.exe
Microsoft Visual J#	2.0	vjredist64.exe
iTextSharp	5.0.5	itextsharp-5.0.5-dll.zip
Ghostscript	9.0.4	gs904w32.exe gs904w64.exe
Nlog	1.0.0.505	NLog-1.0-Refresh-bin.zip
OneWireAPI.NET	4.0	1-wiresdkver400_beta2.zip
Lame	3.99.4	lame3.99.4-20120130.zip
Sox	14.3.1	sox-14.3.1-win32.zip
Avalon Framework	20020806	avalon-framework-cvs-20020806.jar.zip
Fop	0.20-5	fop-0.20.5.jar
Batik	0.20-5	batik-1.5-fop-0.20-5.jar
SQLite	1.0.103.0	sqlite-netFx46-setup-bundle-x64-2015-1.0.103.0.exe
OpenSSL 1.0.2k	1.0.2k	openssl-1.0.2k.tar.gz
OpenSSL FIPS 2.0.10	2.0.10	openssl-fips-2.0.10.tar.gz
Strawberry Perl	5.24.1.1	strawberry-perl-5.24.1.1-64bit.msi
Patch	2.5.9-7	patch-2.5.9-7-bin.zip
ISOnewspaper	30.4	ISOnewspaper30v4_gr.icc.zip
Ogg Vorbis Encoder	2.88	oggenc2.88-1.3.5-generic.zip
Ogg Vorbis Encoder	1.10.1	oggdecV1.10.1.zip
Prism Mvvm	1.1.1	prism.mvvm.1.1.1.nupkg
Bitmiracle.libtiff.net	2.4.560	Bitmiracle.libtiff.net.2.4.560.nupkg
Prism	4.0.0	prism.4.0.0.nupkg
Prism.UnityExtensions	4.0.0	prism.unityextensions.4.0.0.nupkg
PDF Printing	2.9.5.2	PDFPrinting.zip
Entity Framework	6.1.3.net45	entityframework.6.1.3.nupkg

Table 1-13. Democracy Suite 5.5 EMS Software Build Environment Component Descriptions
(continued)

Firmware/Software	Version	Filename
WiX	3.10	Wix310.exe
Spreadsheet Light	3.4.3	spreadsheetlight.3.4.3.nupkg
Open XML SDK 2.0 for Microsoft Office	2.0	OpenXMLSDKv2.msi
Adobe Reader DC	AcrobatDC	AcroRdrDC1501020060_en_US.exe
Arial Narrow Fonts	2.37a	ArialNarrowFonts.zip
SSH.NET	2016.1.0	SSH.NET-2016.1.0-bin.zip
SSMS	14.0.17119.0	SSMS-Setup-ENU.exe
TwainDSM	2.3.0	Twaindsm-2.3.0.win.bin

Table 1-14. Democracy Suite 5.5 ICC Software Build Environment Component Descriptions

Firmware/Software	Version	Filename
NASM Assembler	2.12.02	nasm-2.12.02-win32.zip
OpenSSL 1.0.2k	1.0.2k	openssl-1.0.2k.tar.gz
OpenSSL FIPS 2.0.10	2.0.10	openssl-fips-2.0.10.tar.gz
CSC3-2010	N/A	CSC3-2010.crl
tss-ca-g2	N/A	tss-ca-g2.crl

Table 1-15. Democracy Suite 5.5 Adjudication Software Build Environment Component Descriptions

Firmware/Software	Version	Filename
Microsoft Enterprise Library	5.0	Enterprise Library 5.0.msi
Microsoft Prism	4.0.0	Prism.4.0.0.nupkg
Microsoft Identity Foundation SDK	4.0	WindowsIdentityFoundation-SDK-4.0.msi
Toggle Switch Control Library	1.1.1	ToggleSwitch 1.1.1.zip
Infragistics NetAdvantage Ultimate 2013.1	2013.1	NetAdvantage_20131_PlatformInstaller.zip
iTextSharp	5.5.1	itextsharp-all-5.5.1.zip
CLR Security	June 2010	clrsecurity_june10.zip
OpenSSL 1.0.2k	1.0.2k	openssl-1.0.2k.tar.gz
OpenSSL FIPS 2.0.10	2.0.10	openssl-fips-2.0.10.tar.gz
Community MSI Extensions	1.4	msiext-1.4.zip
TreeViewEx	3.0.0.0	TreeViewEx.dll

Table 1-16. Democracy Suite 5.5 ImageCast Precinct Election Firmware Compiler Descriptions

Firmware/Software	Version	Filename
g++ (GNU C++ compiler)	gcc3.4.0-20040603	m68k-uclinux-tools-c++-gcc3.4.0-20040603.sh

Table 1-17. Democracy Suite 5.5 ImageCast Precinct Firmware Build Environment Component Descriptions

Firmware/Software	Version	Filename
Ubuntu 16.04.1	16.04.1	ubuntu-16.04.1-desktop-i386.iso
Toolchain Installation Script	N/A	Toolchain.sh
m68k uClinux tools base gcc	3.4.0-20040603	m68k-uclinux-tools-base-gcc3.4.0-20040603.sh
m68k uClinux tools c++ gcc	3.4.0-20040603	m68k-uclinux-tools-c++-gcc3.4.0-20040603.sh
m68k uClinux tools gdb	20040603	m68k-uclinux-tools-gdb-20040603.sh
OpenSSL 1.0.2k	1.0.2k	openssl-1.0.2k.tar.gz
OpenSSL FIPS 2.0.10	2.0.10	openssl-fips-2.0.10.tar.gz

Table 1-18. Democracy Suite 5.5 ImageCast X Firmware Build Environment Component Descriptions

Firmware/Software	Version	Filename
Ubuntu 14.04.4	14.04.4	ubuntu-14.04.4-desktop-amd64.iso

Table 1-19. D-Suite 5.5 Configuration Files

Configuration File	Version	Filename
Machine Configuration File (MCF)	5.5.10.20_20180806	MCF_5.5.10.20_20180806.mcf
Device Configuration File (DCF)	5.4.01_20170521	DCF_5.4.01_20170521.dcf

Table 1-20. D-Suite 5.5 Voting System Equipment

Component	Serial Number
Proprietary Hardware	
ImageCast Precinct Optical Scanner PCOS-320C	AAFAJFM0061, AAFAJFN0030, AAFAJGI6764, AAFAJEL0352
ImageCast Precinct Optical Scanner PCOS-320A	AANAGCP0347, AANAGCP0002
ICP Ballot Box BOX-330A	AAUCCFX0083, AAUCCGI0011
ICX Inline EMI Filter	[DVS-EMIFILTER-001] thru [DVS-EMIFILTER-003]
COTS Hardware	

Table 1-20. D-Suite 5.5 Voting System Equipment *(continued)*

Component	Serial Number
ICX aValue 15” Tablet (SID-15V)	0E14AF00014, B03G005400006, B033G00540008, 9E274118, 1D274118, Baytrail98D750C0, Baytrail12034DCC, Baytrail9A6550C8
ICX aValue 21” Tablet (SID-21V)	0E14AF00027, B03G005500019, 03G005500009, 0039BZ2D, 0039B209, Baytrail0039B22D, BaytrailF1B2587F, BaytrailF1B25983
A Value 21" ICX DRE (Prime)	1707101522, 1707101789, 1707101730, 1707101887, 1707101710, 1707101725, 1707101731, 1708100916, 1708100876, 1708100915, 1707101845, 1707101778, 1717101720, 1707101845, 1707101722, 1707202552, 1711300282, 1707100089, 1707101795, 1707101793, 17101793
SII Thermal Printer	1115271A, 1115273A, 115270A, 1115275A
KFI VRP3 Thermal Printer (VVPAT)	KPR000000715, KPR0000078339, KPR0000078377, KRP000000711, KPR000000712, KPR170900010119, KPR0000078337, KPR0000078364, KPR170900008115, KPR0000078339, KPR170900008116, KPR170900010347, KPR170900009733, KPR170900010120, KPR170900010119, KPR170900010337, KPR170900010338, KPR170900010348
Dell OptiPlex 7440 All In One	HVNRFB2, HVNQFB2, HVNPFB2
Dell PowerEdge R630	4Z07T52
Dell PowerEdge R640	JMP9CM2
Canon imageFormula DR-G1130 Scanner	GF301092, GF304418
Canon DR-M160II Scanner	GX333569, GX333573, GX324846, GX326272, GX319353
Dell Precision T3420 PC	HS0VFB2, HS0TFB2, HS0RFB2, HS0SFB2, 4TB3MN2, F575HH2
HP LaserJet Pro Printer M402dn	PHBQF20342, PHBQF20345, PHBQC12619, PHBQC19613, PHBQC12519, PHBQD18790, PHBQC12616, PHBQG09329
HP LaserJet Pro Printer M402dne	PHB5D00782, PHB5D04714, PHB5F04770, PHB5B18304, PHB5D04713
Dell OptiPlex 9030 All-In-One	CF73S52
Dell Ultrasharp 24” Monitor U2414H	1PVZ152, 62VZ152
Dell OptiPlex 3050 All-In-One	19YWWK2
Smart Card Reader ACR39	RR374-010362

Table 1-21. D-Suite 5.5 Voting System Support Equipment

Component	Serial Number
Dell Monitor KM632	FYNTY12, CKX6Y12, CN-0524N3-72461-59H-6U5U
Dell Monitor P2414Hb	CN-0524N3-74261-5AH-2DNU, CN-0524N3-74261-5AH-2DAU
Dell DVD Multi Recorder GP60NB60	[DVS-Dell-001]
Dell Latitude E7450 Laptop	30GFH72, 369FH72
Dell Latitude e3480 Laptop	1VD3NJ2
Maxim iButton Programmer DS9490R# with DS1402	[DVS-Maxim-001] thru [DVS-Maxim-006]
APC Smart-UPS SMT1500	3S1536X06436, 3S1536X06475, 3S1536X06461, 3S1536X06485, 3S1536X06484, 3S1536X06322, 3S1536X07467, 3S1536X06485, 3S1536X06272, 3S1536X06201, 3S1536X07305, 3S1504X00395, 3S1504X00396, 351716X02289, W51530180004, 3S171X06059
Dell X1008 Network Switch	4R8XX42, 26SXX42
Dell X1018 Network Switch	6TN7Y42, 63SXX42
Enabling Devices Sip and Puff	[DVS-enabling devices-001] - [DVS-enabling devices-002]
Cyber Acoustics Headphones ACM-70	[DVS-cyber acoustics-001] - [DVS-cyber acoustics-005]
4-Way Joystick Controller S26	PME QC 1550 12, [DVS-JOY-001], [DVS-JOY-002]
Enablemart # 88906 Rocker (Paddle) Switch	[DVS-paddle-001]
Dell PowerConnect 2808 Network Switch	3S2P0Z1
IOGEAR SDHC/microSDHC 0U51USC410 Card Reader	8632, 8633
Lexar USB 3.0 Dual-Slot Reader	24020845007435
Hoodman Steel USB 3.0 UDMA Reader 102015	[DVS-hoodman-001]
ATI Handset	98862010101-035, 98862010103-075, 00659010100-046, 98862010100-232, 093015-1-1, 00659010100-035
ATI-USB Handset	02440010100-011, [DVS-ATIUSB-001], [DVS-ATIUSB-002], B104326-1-4-040, B104326-1-4-035
ACS PC-Linked Smart Card Reader ACR39U	RR374-006272, RR374-010356, RR374-010365
Lexar Professional CF Card Reader Workflow CFR1	24050361400108, 24050361401994, 24050361401991, 24050361401990
CORCOM Filter P/N#: 15EMC1	[DVS-CorcomEMIFilter-001]
Delta Filter P/N#: 16PDCG5C	[DVS-DeltaEMIFILTER-001]
Kingston Card Reader FCR-HS4	08738174208132

1.1.2 Description of Modification

The Dominion Democracy Suite 5.5-B Voting System is a modified voting system configuration that includes upgrades to the components of the D-Suite 5.5 Voting System. The list below includes changes between this system and the baseline of the Democracy Suite 5.5 Voting System:

GENERAL MODIFICATIONS

- Addition of ImageCast Evolution (ICE), a precinct-level, optical scan, ballot counter (tabulator) designed to perform three major functions: ballot scanning and tabulation, ballot review and second chance voting, and accessible voting and ballot marking. *Submitted version: ICE firmware version 5.5.6.1, hardware version PCOS 410A.*

- Addition of InoTec HiPro 821 Scanner as a component for the ImageCast Central Count (ICC). *Submitted version: ICC software application version 5.5.4.1, HiPro 821 Scanner hardware version 1.1.0.8.*

- Addition of Canon imageFORMULA DR-M260 Scanner as a component for the ImageCast Central Count (ICC). *Submitted version: ICC software application version 5.5.4.1, DR-M260 Scanner hardware version 1.0 SP4.*

- Addition of ImageCast Precinct 2 (ICP2) optical ballot counter. The ICP2 is a precinct-based optical scan ballot tabulator that is used in conjunction with ImageCast compatible ballot storage boxes*Submitted version: ICP2 firmware version 5.5.1.1, hardware version PCOS-330A.*

1.1.3 Initial Assessment

Testing from the previous test campaign was used to establish the baseline. The focus of this test campaign is the addition of the ImageCast Evolution (ICE) optical ballot hybrid precinct-based scanner and BMD, the InoTec HiPro 821 Scanner, the ImageCast Precinct 2 (ICP2) optical ballot scanner, and the Canon imageFORMULA DR-M260 Scanner. It was determined the following tasks would be required to verify compliance of the modifications:

- Source Code Review, Compliance Build, Trusted Build, and Build Document Review
- System Integration Testing
- Technical Documentation Package (TDP) Review
- Functional Configuration Audit (FCA)
- System Loads & Hardening
- Physical Configuration Audit (PCA)
- Security Testing

- Hardware Testing
- Usability & Accessibility Testing
- Volume & Stress Testing
- Accuracy Testing

1.1.4 Regression Test

Regression testing for this test campaign will consist of the execution of the System Integration Testing.

1.2 References

- Election Assistance Commission 2005 Voluntary Voting System Guidelines (VVSG) Version 1.0, Volume I, "Voting System Performance Guidelines", and Volume II, "National Certification Testing Guidelines"
- Election Assistance Commission Testing and Certification Program Manual, Version 2.0
- Election Assistance Commission Voting System Test Laboratory Program Manual, Version 2.0
- National Voluntary Laboratory Accreditation Program NIST Handbook 150, 2016 Edition, "NVLAP Procedures and General Requirements (NIST HB 150-2016)", dated July 2016
- National Voluntary Laboratory Accreditation Program NIST Handbook 150-22, 2008 Edition, "Voting System Testing (NIST Handbook 150-22)", dated May 2008
- United States 107th Congress Help America Vote Act (HAVA) of 2002 (Public Law 107-252), dated October 2002
- Pro V&V, Inc. Quality Assurance Manual, Revision 1.0
- Election Assistance Commission "Approval of Voting System Testing Application Package" letter dated May 6, 2016
- EAC Requests for Interpretation (RFI) (listed on www.eac.gov)
- EAC Notices of Clarification (NOC) (listed on www.eac.gov)
- Dominion Voting Systems Technical Data Package *(A listing of the D-Suite 5.5-B documents submitted for this test campaign is listed in Section 4.6 of this Test Plan)*

1.3 Terms and Abbreviations

This subsection lists terms and abbreviations relevant to the hardware, the software, or this Test Plan.

"ADA" – Americans with Disabilities Act 1990

"BMD" – Ballot Marking Device

"CM" – Configuration Management

"COTS" – Commercial Off-The-Shelf

"DRE" – Direct Record Electronic

"EAC" – United States Election Assistance Commission

"EMS" – Election Management System

"FCA" – Functional Configuration Audit

"HAVA" – Help America Vote Act

"ICC" – ImageCast Central

"ICE" – ImageCast Evolution

"ICP" – ImageCast Precinct

"ICX" – ImageCast X

"ISO" – International Organization for Standardization

"NOC" – Notice of Clarification

"PCA" – Physical Configuration Audit

"QA" – Quality Assurance

"RFI" – Request for Interpretation

"TDP" – Technical Data Package

"UPS" – Uninterruptible Power Supply

"VSTL" – Voting System Test Laboratory

"VVPAT" – Voter Verifiable Paper Audit Trail

"VVSG" – Voluntary Voting System Guidelines

1.4 Project Schedule

The Project Schedule for the test campaign is located in Appendix A. The dates on the schedule are not firm dates but planned estimates based on the anticipated project work flow.

1.5 Scope of Testing

The scope of testing focused on the addition of the ImageCast Evolution (ICE) optical ballot hybrid precinct-based scanner and BMD, the ICP2 optical ballot counter, the InoTec HiPro 821 Scanner, and the Canon imageFORMULA DR-M260 Scanner. To evaluate the D-Suite 5.5-B test requirements, the submitted modifications were evaluated against each section of the EAC 2005 VVSG to determine the applicable tests to be performed.

Based on this assessment, it was determined that multiple areas within the EAC 2005 VVSG would be evaluated to encompass the required tests. A breakdown of the areas and associated tests is listed below:

- EAC 2005 VVSG Volume 1, Section 2: Functional Requirements
  - System Integration Testing
  - Functional Configuration Audit (FCA)
  - Physical Configuration Audit (PCA), including System Loads & Hardening
  - Technical Documentation Package (TDP) Review
  - Volume & Stress Testing
  - Accuracy Testing
- EAC 2005 VVSG Volume 1, Section 3: Usability & Accessibility
  - Usability & Accessibility Testing
  - Technical Documentation Package (TDP) Review
- EAC 2005 VVSG Volume 1, Section 4: Hardware Requirements
  - Hardware Testing
  - Technical Documentation Package (TDP) Review
- EAC 2005 VVSG Volume 1, Section 5: Software Requirements
  - Source Code Review, Compliance Build, Trusted Build, and Build Document Review
  - Technical Documentation Package (TDP) Review
  - Functional Configuration Audit (FCA)
- EAC 2005 VVSG Volume 1, Section 7: Security Requirements
  - Security Testing

- Technical Documentation Package (TDP) Review
- Functional Configuration Audit (FCA)

1.5.1 Block Diagram

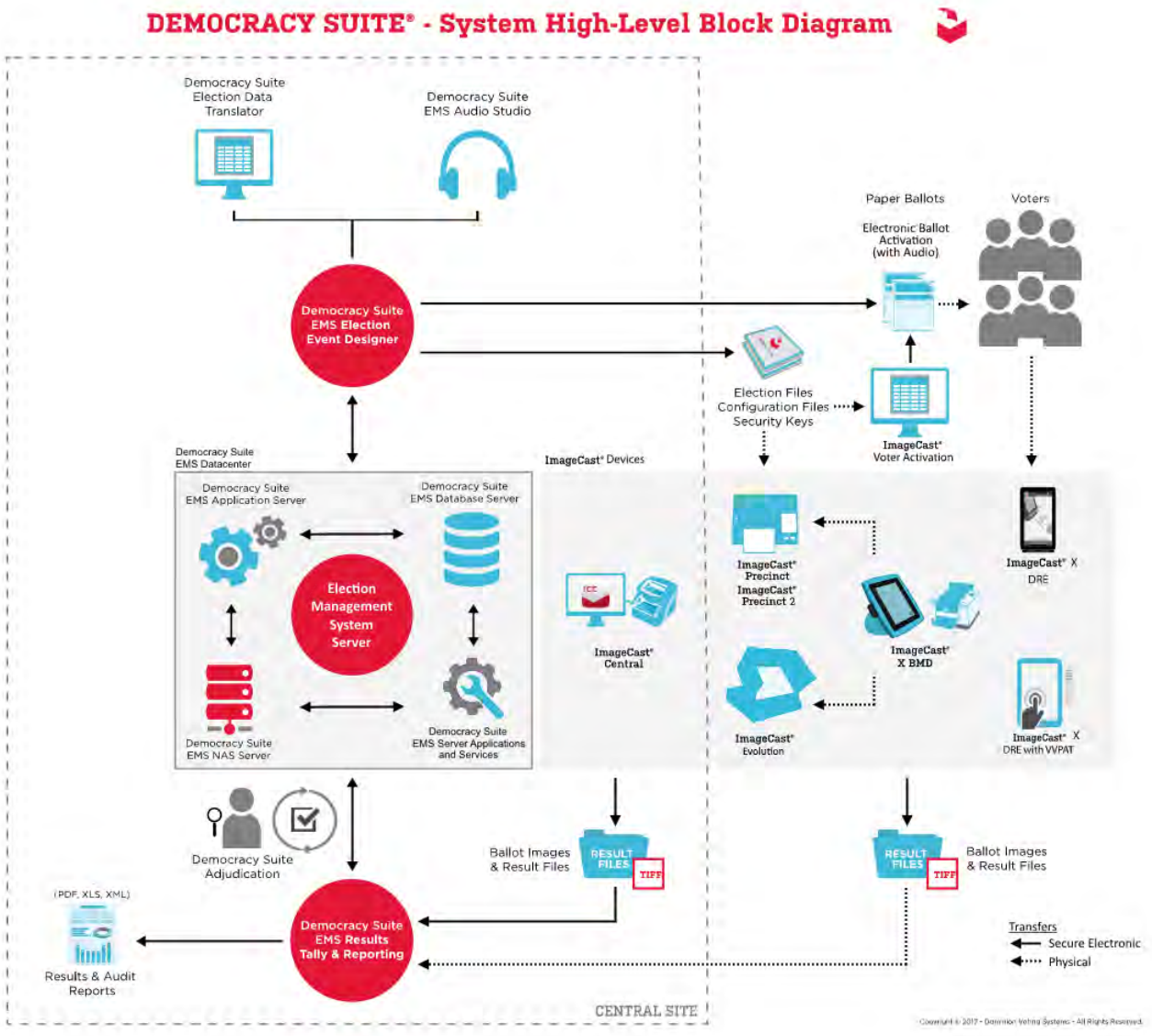


Figure 1-1. D-Suite 5.5-B System Overview

1.5.2 System Limits

The system limits that Dominion Voting Systems has stated to be supported by the D-Suite 5.5-B are provided in the table below.

Table 1-22. D-Suite 5.5-B System Limits by Configuration

Characteristic	Configuration Values		Limiting Component
	Standard	Express	
Landscape Ballot Orientation			
Ballot positions	292	292	*22-inch Landscape Ballot (240 candidates + 24 write-ins + 28 Yes/No choices)
Precincts in an election	1000	250	Memory
Contests in an election	1000	250	Memory
Candidates/Counters in an election	10000	2500	Memory
Candidates/Counters in a precinct	240	240	*22-inch Ballot
Candidates/Counters in a tabulator	10000	2500	Memory
Ballot Styles in an election	3000	750	Memory
Contests in a ballot style	38	38	*22-inch Landscape Ballot (24 candidacy contests + 14 Propositions)
Candidates in a contest	240	240	*22-inch Ballot
Ballot styles in a precinct	5	5	Memory
Number of political parties	30	30	Memory
“Vote for” in a contest	24	24	*22-inch Landscape Ballot
Supported languages in an election	5	5	Memory
Number of write-ins	24	24	*22-inch Landscape Ballot
Portrait Ballot Orientation			
Ballot positions	462	462	*22-inch Portrait Ballot
Precincts in an election	1000	250	Memory
Contests in an election	1000	250	Memory
Candidates/Counters in an election	10000	2500	Memory
Candidates/Counters in a precinct	462	462	*22-inch Portrait Ballot
Candidates/Counters in a tabulator	10000	2500	Memory
Ballot Styles in an election	3000	750	Memory
Contests in a ballot style	156	156	*22-inch Portrait Ballot

Table 1-22. D-Suite 5.5-B System Limits by Configuration *(continued)*

Characteristic	Configuration Values		Limiting Component
	Standard	Express	
Candidates in a contest	231	231	*22-inch Portrait Ballot (Column Span 3)
Ballot styles in a precinct	5	5	Memory
Number of political parties	30	30	No Limitation
"Vote for" in a contest	30	30	No Limitation
Supported languages in an election	5	5	Memory
Number of write-ins	462	462	*22-inch Portrait Ballot

***The 22-inch Ballot length applies only to hand-marked paper ballots.**

1.5.3 Supported Languages

The following languages are supported by the D-Suite 5.5-B System:

Table 1-23. D-Suite 5.5-B Supported Languages

Language	ICE	ICP	ICX
Alaska Native	Yes, if using Latin alphabet	Yes	No
Apache	Audio only	Audio only	No
Bengali	Yes	Yes	Yes
Chinese	Yes	Yes	Yes
English	Yes	Yes	Yes
Eskimo	Yes, if using Latin alphabet	Yes	No
Filipino	Yes, if using Latin alphabet	Yes	No
French	Yes	Yes	Yes
Hindi	Yes	Audio only	Yes
Japanese	Yes	Yes	Yes
Jicarilla	Audio only	Audio only	No
Keres	Audio only	Audio only	No
Khmer	Yes	Audio only	No
Korean	Yes	Yes	Yes
Navajo	Audio only	Audio only	No
Seminole	Audio only	Audio only	No
Spanish	Yes	Yes	Yes
Tagalog	No	No	Yes
Thai	Yes	Audio only	Yes
Towa	Audio only	Audio only	No
Ute	Audio only	Audio only	No
Vietnamese	Yes	Yes	Yes
Yuman	Audio only	Audio only	No

Support for all stated languages will be verified; however, only English and Spanish language ballots will be cast during the performance of functional testing. Additionally, one character based language (Chinese) will be tested during System Integration Testing.

For the character based language, the ballot will be created by Pro V&V and voted utilizing both paper ballots and ADA voting devices along with all applicable peripherals. The Chinese Language for the ballot will be created using a readily available online translation tool. The translated language text will be entered into the Election Event Designer Application. A ballot preview will be generated in the EED application. The Chinese characters displayed in the ballot preview will be compared to the characters generated by the online translation tool, to ensure that the characters match. The ballots will then be generated and printed, and the election loaded onto the tabulators and the BMD units. The Chinese characters displayed on both the printed ballots and displayed on the BMD units will be compared to the original Chinese Characters generated by the online translation tool to verify that the characters match.

1.5.4 Supported Functionality

The D-Suite 5.5-B is designed to support the following voting variations:

- General Election
- Closed Primary
- Open Primary
- Early Voting
- Partisan/Non-Partisan Offices
- Write-In Voting
- Primary Presidential Delegation Nominations
- Split Precincts
- Vote for N of M
- Ballot Rotation
- Provisional or Challenged Ballots

1.5.5 VVSG

The D-Suite 5.5-B Voting System shall be evaluated against the relevant requirements contained in the EAC 2005 VVSG, Version 1.0.

1.5.6 RFIs

There are no RFIs released by the EAC as of the date of this Test Plan that pertain to this test campaign that were not in effect at the time of the baseline system certification.

1.5.7 NOCs

There are no NOCs released by the EAC as of the date of this Test Plan that pertain to this test campaign that were not in effect at the time of the baseline system certification.

2.0 PRE-CERTIFICATION TESTING AND ISSUES

This section describes previous testing performed prior to submitting the voting system to the EAC.

2.1 Evaluation of Prior VSTL Testing

Pro V&V evaluated to the published Final Test Report for the D-Suite 5.5 System in order to baseline the current system under test. It was determined that Accuracy and Hardware Testing for the following components would be re-used to satisfy requirements for this test campaign: ICX BMD, ICX DRE, ICP, and ICX DRE w/VVPAT.

2.2 Evaluation of Prior Non-VSTL Testing

No prior non-VSTL testing of the D-Suite 5.5 modifications were considered for this test campaign.

2.3 Known Field Issues

D-Suite 5.5-B is a modification to a previously certified system and has not been fielded.

3.0 MATERIALS REQUIRED FOR TESTING

The following sections list all materials needed to enable the test engagement to occur.

The materials required for testing of the D-Suite 5.5-B System include all materials to enable the test campaign to occur. This includes the applicable hardware and software as well as the TDP, test support materials, and deliverable materials, as described in the following subsections.

3.1 Software

This subsection lists the proprietary and COTS software to be provided by the manufacturer as part of the test campaign.

In addition to the baseline system software identified in Section 1.1.1 of this Test Plan, the following software is required for test performance: ICC Software application version 5.5.4.1, which has been updated from the baseline version, and ICE firmware version 5.5.6.1.

Pro V&V will perform a comparison on the submitted source code against the previously certified versions. Regression testing will be performed to verify successful implementation of changes.

3.2 Equipment

This subsection lists the proprietary and COTS equipment to be provided by the manufacturer as part of the test campaign.

For COTS equipment, every effort will be made to verify that the COTS equipment has not been modified for use. This will be accomplished by performing research using the COTS equipment manufacturer's websites based on the serial numbers and service tag numbers for each piece of equipment. Assigned test personnel will evaluate COTS hardware, system software and communications components for proven performance in commercial applications other than voting. For PCs, laptops, and servers, the service tag information will be compared to the system information found on each machine. Physical external and internal examination will also be performed when the equipment is easily accessible without the possibility of damage. Hard drives, RAM memory, and other components will be examined to verify that the components match the information found on the COTS equipment manufacturer's websites.

All hardware required for testing is identified in Section 1.1 of this test plan.

3.3 Test Materials

This subsection lists the test materials required to execute the required tests throughout the test campaign.

Table 3-1. Required Test Materials

Material	Description(s)
Tamper Proof Security Seals	Adhesive tamper proof security seal, Novavision Part# XSG21-08RESN
Printer Cartridges	HP LaserJet CF226X
Smart Cards	Programmable Smart Cards
ImageCast Precinct Cleaning Sheets	Cleaning Sheets for ImageCast Precinct tabulator Part# CSHT-100B
Stereo Breakout Cable	3.5mm stereo male plug to dual 3.5mm mono female plugs
3.5mm Stereo Cable	3.5mm stereo male plug to 3.5mm stereo female plug
Compact Flash Cards	SanDisk Ultra 4Gb and Centon 16GB Compact Flash Cards
iButton Security Tokens	iButton Security Token with lanyards
Permanent Markers	Fine Tip Sharpie Permanent Markers
Ethernet Cables	Cat5e Ethernet Cables
ICE Paper Rolls	Replacement Thermal Paper Rolls for the ImageCast Evolution tabulator
ICP Paper Rolls	Replacement Thermal Paper Rolls for the ImageCast Precinct tabulator
Sip & Puff Disposable Straws	Disposable straws for use with the Sip & Puff input device
Ballot Stock	Ballot Paper Stock for printing ballots

Table 3-1. Required Test Materials *(continued)*

Material	Description(s)
A/C Power Cables	3-Prong A/C Power Cables
USB Thumb drives	4 GB, 8 GB, and 16 GB USB Thumb drives

3.4 Proprietary Data

All data and documentation considered by the manufacturer to be proprietary will be identified and documented in an independent submission along with a Notice of Protected Information.

4.0 TEST SPECIFICATIONS

Certification testing of the Dominion D-Suite 5.5-B Voting System submitted for evaluation will be performed to ensure the applicable requirements of the EAC 2005 VVSG and the EAC Testing and Certification Program Manual, Version 2.0 are met. Additionally, all EAC Request for Interpretations (RFI) and Notices of Clarification (NOC) relevant to the system under test will be incorporated in the test campaign. A complete listing of the EAC RFIs and NOCs is available on the EAC website.

4.1 Requirements (Strategy of Evaluation)

To evaluate the D-Suite 5.5-B test requirements, the submitted modifications were evaluated against each section of the EAC 2005 VVSG to determine the applicable tests to be performed. Based on this assessment, it was determined the following evaluations would be required to verify compliance of the modifications:

Technical Documentation Package (TDP) Review

A TDP Review will be performed to ensure that all submitted modifications are accurately documented and that the documents meet the requirements of the EAC 2005 VVSG. The preliminary TDP is performed to gather information concerning the system under test and its capabilities or design intentions. Additionally, a TDP review will be performed throughout the test campaign. The TDP Review includes the Initial Review, the Regulatory/Compliance Review, and the Final Review. This review is conducted to determine if the submitted technical documentation meets the regulatory, customer-stated, or end-user requirements and includes reviewing the documents for stated functionality review and verification.

Section 2: Functional Requirements

The requirements in this section shall be tested during the FCA and System Integration Test. This evaluation will utilize baseline test cases as well as specifically designed test cases and will include predefined election definitions for the input data.

The FCA targets the specific functionality claimed by the manufacturer to ensure the product functions as documented. This testing uses both positive and negative test data to test the robustness of the system. The FCA encompasses an examination of manufacturer tests, and the

conduct of additional tests, to verify that the system hardware and software perform all the functions described in the manufacturer's documentation submitted in the TDP (such as system operations, voter manual, maintenance, and diagnostic testing manuals). It includes a test of system operations in the sequence in which they would normally be performed. These system operations and functional capabilities are categorized as follows by the phase of election activity in which they are required:

- Overall System Capabilities: These functional capabilities apply throughout the election process. They include security, accuracy, integrity, system audit ability, election management system, vote tabulation, ballot counters, telecommunications, and data retention.

- Pre-voting Capabilities: These functional capabilities are used to prepare the voting system for voting. They include ballot preparation, the preparation of election-specific software (including firmware), the production of ballots, the installation of ballots and ballot counting software (including firmware), and system and equipment tests.

- Voting System Capabilities: These functional capabilities include all operations conducted at the polling place by voters and officials including the generation of status messages.

- Post-voting Capabilities: These functional capabilities apply after all votes have been cast. They include closing the polling place; obtaining reports by voting machine, polling place, and precinct; obtaining consolidated reports; and obtaining reports of audit trails.

- Maintenance, Transportation and Storage Capabilities: These capabilities are necessary to maintain, transport, and store voting system equipment.

The system integration testing addresses the integration of the hardware and software. This testing focuses on the compatibility of the voting system software components and subsystems with one another and with other components of the voting system. During test performance, the system is configured as would be for normal field use.

Section 3: Usability and Accessibility Requirements

The requirements in this section shall be tested during the Usability and Accessibility Testing. This evaluation will utilize baseline test cases as well as specifically designed test cases and will include predefined election definitions for the input data.

The usability testing focuses on the usability of the system being tested. Usability is defined generally as a measure of the effectiveness, efficiency, and satisfaction achieved by a specified set of users with a given product in the performance of specified tasks. In the context of voting, the primary user is the voter, the product is the voting system, and the task is the correct recording of the voter ballot selections. Additional requirements for task performance are independence and privacy: the voter should normally be able to complete the voting task without assistance from others, and the voter selections should be private. Accessibility evaluates the requirements for accessibility. These requirements are intended to address HAVA 301 (a) (3) (B).

Section 4: Hardware Requirements

The hardware tests specified in the VVSG are divided into two categories: non-operating and operating. The non-operating tests apply to the elements of the system that are intended for use at poll site locations and are intended to simulate the storage and transport of equipment between the storage facility and the polling location. The Operating tests apply to the entire system, including hardware components that are used as part of the voting system telecommunications capability, and are intended to simulate conditions that the voting system may encounter during operation. Prior to and immediately following each required non-operating and operating test, the system shall be subjected to an operational status check.

The requirements in this section shall be tested and/or evaluated by personnel verified by Pro V&V to be qualified to perform the testing.

Section 5: Software Requirements

The requirements in this section shall be tested utilizing a combination of review and functional testing during the source code review, TDP review, and FCA. Trusted builds from previously certified versions will be used as the baseline for testing. The ICE and ICP2 components will be subjected to the full suite of testing.

To perform the source code review, Pro V&V will review the submitted source code to the EAC 2005 VVSG and the manufacturer-submitted coding standards. Prior to initiating the software review, Pro V&V shall verify that the submitted documentation is sufficient to enable: (1) a review of the source code and (2) Pro V&V to design and conduct tests at every level of the software structure to verify that design specifications and performance guidelines are met. The source code review includes a compliance build and a trusted build of the submitted source code.

Section 7: Security Requirements

The requirements in this section shall be tested during the source code review, security tests, and FCA.

To evaluate the integrity of the system, Pro V&V will develop specifically designed test cases in an attempt to defeat the access controls and security measures documented in the system TDP as well verifying compliance to EAC RFI 2012-05. A threat matrix will be created to determine the risks and vulnerabilities. An evaluation of the system will be accomplished by utilizing a combination of functional testing, source code review, and static code analyzers.

During the security testing, the system shall be inspected for various controls and measures that are in place to meet the objectives of the security standards which include: protection of the critical elements of the voting system; establishing and maintaining controls to minimize errors; protection from intentional manipulation, fraud and malicious mischief; identifying fraudulent or erroneous changes to the voting system; and protecting the secrecy in the voting process.

4.1.1 Rationale for 'Not Applicable' Requirements

[NOTE: This table contains ALL false statements per the State of Wisconsin testing (and common knowledge) delineating threat protection, off-the-shelf COTS wired and wireless functions, telcom modems & ethernet connections for wired and wireless FTP, SMTP and NET connections and telecom providers for Dominion machines in their reliance on Internet Information Services (IIS)

No vulnerability tests are performed on the Microsoft Internet Information Services (IIS) server software used.]

All requirements that were excluded from the previous test campaign (D-Suite 5.5) were also deemed not applicable to this test campaign due to the submitted modifications not impacting the specific requirements. These requirements are identified below:

- Volume I, Section 6.2.6 (Telecommunications Requirements: Integrity)
- Volume I, Section 7.5.2-7.5.4 (Security: Protection Against External Threats, Monitoring and Responding to External Threats, and Shared Operating Environment)
- Volume I, Section 7.6 (Use of Public Communications Networks)
- Volume I, Section 7.7 (Wireless Communications)

The rationale for not evaluating the D-Suite 5.5-B to the indicated sections is described in following table. Specific requirements that are excluded from this test campaign are identified in the EAC spreadsheet.

Table 4-1. Not Applicable Requirements

EAC 2005 VVSG Version 1 Volume I, Section	Rationale for 'Not Applicable'
6.2.6	These requirements are written for use of public networks. The D-Suite 5.5-B does not utilize public networks.
7.5.2-7.5.4	These requirements are written for use of public networks. The D-Suite 5.5-B does not utilize public networks.
7.6	D-Suite 5.5-B does not support transmission over public networks.
7.7	No wireless technology is utilized in this system.

4.2 Hardware Configuration and Design

The hardware configuration and design for the modification has changed from the baseline system. The ImageCast Evolution (ICE) has been added to the system configuration. Also, the InoTec HiPro 821 Scanner and the Canon imageFORMULA DR-M260 Scanner are newly introduced COTS document scanners for use with the ICC. Additionally, the ICP2 has been added to this configuration.

4.3 Software System Functions

The software system functions for the previously certified voting system (D-Suite 5.5) remain unchanged for the submitted modifications. An update to the ICC was presented for evaluation, along with the ICE and ICPs firmware applications, which are new to this configuration.

4.4 Test Case Design

Test cases are designed based on the manufacturer's design specifications and the relevant technical requirements set forth by the VVSG. Test cases shall be based on the following aspects of the voting system:

- Hardware qualitative examination design
- Hardware environmental test case design
- Software module test case design and data
- Software functional test case design
- System level test case design

Test cases shall provide information regarding the sequence of actions to be performed for the execution of a test, the requirements being met, the test objective, test configuration, equipment needed, special requirements, assumptions, and pass/fail criteria. Once the test cases are finalized, they will be validated and published for use in the test campaign. The validation of the test case will be accomplished by technical review and approval. This validation will include the following: confirmation of adequate test coverage of all requirements; confirmation that test case results are not ambiguous and gave objective pass/fail criteria; and confirmation that any automated test suites will produce valid results.

4.4.1 Hardware Qualitative Design

Previous hardware examinations were performed on the certified baseline system (D-Suite 5.5). The ICX BMD, ICX DRE, ICP, ICP2, and the ICX DRE with VVPAT hardware testing will be re-used from the previous certification test campaign (D-Suite 5.5-B). The full suite of hardware and electrical testing (as listed below) will be performed on the ICE and ICP2components of the D-Suite 5.5-B System. The Canon M260 and InoTec HiPro Scanner components will be subjected to Temperature-Power Variation Testing only.

Electrical Tests:

- Electrical Power Disturbance
- Electromagnetic Radiation
- Electrostatic Disruption
- Electromagnetic Susceptibility
- Electrical Fast Transient
- Lightning Surge
- Conducted RF Immunity
- Magnetic Fields Immunity
- Electrical Supply

Environmental Tests:

- Bench Handling

- Vibration
- Low Temperature
- High Temperature
- Humidity
- Temperature Power Variation
- Acoustic

4.4.2 Hardware Environmental Test Case Design

The voting system hardware shall be subjected to the tests specified in Section 4.4.1. Testing will be performed by personnel verified by Pro V&V to be qualified to perform the test. Pro V&V will utilize third-party test facilities for performance of the electrical and environmental tests. Environmental and Electrical will be performed at the NTS Longmont facility located in Longmont, Colorado. All pre and post operational status checks shall be conducted by Pro V&V personnel.

4.4.3 Software Module Test Case Design and Data

Pro V&V shall review the manufacturer's program analysis, documentation, and module test case design and shall evaluate the test cases for each module with respect to flow control parameters and entry/exit data. As needed, Pro V&V shall design additional test cases to satisfy the coverage criteria specified in Volume II, Section 7.2.1.

Component Level Testing will be implemented during the FCA for each component and subcomponent. During the Source Code Review, Compliance Builds, and Security Testing, Pro V&V will utilize limited structural-based techniques (white-box testing). Additionally, specification-based techniques (black-box testing) will be utilized for the individual software components.

Pro V&V shall define the expected result for each test and the ACCEPT/REJECT criteria for certification. If the system performs as expected, the results will be accepted.

If the system does not perform as expected, an analysis will be performed to determine the cause. The test will be repeated in an attempt to reproduce the results. If the failure can be reproduced and the expected results are not met, the system will have failed the test. If the results cannot be reproduced, the test will continue. All errors encountered will be documented and tracked through resolution.

4.4.4 Software Functional Test Case Design and Data

Pro V&V shall review the manufacturer-submitted test plans and data to verify that the individual performance requirements specified in the EAC 2005 VVSG and the TDP are reflected in the software. As part of this process, Pro V&V shall review the manufacturer's test case design and prepare a detailed matrix of system functions and the test cases that exercise them. Pro V&V shall also prepare a test procedure describing all test ballots, operator procedures, and the data content

of output reports. Pro V&V shall define abnormal input data and operator actions and then design test cases to verify that the system is able to handle and recover from these abnormal conditions. During this review, emphasis shall be placed on those functions where the manufacturer data on module development, such as the system release notes and comments within the source code, reflects significant debugging problems, and on functional tests that resulted in high error rates.

Pro V&V shall define the expected result for each test and the ACCEPT/REJECT criteria for certification. If the system performs as expected, the results will be accepted.

If the system does not perform as expected, an analysis will be performed to determine the cause. The test will be repeated in an attempt to reproduce the results. If the failure can be reproduced and the expected results are not met, the system will have failed the test. If the results cannot be reproduced, the test will continue. All errors encountered will be documented and tracked through resolution.

4.4.5 System-Level Test Case Design

System Level testing will be implemented to evaluate the complete system. This testing will include all proprietary components and COTS components (software, hardware, and peripherals) in a configuration of the system's intended use. For software system tests, the tests shall be designed according to the stated design objective without consideration of its functional specification. The system level hardware and software test cases shall be prepared independently to assess the response of the hardware and software to a range of conditions.

4.5 Security Functions

The objective of the Security Testing is to evaluate the effectiveness of the voting system in detecting, preventing, recording, reporting, and recovering from security threats. To evaluate the integrity of the system, Pro V&V shall develop specifically designed test cases in an attempt to defeat the access controls and security measures documented in the system TDP. The submitted threat matrix identifying the system's risks and vulnerabilities shall be evaluated for completeness and to determine that mitigating controls are adequately implemented.

An evaluation of the system shall be accomplished by utilizing a combination of functional testing and source code review. All findings will be reported to the EAC and DVS. The test methods for performing the Security Testing are execution and review. Prior to performance of Security testing, the examiner will verify that security hardening scripts have been properly applied to system components per the system documentation. The examiner will review the submitted TDP to verify that documented access and physical controls are in place. Following the documented procedures, the examiner will configure the voting system for use and functionality to verify that the documented controls are in place and adequate and meet the stated requirements.

Physical Security will be tested by setting up the system as described in the TDP and then examining the effectiveness and comprehensiveness of physical security measures. Administrative Security will be tested by examining the system's documented security instructions and procedures for effectiveness and breadth. Logical security will be tested as part

of FCA testing by a recognized security expert who not only will review the physical and administrative testing outcomes, but will perform the following tests on system components: Vulnerability Scans, SCAP Scans, and Physical Bypass Attempts. Logical security testing will assess the effectiveness of the security hardening scripts applied during the system setup and install process.

4.6 TDP Evaluation

In order to determine compliance of the modified TDP documents with the EAC 2005 VVSG, a limited TDP review shall be conducted. This review will focus on TDP documents that have been modified since the certification of the baseline system. The review will consist of a compliance review to determine if each regulatory, state, or manufacturer-stated requirement has been met based on the context of each requirement. Results of the review of each document will be entered on the TDP Review Checklist and reported to the manufacturer for disposition of any anomalies. This process will be ongoing until all anomalies are resolved.

Any revised documents during the TDP review process will be compared with the previous document revision to determine changes made, and the document will be re-reviewed to determine whether subject requirements have been met. A listing of all documents contained in the D-Suite 5.5-B TDP is provided in Table 4-2.

Table 4-2. TDP Documents

Document Number	Description	Version
Adjudication Documents		
2.05	Democracy Suite Adjudication Software Design and Specification	5.5-B::122
2.08	Democracy Suite Adjudication System Operation Procedures	5.5-B::170
2.09	Democracy Suite Adjudication System Maintenance Manual	5.5-B::102
D-Suite Documents		
2.02	Democracy Suite System Overview	5.5-B::172
2.06	Democracy Suite System Security Specification	5.5-B::574
2.07	Democracy Suite System Test and Verification	5.5-B::196
2.10	Democracy Suite Personnel Deployment and Training Requirements	5.5-B::132
2.11	Democracy Suite Configuration Management Process	5.5-B::396
2.12	Democracy Suite Quality Assurance Program	5.5-B::160
2.13	Democracy Suite System Change Notes	5.5-B::173
EMS Documents		
2.03	Democracy Suite EMS Functional Description	5.5-B::383
2.05	Democracy Suite EMS Software Design and Specification	5.5-B::329
2.08	Democracy Suite EMS System Operations Procedures	5.5-B::727

Table 4-2. TDP Documents *(continued)*

Document Number	Description	Version
2.09	Democracy Suite EMS System Maintenance Manual	5.5-B::148
---	Democracy Suite EMS System Installation and Configuration Procedure	5.5-B::349
ImageCast Central Documents		
2.03	Democracy Suite ImageCast Central Functionality Description	5.5-B::191
2.05	Democracy Suite ImageCast Central Software Design and Specification	5.5-B::125
2.08	Democracy Suite ImageCast Central System Operation Procedures	5.5-B::213
---	Democracy Suite ImageCast Central Installation and Configuration Procedure	5.5-B::203
ImageCast Evolution Documents		
2.03	Democracy Suite ImageCast Evolution Functionality Description	5.5-B::120
2.04	Democracy Suite ImageCast Evolution System Hardware Specifications	5.5-B::332
2.05	Democracy Suite ImageCast Evolution Software Design and Specifications	5.5-B::175
2.08	Democracy Suite ImageCast Evolution System Operation Procedures	5.5-B::241
2.09	Democracy Suite ImageCast Evolution System Maintenance Manual	5.5-B::165
ImageCast Precinct Documents		
2.03	Democracy Suite ImageCast Precinct Functionality Description	5.5-B::182
2.04	Democracy Suite ImageCast Precinct System Hardware Specification	5.5-B::153
2.04.1	Democracy suite ImageCast Precinct System Hardware Characteristics	5.5-B::98
2.05	Democracy Suite ImageCast Precinct Software Design and Specification	5.5-B::155
2.08	Democracy Suite ImageCast Precinct System Operation Procedures	5.5-B::277
2.09	Democracy Suite ImageCast Precinct System Maintenance Manual	5.5-B::125
ImageCast Precinct2 Documents		
2.03	Democracy Suite ImageCast Precinct 2 Functionality Description	5.5-B::10
2.04	Democracy Suite ImageCast Precinct 2 System Hardware Specifications	5.5-B-11
2.05	Democracy Suite Imagecast Precinct 2 Software Design and Specifications	5.5-B::16
2.08	Democracy Suite Imagecast Precinct 2 System Operation Procedures	5.5-B::10
2.09	Democracy Suite Imagecast Precinct 2 System Maintenance Manual	5.5-B::9
ImageCast X Documents		

Table 4-2. TDP Documents *(continued)*

Document Number	Description	Version
2.03	Democracy Suite ImageCast X Functionality Description	5.5-B::97
2.05	Democracy Suite ImageCast X Software Design and Specification	5.5-B::98
2.08	Democracy Suite ImageCast X System Operation Procedures	5.5-B::85
---	Democracy Suite ImageCast X System Installation and Configuration	5.5-B::87
2.09	Democracy Suite ImageCast X System Maintenance Manual	5.5-B::76
User Guides		
---	Democracy Suite ImageCast Adjudication User Guide	5.5-B::141
---	Democracy Suite Election Data Translator User Guide	5.5-B::89
---	Democracy Suite EMS Audio Studio User Guide	5.5-B::38
---	Democracy Suite EMS Election Event Designer User Guide	5.5-B::339
---	Democracy Suite EMS Results Tally and Reporting User Guide	5.5-B::145
---	Democracy Suite ImageCast Central User Guide	5.5-B::137
---	Democracy Suite ImageCast Precinct User Guide	5.5-B::56
---	Democracy Suite ImageCast Voter Activation User Guide	5.5-B::53
---	Democracy Suite ImageCast X User Guide	5.5-B::252
---	Democracy Suite ImageCast Precinct 2 User Guide	5.5-B::6
---	Canon imageFORMULA DR-M160II User Manual	---
---	Canon imageFORMULA DR-M260 User Manual	---
---	Canon imageFORMULA DR-G1130 DR-G1100 User Manual	---
---	HiPro User Manual	1.2
Supplementary Documents		
----	Common Industry Format for Usability Test Report ImageCast X 5.2 with VVPAT	5.5::1
---	Dell Latitude E7450 Owner's Manual	Rev. A00
---	SID-15V-Z37-A1R User Manual	Rev. 1.0
---	SID-21V-Z37-A1R User Manual	Rev. 1.0
---	Cyber Acoustics ACM-70B Stereo Headphones Product Sheet	---
---	Democracy Suite ImageCast C++ Coding Standard	5.5-B::59
---	Democracy Suite C# Automated Code Review Process	5.5-B::54
---	Dell Latitude E7450/Latitude 7450 Regulatory Compliance Sheet	Rev. A09
---	Dell OptiPlex 9020 AIO Regulatory Compliance Sheet	Rev. A09

Table 4-2. TDP Documents *(continued)*

Document Number	Description	Version
---	Dell OptiPlex 9030 AIO Regulatory Compliance Sheet	Rev. A09
---	Dell Networking X-Series Specification Sheet	Ver. 1.9
---	Dell OptiPlex 9020 All-in-One Technical Specification Sheet	---
---	Dell OptiPlex 9030 All-in-One Technical Specification Sheet	---
---	Dell OptiPlex 3050 All-in-One Technical Specification Sheet	---
---	Google Java Style Dominion XML	---
---	Dominion Voting Systems Java Coding Standards	1.0
---	Dominion Voting Systems JavaScript Coding Standards	1.0
---	ICX Machine Configuration File (MCF) Parameters Settings	5.5-B::31
---	Democracy Suite ImageCast Device Configuration Files	5.5-B::105
---	Democracy Suite ImageCast Printing and Finishing Specification	5.5-B::99
---	Democracy Suite ImageCast Total Results File Format	5.5-B::62
---	Democracy Suite ImageCast Election Definition Files	5.5-B::88
---	Democracy Suite ImageCast Precinct Extracting Firmware Contents	5.5-B::41
---	Democracy Suite ImageCast Precinct Firmware Update Procedure	5.5-B::68
---	Democracy Suite ImageCast Precinct Level One (L1) Maintenance Manual	5.5-B::67
---	Democracy Suite ImageCast Precinct Technical Guide	5.5-B::57
---	Usability Test Report of ImageCast Precinct 5.0 with 36 Participants for VVSG 1.0	5.0::10
---	Usability Test Report of ImageCast X 5.0 with 36 Participants for VVSG 1.0	5.0::13
---	YEDU.E95462 Uninterruptible Power-supply Equipment Sheet	---
---	Dell Latitude E7440 Regulatory Compliance Sheet	Rev. A09
---	Dell Latitude 3480 Regulatory Compliance Sheet	Rev. A11
---	Dell PowerEdge R630 Regulatory Compliance Sheet	Rev. A10
---	Dell Precision T1700 MT Regulatory Compliance Sheet	Rev. A09
---	Dell PowerConnect 2808 Product Safety. EMC, and Environmental Datasheet	---
---	Dell PowerConnect 2816 Product Safety. EMC, and Environmental Datasheet	---
---	Smart Pro SM1500 Datasheet	---
---	APC Smart-UPS 230V Product Information Sheet	---
---	HP M402dn Datasheet	Rev. 2

Table 4-2. TDP Documents *(continued)*

Document Number	Description	Version
---	HP M402dne Datasheet	May 2017
---	Dell Latitude 3480 Owner's Manual	Rev. A00
---	Dell Latitude 3470 Owner's Manual	Rev. A00
---	Dell Precision T3420 Owner's Manual	Rev. A00
---	aValue HID-21V-BTX-A1R User Manual	Rev. 2.0
---	aValue SID-15V-Z37-A1R Data Sheet	---
---	aValue SID-21V-Z37-A1R Data Sheet	---
---	APC Installation and Operation Back-UPS Pro BR1000G	10/2014
---	APC Smart-UPS SMT1500 Operation Manual	03/2013
---	Dell OptiPlex 7440 All-In-One Owner's Manual	Rev. A01
---	Dell OptiPlex 3050 All-In-One Owner's Manual	Rev. A01
---	Dell P2417H Monitor User's Guide	Rev. A01
---	Dell PowerEdge R630 Owner Manual	Rev. A03
---	Lexar Pro USB 3 Dual Slot Reader	---
---	Usability Study of Dominion Voting Systems ImageCast Evolution Versions 4.1.1.1 and 4.6.1.1	1.0.0::37
---	Democracy Suite ImageCast Evolution Firmware Installation Procedure	5.5-B::96
---	Democracy Suite ImageCast Evolution Level One (L1) Maintenance Manual	5.5-B::134
---	Democracy Suite ImageCast Evolution Machine Behavior Settings	5.5-B::96
---	Seiko SII RP-D10 Series User's Guide	Jan. 2018
---	Dell EMC PowerEdge R640 Installation and Service Manual	Rev. A01
---	Dell OptiPlex 7060 Small Form Factor Service Manual	Rev. A00
---	Dell Latitude E7470 Owner's Manual	Rev. A02
---	APC Operation Manual Smart-UPS 750/1000/1500/2200/3000 VA	---
---	ACR38x CCID Smart Card Reader Reference Manual	V6.05
---	ACR39 Series PC-linked Smart Card Readers Reference Manual	V1.04
---	Ablenet Single Switch Quickstart Guide	---
---	The Programing Group High-Integrity C++Coding Standard Manual	Ver. 2.2
---	HIC++ Standards Model for C++	9.5.4
---	Dominion Voting Voter-verified paper audit trail (VVPAT) Model: VRP3 User Manual Safety Precautions	07 2018

Table 4-2. TDP Documents *(continued)*

Document Number	Description	Version
---	Democracy Suite ImageCast Precinct 2 Machine Behavior Settings	5.5-B::10
---	APC Smart-UPS 1500 Specification Sheet	---
---	Democracy Suite ImageCast Precinct 2 Extracting Firmware Contents and Verifying SHA256 Values	5.5-B::13
---	Democracy Suite ImageCast Precinct 2 Level One (L1) Maintenance Manual	5.5-B::9
---	APC Back-UPS BE600M1 User Manual	09/2015
---	APC Back-UPS SMT1500C Operation Manual	01/2017
---	Avalue HID-21V-BTX FactSheet (---)	---
---	Avalue SID 21V Quick Reference	Feb 2018
---	Dell Latitude 3490 Owners Manual	Rev. A01
---	Dell OptiPlex 3050 AIO EMC Emissions Compliance Sheet	Rev. A11
---	Dell Latitude 3400 Setup and Specification Guide	Rev. A00
---	Dell PowerEdge R640 Technical Guide	Rev. A00
---	Dell Networking X Series User Guide	Rev. A06
---	Dell P2419H Monitor User's Guide	Rev. A05
---	DisplayLink DL 125 Product Brief	---
---	HIC Coding Standard	2.2
---	Kingston USB 3.0 High-Speed Media Reader Datasheet	---
---	Lenovo ThinkCentre TIO24Gen3Touch Monitor User Guide	May 2017
---	Dell Optiplex 7050 Tower Owners Manual (A01)	Rev. A01
---	Dell Optiplex 7060 Small Form Factor Service Manual	Rev. A00
---	Dell Optiplex 7060 Tower Setup and Specifications Guide	Rev. A01
---	Dell Precision 3430 Small Form Factor Service Manual	Rev. A00
---	Dell Precision 3430 Small Form Factor Setup and Specifications Guide	Rev. A00
---	Scamax 8x1 Scanner Brochure	---
---	Tripp Lite SmartPro SM1500RMXL2UTAA Datasheet	---
Build Documents		
---	Democracy Suite ImageCast Evolution Firmware Build, Prerequisite Setup and Installation	5.5-B::95
---	Democracy Suite ImageCast Precinct Firmware Build and Install	5.5-B::90
---	Democracy Suite ImageCast X Build	5.5-B::55

Table 4-2. TDP Documents *(continued)*

Document Number	Description	Version
---	Democracy Suite Windows Build Document	5.5-B::40
---	Democracy Suite ImageCast Precinct 2 Build Environment and Prerequisite Setup, Firmware Build and Installation	5.5-B::24

4.7 Source Code Review

Pro V&V will review the submitted source code to the EAC 2005 VVSG and the manufacturer-submitted coding standards. Prior to initiating the software review, Pro V&V shall verify that the submitted documentation is sufficient to enable: (1) a review of the source code and (2) Pro V&V to design and conduct tests at every level of the software structure to verify that design specifications and performance guidelines are met.

For the ICE software, a combination of Automated Source Code Review and Manual Source Code Review methods will be used to review the source code. For all other components, the submitted source code will be compared to the previously certified Democracy Suite 5.5 voting system versions to determine the changes, if any. A combination of Automated Source Code Review and Manual Source Code Review methods will then be used to review the changes in the source code. In addition, 10% of the source code comments will be manually reviewed.

4.8 QA and CM System Review

The Dominion Voting Systems Quality and Configuration Management Manuals shall be reviewed for their fulfillment of Volume I, Sections 8 and 9, and the requirements specified in Volume II, Section 2. The requirements for these sections establish the quality assurance and configuration standards for voting systems to which manufacturers must conform and require voting system manufacturers to implement a quality assurance and configuration management program that is conformant with recognized ISO standards. As part of the review process, the Dominion TDP documents will be reviewed to determine if the stated policies are being followed.

4.9 Physical Configuration Audit (PCA)

The Physical Configuration Audit (PCA) compares the voting system components submitted for qualification to the manufacturer's technical documentation, and shall include the following activities:

- Establish a configuration baseline of software and hardware to be tested; confirm whether manufacturer's documentation is sufficient for the user to install, validate, operate, and maintain the voting system
- Verify software conforms to the manufacturer's specifications; inspect all records of manufacturer's release control system; if changes have been made to the baseline version, verify manufacturer's engineering and test data are for the software version submitted for certification

- If the hardware is non-COTS, Pro V&V shall review drawings, specifications, technical data, and test data associated with system hardware to establish system hardware baseline associated with software baseline

- Review manufacturer's documents of user acceptance test procedures and data against system's functional specifications; resolve any discrepancy or inadequacy in manufacturer's plan or data prior to beginning system integration functional and performance tests

- Subsequent changes to baseline software configuration made during testing, as well as system hardware changes that may produce a change in software operation are subject to re-examination

4.10 Functional Configuration Audit (FCA)

The Functional Configuration Audit (FCA) encompasses an examination of manufacturer's tests, and the conduct of additional tests, to verify that the system hardware and software perform all the functions described in the manufacturer's documentation submitted in the TDP. In addition to functioning according to the manufacturer's documentation tests will be conducted to ensure all applicable EAC 2005 VVSG requirements are met.

4.11 Accuracy

The accuracy test ensures that each component of the voting system can each process 1,549,703 consecutive ballot positions correctly within the allowable target error rate. The Accuracy test is designed to test the ability of the system to "capture, record, store, consolidate and report" specific selections and absences of a selection. The required accuracy is defined as an error rate. This rate is the maximum number of errors allowed while processing a specified volume of data.

In an effort to achieve this and to verify the proper functionality of the units under test, the following methods will be used to test components of the voting system:

For paper-based voting systems the ballot positions on a paper ballot must be scanned to detect selections for individual candidates and contests and the conversion of those selections detected on the paper ballot converted into digital data. The accuracy requirements for the ICE and the ICC units will be met by the execution of the standard accuracy test utilizing pre-marked and hand-marked ballots of each ballot length supported by the system, and ballots produced by the ICX BMD.

The ICE and ICC units will be tested by utilizing a combination of hand marked (70%) and pre-marked (30%) ballots to achieve an accuracy rate greater than 1,549,703 correct ballot positions.

The ICX BMD, ICX DRE, ICP, and the ICX DRE with VVPAT Accuracy test will be reused from the Dominion 5.5 EAC Campaign

4.12 Volume & Stress

Tests to investigate the system's response to conditions that tend to overload the system's capacity to process, store, and report data. The test parameters will focus on the system's stated limits and the ballot logic for areas such as the maximum number of active voting positions, maximum number of ballot styles, maximum candidates, maximum contests, and stated limits within the EMS. This test will be utilized to ensure the system can achieve the manufacturer's TDP claims of what the system can support. Testing will be performed by exercising an election definition and test cases developed specifically to test for volume and stress conditions of the system being tested.

4.13 System Integration

System Integration is a system level test for the integrated operation of both hardware and software. It evaluates the compatibility of the voting system software components or subsystems with one another, and with other components of the voting system environment. This is determined through functional tests integrating the voting system software with the remainder of the system. During this area of testing, the system shall be configured exactly as it would for normal field use. This includes connecting all supporting equipment and peripherals including ballot boxes, voting booths (regular and accessible), and any physical security equipment such as locks and ties.

Pro V&V personnel shall properly configure and test the system by following the procedures detailed in the D-Suite 5.5-B voting system technical documentation.

5.0 TEST DATA

The following subsections provide information concerning test data recording, criteria, and reduction.

5.1 Test Data Recording

All equipment utilized for test data recording shall be identified in the test data package. The output test data shall be recorded in an appropriate manner as to allow for data analysis. For source code and TDP reviews, results shall be compiled in reports and submitted to Dominion for resolution.

5.2 Test Data Criteria

The D-Suite 5.5-B Voting System shall be evaluated against all applicable requirements contained in the EAC 2005 VVSG. The acceptable range for system performance and the expected results for each test case shall be derived from the manufacturer-submitted technical documentation and the EAC 2005 VVSG.

6.0 TEST PROCEDURE AND CONDITIONS

The following subsections detail the facility requirements, test setup conditions, and sequence of testing.

6.1 Facility Requirements

Unless otherwise annotated, all testing shall be conducted at the Pro V&V test facility located in Huntsville, AL, by personnel verified by Pro V&V to be qualified to perform the test.
Unless otherwise specified herein, testing shall be performed at the following standard ambient conditions and tolerances:

- Temperature: 68-75◦ F (±3.6◦F)
- Relative Humidity: Local Site Humidity
- Atmospheric Pressure: Local Site Pressure
- Time Allowable Tolerance: ±5%

Testing performed at third-party laboratories will be subjected to the test parameters and tolerances defined by the test facility and will be reported in the final Test Report.

6.2 Test Set-up

All voting system equipment shall be received and documented using Pro V&V proper QA procedures. Upon receipt of all hardware, an inspection will be performed to verify that the equipment received is free from obvious signs of damage and/or degradation that may have occurred during transit. If present, this damage shall be recorded, photographed, and reported to the Dominion Representative. Additionally, a comparison shall be made between the recorded serial numbers/part numbers and those listed on shipper's manifest and any discrepancies shall be reported to the Dominion Representative. TDP items and all source code received shall be inventoried and maintained by Pro V&V during the test campaign.

During test performance, the system shall be configured as it would be for normal field use. This includes connecting all supporting equipment and peripherals.

6.3 Test Sequence

The D-Suite 5.5-B Voting System will be evaluated against all applicable requirements in the EAC 2005 VVSG. There is no required sequence for test performance.

6.4 Test Operations Procedure

Pro V&V will identify PASS/FAIL criteria for each executed test case. The PASS/FAIL criteria will be based on the specific expected results of the system. In the case of an unexpected result that deviates from what is considered standard, normal, or expected, a root cause analysis will be performed.

Pro V&V will evaluate every EAC 2005 VVSG requirement applicable to the Democracy Suite 5.5-B voting system. Any deficiencies noted will be reported to the EAC and the manufacturer. If it is determined that there is insufficient data to determine compliance, this test plan will be altered and additional testing will be performed.

APPENDIX A

PROJECT SCHEDULE

Task Name	Start Date	End Date	Duration
TDP	**02/11/19**	**06/03/19**	**80d**
Initial Review	02/11/19	03/04/19	16d
Compliance Review	03/05/19	05/28/19	60d
Final review	05/29/19	06/03/19	4d
TRR	02/12/19	02/13/19	2d
Test Plan	**02/11/19**	**05/16/19**	**69d**
Test Plan Creation	03/04/19	03/20/19	13d
Vendor Review & Comments	03/21/19	03/27/19	5d
EAC Submission & Review	03/28/19	04/24/19	20d
EAC Comment Review & Update	04/25/19	04/30/19	4d
EAC Submission & Review of Revision	05/01/19	05/14/19	10d
EAC Approved Test Plan	05/15/19	05/16/19	2d
Source Code Review	**02/11/19**	**04/10/19**	**43d**
Source Code Delivered	02/19/19	02/19/19	1d
Source Code Review Automated	02/20/19	02/20/19	1d
Source Code Review Manual	02/20/19	03/05/19	10d
Source Code Re-Review	03/06/19	03/06/19	1d
Document Review	03/07/19	03/07/19	1d
Compliance Build	03/08/19	03/11/19	2d
System Delivery & Setup	**03/12/19**	**04/26/19**	**34d**
Equipment Delivered	03/18/19	04/26/19	30d
PCA	03/18/19	04/26/19	30d
System Setup Loads & Hardening	03/12/19	04/26/19	34d
Hardware Testing	**02/15/19**	**05/15/19**	**64d**
Electrical Testing (ICE) - TUV	02/15/19	02/21/19	5d
Environmental Testing (ICE) - NTS	02/19/19	03/08/19	14d
Temp Power(ICE, M260,&HiPro)-NTS	03/11/19	03/15/19	5d
Temp Power (HiPro) - NTS	04/15/19	04/19/19	5d
Maintainability	05/14/19	05/14/19	1d
Acoustic Test	05/15/19	05/15/19	1d
System Level Testing	**03/25/19**	**05/23/19**	**44d**
FCA	03/25/19	04/26/19	25d
Security	04/29/19	04/30/19	2d
Usability	04/29/19	04/30/19	2d
Accessibility	05/01/19	05/01/19	1d
Volume & Stress	05/02/19	05/08/19	5d
Accuracy	05/09/19	05/13/19	3d
Regression Testing	05/14/19	05/14/19	1d
Trusted Build	05/15/19	05/16/19	2d
System Integration	05/17/19	05/23/19	5d

Test Report	**05/17/19**	**07/24/19**	**46d**
Test Report Creation	05/17/19	05/29/19	8d
Vendor Review & Comments	05/30/19	05/31/19	2d
EAC Submission & Review	06/03/19	06/28/19	20d
EAC Comment Review & Update	07/01/19	07/08/19	4d
EAC Submission & Review of Revision	07/09/19	07/22/19	10d
EAC Approved Test Report	07/23/19	07/24/19	2d

U. S. ELECTION ASSISTANCE COMMISSION
VOTING SYSTEM TESTING AND CERTIFICATION PROGRAM
1335 East West Highway, Suite 4300
Silver Spring, MD 20910

May 29, 2019

Hunter Medlock
Pro V&V
700 Boulevard South, Suite 200
Huntsville, Alabama 35802

(Sent via e-mail)

RE: Approval of Dominion DVS 5.5-B Test Plan

Dear Mr. Medlock,

This letter is to inform you that Rev. 1.0 of the test plan submitted by Pro V&V for the testing of Dominion DVS 5.5-B voting system has been reviewed and approved. Per section 4.6.4.3 of the EAC's Testing and Certification Program Manual ("Program Manual") a test plan is approved based on the information submitted. Test plan approval indicates the following:

- Approval simply signifies that the tests proposed, if performed properly, appear to be sufficient to fully test the system. A final determination of the sufficiency of the testing is a global evaluation based on the test plan, test cases, and test report reviews, as well as the EAC's Quality Monitoring Process outlined in Chapter 8 of the Program Manual.
- Approval allows the test laboratory to begin test case development, testing, and test report submittal.
- A test plan is approved based on information submitted. It is not known if relevant information was omitted that would affect the testing campaign.
- The test plan is a living document and is expected to change and be updated during various phases of the testing life cycle. A final version that reflects all of the testing completed (e.g. TDP, Hardware, and Software) should be submitted to the EAC at the completion of testing. If this final "as run" test plan does not reflect all the testing required, the EAC reserves the right to request further updates to the test plan and possibly additional testing.

I also want to take this opportunity to remind you of the EAC's requirements following approval of a test plan. Section 4.5 of the Program Manual requires VSTLs to report any changes to a voting system or an approved test plan directly to the EAC. Under this section, Manufacturers are required to enable VSTLs to report all test failures or anomalies directly to the EAC. In addition, for further guidance on this matter, please refer to Section 4.5.1 for information regarding the reporting requirements for changes to a system or test plan during testing, and Section 4.5.2 for information regarding the reporting requirements for anomalies or failures found during testing.

Section 4.6 of the Program Manual lays out the various requirements for the submission and approval of a test report.

If you should have any questions regarding the approval of the test plan referenced above, or the rest of the EAC's certification process please contact me.

Sincerely,

Jerome Lovato
Director, Voting System Testing and Certification

700 Boulevard South
Suite 102
Huntsville, AL 35802
Phone (256)713-1111
Fax (256)713-1112

Test Plan for EAC 2005 VVSG Certification Testing Dominion Voting Systems Democracy Suite (D-Suite) Version 5.5-B Voting System

EAC Project Number: DVS-DemSuite5.5-B

Version: Rev. 03

Date: 08/20/2019

EAC Lab Code 1501

NVLAP LAB CODE 200908-0

SIGNATURES

Approved by: _____ 8-20-19

Michael Walker, VSTL Project Manager — Date

Approved by: _____ 8/20/19

Wendy Owens, VSTL Program Manager — Date

REVISIONS

Revision	Description	Date
NR	Initial Release	03/28/2019
01	Updates per EAC Comments. Added ICP2 component and associated edits.	05/16/2019
02	As-Run Version	08/05/2019
03	Updated with EAC Comments	08/20/2019

TABLE OF CONTENTS

1.0 INTRODUCTION **1**

1.1 Description and Overview of EAC System Being Modified 1

1.1.1 Baseline Certified System 4

1.1.2 Description of Modification 14

1.1.3 Initial Assessment 14

1.1.4 Regression Test 15

1.2 References 15

1.3 Terms and Abbreviations 15

1.4 Project Schedule 16

1.5 Scope of Testing 17

1.5.1 Block Diagram 18

1.5.2 System Limits 19

1.5.3 Supported Languages 20

1.5.4 Supported Functionality 21

1.5.5 VVSG 21

1.5.6 RFIs 21

1.5.7 NOCs 22

2.0 PRE-CERTIFICATION TESTING AND ISSUES 22

2.1 Evaluation of Prior VSTL Testing 22

2.2 Evaluation of Prior Non-VSTL Testing 22

2.3 Known Field Issues 22

3.0 MATERIALS REQUIRED FOR TESTING 22

3.1 Software 22

3.2 Equipment 23

3.3 Test Materials 23

3.4 Proprietary Data 24

4.0 TEST SPECIFICATIONS **24**

4.1 Requirements (Strategy of Evaluation) 24

4.1.1 Rational for 'Not Applicable' requirements 27

4.2 Hardware Configuration and Design 27

4.3 Software System Functions 27

4.4 Test Case Design 27

4.4.1 Hardware Qualitative Test Case Design 28
4.4.2 Hardware Environmental Test Case Design 29
4.4.3 Software Module Test Case Design and Data 29
4.4.4 Software Functional Test Case Design and Data 29
4.4.5 System-Level Test Case Design 30
4.5 Security Functions 30
4.6 TDP Evaluation 31
4.7 Source Code Review 37
4.8 QA & CM System Review 37
4.9 Physical Configuration Audit (PCA) 37
4.10 Functional Configuration Audit (FCA) 38
4.11 Accuracy 38
4.12 Volume & Stress 39
4.13 System Integration 39
5.0 TEST DATA 39
5.1 Test Data Recording 39
5.2 Test Data Criteria 39
6.0 TEST PROCEDURES AND CONDITIONS 39
6.1 Facility Requirements 40
6.2 Test Set-Up 40
6.3 Test Sequence 40
6.4 Test Operations Procedure 40

PROJECT SCHEDULE A-1

1.0 INTRODUCTION

The purpose of this Test Plan is to document the procedures that Pro V&V, Inc. will follow to perform certification testing during a system modification campaign for the Dominion Voting Systems Democracy Suite (D-Suite) 5.5-B Voting System to the requirements set forth for voting systems in the U.S. Election Assistance Commission (EAC) 2005 Voluntary Voting System Guidelines (VVSG), Version 1.0. Prior to submitting the voting system for testing, Dominion Voting Systems submitted an application package to the EAC for certification of the D-Suite 5.5-B Voting System. The application was accepted by the EAC and the project was assigned the unique Project Number of DVS-DemSuite5.5-B.

At test conclusion, the results of all testing performed as part of this test campaign will be submitted to the EAC in the form of a national certification test report.

1.1 Description and Overview of EAC Certified System Being Modified

The EAC Certified System that is the baseline for the submitted modification is described in the following subsections. All information presented was derived from the previous Certification Test Report, the EAC Certificate of Conformance and/or the System Overview.

The D-Suite 5.5-B Voting System is a paper-based optical scan voting system with a hybrid paper/DRE option consisting of the following major components: The Election Management System (EMS), the ImageCast Central (ICC), the ImageCast Precinct (ICP and ICP2), the ImageCast X (ICX) DRE w/ Reports Printer, ImageCast X (ICX) DRE w/VVPAT, the ImageCast Evolution (ICE), and the ImageCast X (ICX) BMD. The D-Suite 5.5-B Voting System configuration is a modification from the EAC approved D-Suite 5.5 system configuration.

The following subsections describe the baselined D-Suite 5.5 Voting System.

Election Management System (EMS)

The D-Suite 5.5 EMS consists of various components running as either a front-end/client application or as a back-end/server application. A listing of the applications and a brief description of each is presented below.

Front-end/Client applications:

- EMS Adjudication: Represents the client component responsible for adjudication, including reporting and generation of adjudicated result files from ImageCast Central tabulators and adjudication of write-in selections from ImageCast Precinct and ImageCast Central tabulators. This client component is installed on both the server and the client machines.

- EMS Audio Studio: A client application that represents an end-user helper application used to record audio files for a given election project. As such, it is utilized during the pre-voting phase of the election cycle.

- EMS Election Data Translator: End-user application used to export election data from election project and import election data into election project.

- EMS Election Event Designer: A client application that integrates election definition functionality together with ballot styling capabilities and represents a main pre-voting phase end-user application

- ImageCast Voter Activation: An application, installed on a workstation or laptop at the polling place, which allows the poll workers to program smart cards for voters. The smart cards are used to activate voting sessions on ImageCast X.

- EMS Results Tally and Reporting: A client application that integrates election results acquisition, validation, tabulation, reporting, and publishing capabilities and represents the main post-voting phase end-user application.

Back-end/Server applications:

- EMS Adjudication Service: Represents a server side application which provides ballot information such as contests, candidates and their coordinates from EMS to the Adjudication application.

- EMS Application Server: Represents a server side application responsible for executing long running processes, such as rendering ballots, generating audio files and election files, etc.

- EMS Database Server: Represents a server side RDBMS repository of the election project database which holds all the election project data, including pre-voting and post-voting data.

- EMS Data Center Manager: A server application that represents a system level configuration application used in EMS back-end data center configuration.

- EMS File System Service: A back-end application that acts as a stand-alone service that runs on client machines, enabling access to low level operating system API for partitioning CF cards, reading raw partition on ICP CF card, etc.

- EMS NAS Server: Represents a server side file repository of the election project file based artifacts, such as ballots, audio files, reports, log files, election files, etc.

- Smart Card Helper Service: A service that is installed on a workstation or laptop at the polling place, and provides required data format for programming smart cards for ImageCast devices, or, for jurisdiction's voting registration system in case of integration.

ImageCast Precinct (ICP)

The ICP device is a hybrid precinct optical scan paper/DRE ballot counter designed to provide six major functionalities: ballot scanning, second chance voting, accessible voting, ballot review, tabulation, and poll worker functions.

For ballot scanning functionality the ICP scans marked paper ballots, interprets voter marks on the paper ballots and stores the ballots for tabulation when the polls are closed.

Second Chance voting refers to scenarios in which an error has been detected on the voter's paper ballot (e.g., blank ballot, undervoted ballot, overvoted ballot, misread ballot, cross-over voted ballot), and the ICP notifies the voter by displaying a message or providing an audio visual cue, that one of these situations has been detected, and offers the voter an opportunity to reject and fix their ballot, or to cast the ballot as-is.

Accessible voting allows voters with disabilities to listen to an audio representation of a ballot and use a hand held controller called an Audio Tactile Interface (ATI) to make vote selections, which are then saved directly to the ICP when the voter casts their Accessible Voting ballot.

The Ballot Review feature allows a voter to review their vote selections using an audio or visual representation, which displays or presents the voter with a complete listing of all contests contained on the ballot and an indication of the results which will be recorded for each contest once the voter's ballot is cast.

The Tabulation of paper ballots and Accessible Voting ballots cast by voters is performed when the polls are closed on the ICP unit and the unit tabulates the results, generates results files for aggregation into RTR, and prints a results report containing the results of the ballots cast.

For poll worker functions the ICP contains a small touch-screen LCD to allow the poll worker to initiate polling place activities, diagnostics and reports.

ImageCast Central (ICC) Count Scanner

The ICC is a high-speed, central ballot scan tabulator based on Commercial off the Shelf (COTS) hardware, coupled with the custom-made ballot processing application software. It is used for high speed scanning and counting of paper ballots.

ImageCast X (ICX)

The Democracy Suite ImageCast X (ICX) consists exclusively of COTS available hardware and operating system, while the applications installed on top customize its behavior to turn it into a Ballot Marking Device (BMD) or a Direct-Recording Electronic (DRE) device with or without a Voter Verifiable Paper Audit Trail (VVPAT). ICX application is the application that verifies voter's session eligibility, using the smart card and then presents the appropriate ballot to the voter. When a voter is satisfied with choices selected, ICX application verifies them and produces an Electronic Mobile Ballot or stores the votes onto a memory device. The ICX is designed to perform the following functions:

- Ballot marking and printing of electronic mobile ballots (in BMD mode)
- Ballot review and second chance voting
- Accessible voting and ballot marking
- Saving voting results (in DRE mode)
- Printing votes on a voter verifiable paper audit trail device (when VVPAT is in use)

1.1.1 Baseline Certified System

The baseline system for this modification is the D-Suite 5.5 Voting System. The tables below describe the certified equipment and firmware versions. Detailed descriptions of the D-Suite 5.5 test campaign are contained in Pro V&V Report No.TR-01-01-DVS-2017-02.01 Rev. B, which is available for viewing on the EAC's website at www.eac.gov.

This subsection lists the proprietary and COTS software to be provided by the manufacturer as part of the test campaign.

Table 1-1. Democracy Suite 5.5 EMS Software Component Descriptions

Software	Version	Filename	Configuration	
			Standard	Express
EMS Election Event Designer (EED)	5.5.12.1	setup.exe: EED_FED_CERT_Setup_x64.msi	X	X
EMS Results Tally and Reporting (RTR)	5.5.12.1	setup.exe: RTR_FED_CERT_Setup_x64.msi	X	X
EMS Application Server	5.5.12.1	setup.exe: APPS_FED_CERT_Setup_x64.msi	X	X
EMS File System Service (FSS)	5.5.12.1	setup.exe: FSSSetup.msi	X	X
EMS Audio Studio (AS)	5.5.12.1	setup.exe: EMSAudioStudioSetup.msi	X	X
EMS Data Center Manager (DCM)	5.5.12.1	DemocracySuiteEMS_DCM.exe	X	X
EMS Election Data Translator (EDT)	5.5.12.1	setup.exe: EDTSetup_x86.msi EDTSetup_x64.msi	X	X
ImageCast Voter Activation (ICVA)	5.5.12.1	setup.exe: ICVASetup.msi	X	X
EMS Adjudication (Adj.)	5.5.8.1	DVS ImageCast Adjudication Client Setup.msi	X	X
EMS Adjudication Service	5.5.8.1	DVS Adjudication Services Setup.msi	X	X
Smart Card Helper Service	5.5.12.1	setup.exe: SmartCardServiceSetup.msi	X	X

Table 1-2. Democracy Suite 5.5 ImageCast Precinct Software Component Descriptions

Firmware/Software	Version	Filename
Election Firmware	5.5.3-0002	cf2xx.sig
Firmware Updater	5.5.3-0002	firmUp.enc
Firmware Extractor	5.5.3-0002	FirmwareExtract.enc
Kernel (uClinux)	5.5.3-0002	image.bin.gz
Boot Loader (COLILO)	20040221	colilo.bin
Asymmetric Key Generator	5.5.3-0002	Keygen.enc
Asymmetric Key Exchange Utility	5.5.3-0002	KeyExchange.enc
Firmware Extractor (Uses Technician Key)	5.5.3-0002	TechExtract.enc

Table 1-3. Democracy Suite 5.5 ImageCast Central Software Component Descriptions

Firmware/Software	Version	Filename
ImageCast Central Application	5.5.3.0002	ICCSetup.exe

Table 1-4. Democracy Suite 5.5 ImageCast X Software Component Descriptions

Firmware/Software	Version	Filename
ICX Application	5.5.10.25	ICX.apk

Table 1-5. Democracy Suite 5.5 EMS Client/Server Software Component Descriptions

Firmware/Software	Version	Filename	Configuration	
			Standard	Express
Microsoft Windows Server	2012 R2 Standard	Physical Media from Microsoft	X	
Microsoft Windows	10 Professional	Physical Media from Microsoft	X	X
.NET Framework	3.5	Physical Media from Microsoft	X	X
Microsoft Visual J#	2.0	vjredist64.exe vjredist.exe	X	X
Microsoft Visual C++ 2013 Redistributable	2013	vcredist_x64.exe vcredist_x86.exe	X	X
Microsoft Visual C++ 2015 Redistributable	2015	vc_redist.x64.exe vc_redist.x86.exe	X	X
Java Runtime Environment	7u80	jre-7u80-windows-x64.exe jre-7u80-windows-i586.exe	X	X
Java Runtime Environment	8u144	jre-8u144-windows-x64.exe jre-8u144-windows-i586.exe	X	X
Microsoft SQL Server 2016 Standard	2016 Standard	Physical Media from Microsoft	X	

Table 1-5. Democracy Suite 5.5 EMS Client/Server Software Component Descriptions *(continued)*

Firmware/Software	Version	Filename	Configuration	
			Standard	Express
Microsoft SQL Server 2016 Service Pack 1	2016 SP1	SQLServer2016SP1-KB3182545-x64-ENU.exe	X	
Microsoft SQL Server 2016 SP1 Express	2016 SP1	SQLEXPRADV_x64_ENU.exe		X
Cepstral Voices	6.2.3.801	Allison (English): Cepstral_Allison_windows_6.2.3.801.exe Alejandra (Spanish): Cepstral_Alejandra_windows_6.2.3.801.exe	X	X
Arial Narrow Fonts	2.37a	ARIALN.TTF ARIALNB.TTF ARIALNBI.TTF ARIALNI.TTF	X	X
Maxim iButton Driver	4.05	install_1_wire_drivers_x86_v405.msi install_1_wire_drivers_x64_v405.msi	X	X
Adobe Reader DC	AcrobatDC	AcroRdrDC1501020060_en_US.exe	X	X
Microsoft Access Database Engine	2010	AccessDatabaseEngine.exe AccessDatabaseEngine_x64.exe	X	X
Open XML SDK 2.0 for Microsoft Office	2.0	OpenXMLSDKv2.msi	X	X

Table 1-6. Democracy Suite 5.5 EMS Software Platform Unmodified COTS Component Descriptions

Firmware/Software	Version	Filename
Infragistics NetAdvanatage Win Forms 2011.1	2011 Vol.1	NetAdvantage_WinForms_20111.msi
Infragistics NetAdvanatage WPF 2012.1	2012 Vol.1	NetAdvantage_WPF_20121.msi
TX Text Control Library for .NET	16.0	TXText Control.NET for Windows Forms 16.0.exe
SOX	14.3.1	sox.exe , libgomp-1.dll, pthreadgc2.dll, zlib1.dll
NLog	1.0.0.505	NLog.dll
iTextSharp	5.0.5	itextsharp.dll

Table 1-6. Democracy Suite 5.5 EMS Software Platform Unmodified COTS Component Descriptions *(continued)*

Firmware/Software	Version	Filename
OpenSSL	1.0.2k & 2.0.14 FIPS	openssl.exe, libeay32.dll, ssleay32.dll
SQLite	1.0.103.0	System.Data.SQLite.DLL (32-bit and 64-bit)
Lame	3.99.4	lame.exe
Speex	1.0.4	speexdec.exe and speexenc.exe
Ghostscript	9.04	gsdll32.dll (32-bit and 64-bit)
One Wire API for .NET	4.0.2.0	OneWireAPI.NET.dll
Avalon-framework-cvs-20020806	20020806	avalon-framework-cvs-20020806.jar
Batik	0.20-5	batik.jar
Fop	0.20-5	fop.jar
Microsoft Visual J# 2.0 Redistributable Package-Second Edition(x64)	2.0	vjc.dll , vjsjbc.dll, vjslibcw.dll, vjsnativ.dll , vjssupuilib.dll , vjsvwaux.dll
Entity framework	6.1.3	EntityFramework.dll
Spreadsheetlight	3.4.3	SpreadsheetLight.dll, SpreadsheetLight.xml
Open XML SDK 2.0 For Microsoft Office	2.0.5022.0	DocumentFormat.OpenXml.dll, DocumentFormat.OpenXml.xml

Table 1-7. Democracy Suite 5.5 ImageCast Precinct Unmodified COTS Component Descriptions

Firmware/Software	Version	Filename
OpenSSL 1.0.2k	1.0.2k	openssl-1.0.2k.tar.gz
OpenSSL FIPS 2.0.10	2.0.10	openssl-fips-2.0.10.tar.gz
Zlib	1.2.3	Zlib-1.2.3.tar.gz

Table 1-8. Democracy Suite 5.5 ImageCast X Unmodified COTS Component Descriptions

Firmware/Software	Version	Filename
Google Text-to-Speech Engine	3.11.12	ARM: com.google.android.tts_3.11.12-210311121_minAPI19(armeabi-v7a)(nodpi).apk x86: com.google.android.tts_3.11.12-210311123_minAPI15(x86)(nodpi).apk
ICX Prime Android 5.1.1 Image	0405	0405_5.1.1-01.12_user_android_x86.iso
ICX Classic Android 4.4.4 Image	0.0.98	byt_t_crv2_64-ota-BCX18-V0.0.98.zip

Table 1-9. Democracy Suite 5.5 ImageCast Central Software Build Library Source Code (Unmodified COTS)

Firmware/Software	Version	Filename
OpenSSL 1.0.2k	1.0.2k	openssl-1.0.2k.tar.gz
OpenSSL FIPS 2.0.10	2.0.10	openssl-fips-2.0.10.tar.gz

Table 1-10. Democracy Suite 5.5 ImageCast Central Runtime Software Components (Unmodified COTS)

Firmware/Software	Version	Filename
1-Wire Driver (x86)	4.05	install_1_wire_drivers_x86_v405.msi
1-Wire Driver (x64)	4.05	install_1_wire_drivers_x64_v405.msi
Canon DR-G1130 TWAIN Driver	1.2 SP6	G1130_DRIT_V12SP6.exe
Canon DR-M160II TWAIN Driver	1.2 SP6	M160II_DRIT_V12SP6.exe
Visual C++ 2013 Redistributable (x86)	12.0.30501	vcredist_x86.exe

Table 1-11. Democracy Suite 5.5 ImageCast Precinct Modified COTS Software Component Descriptions

Firmware/Software	Version	Filename
uClinux	20070130	uClinux-dist-20070130.tar.gz
COLILO Bootloader	20040221	Colilo20040221.tar.gz

Table 1-12. Democracy Suite 5.5 ImageCast X Modified COTS Software Component Descriptions

Firmware/Software	Version	Filename
Zxing Barcode Scanner	4.7.5	BS-4.7.5.zip
SoundTouch	1.9.2	Soundtouch-1.9.2.tar.gz

Table 1-13. Democracy Suite 5.5 EMS Software Build Environment Component Descriptions

Firmware/Software	Version	Filename
Windows 10 Professional	10 Professional	Physical Media from Microsoft
.NET Framework 3.5	3.5	Physical Media from Microsoft
Internet Information Server (IIS)	10.0	Physical Media from Microsoft
7-Zip	9.20 (64 Bit)	7z920-x64.msi
Visual Studio 2015 Professional with Update 3	2015 Update 3	en_visual_studio_professional_2015_with_update_3_x86_x64_web_installer_8922978.exe

Table 1-13. Democracy Suite 5.5 EMS Software Build Environment Component Descriptions
(continued)

Firmware/Software	Version	Filename
.NetDiscUtils	0.10	DiscUtilsBin-0.10.zip
Infragistics NetAdvantage Win Forms 2011.1	2011.1	NetAdvantage_WinForms_20111.msi
Infragistics Net Advantage – WPF 2012.1	2012.1	NetAdvantage_WPF_20121.msi
TX Text Control 16.0.NET	16	TX Text Control.NET for Windows Forms 16.0.exe
Speex	1.0.4	speex_win32_1.0.4_setup.exe
Microsoft Visual J#	2.0	vjredist64.exe
iTextSharp	5.0.5	itextsharp-5.0.5-dll.zip
Ghostscript	9.0.4	gs904w32.exe gs904w64.exe
Nlog	1.0.0.505	NLog-1.0-Refresh-bin.zip
OneWireAPI.NET	4.0	1-wiresdkver400_beta2.zip
Lame	3.99.4	lame3.99.4-20120130.zip
Sox	14.3.1	sox-14.3.1-win32.zip
Avalon Framework	20020806	avalon-framework-cvs-20020806.jar.zip
Fop	0.20-5	fop-0.20.5.jar
Batik	0.20-5	batik-1.5-fop-0.20-5.jar
SQLite	1.0.103.0	sqlite-netFx46-setup-bundle-x64-2015-1.0.103.0.exe
OpenSSL 1.0.2k	1.0.2k	openssl-1.0.2k.tar.gz
OpenSSL FIPS 2.0.10	2.0.10	openssl-fips-2.0.10.tar.gz
Strawberry Perl	5.24.1.1	strawberry-perl-5.24.1.1-64bit.msi
Patch	2.5.9-7	patch-2.5.9-7-bin.zip
ISOnewspaper	30.4	ISOnewspaper30v4_gr.icc.zip
Ogg Vorbis Encoder	2.88	oggenc2.88-1.3.5-generic.zip
Ogg Vorbis Encoder	1.10.1	oggdecV1.10.1.zip
Prism Mvvm	1.1.1	prism.mvvm.1.1.1.nupkg
Bitmiracle.libtiff.net	2.4.560	Bitmiracle.libtiff.net.2.4.560.nupkg
Prism	4.0.0	prism.4.0.0.nupkg
Prism.UnityExtensions	4.0.0	prism.unityextensions.4.0.0.nupkg
PDF Printing	2.9.5.2	PDFPrinting.zip
Entity Framework	6.1.3.net45	entityframework.6.1.3.nupkg

Table 1-13. Democracy Suite 5.5 EMS Software Build Environment Component Descriptions
(continued)

Firmware/Software	Version	Filename
WiX	3.10	Wix310.exe
Spreadsheet Light	3.4.3	spreadsheetlight.3.4.3.nupkg
Open XML SDK 2.0 for Microsoft Office	2.0	OpenXMLSDKv2.msi
Adobe Reader DC	AcrobatDC	AcroRdrDC1501020060_en_US.exe
Arial Narrow Fonts	2.37a	ArialNarrowFonts.zip
SSH.NET	2016.1.0	SSH.NET-2016.1.0-bin.zip
SSMS	14.0.17119.0	SSMS-Setup-ENU.exe
TwainDSM	2.3.0	Twaindsm-2.3.0.win.bin

Table 1-14. Democracy Suite 5.5 ICC Software Build Environment Component Descriptions

Firmware/Software	Version	Filename
NASM Assembler	2.12.02	nasm-2.12.02-win32.zip
OpenSSL 1.0.2k	1.0.2k	openssl-1.0.2k.tar.gz
OpenSSL FIPS 2.0.10	2.0.10	openssl-fips-2.0.10.tar.gz
CSC3-2010	N/A	CSC3-2010.crl
tss-ca-g2	N/A	tss-ca-g2.crl

Table 1-15. Democracy Suite 5.5 Adjudication Software Build Environment Component Descriptions

Firmware/Software	Version	Filename
Microsoft Enterprise Library	5.0	Enterprise Library 5.0.msi
Microsoft Prism	4.0.0	Prism.4.0.0.nupkg
Microsoft Identity Foundation SDK	4.0	WindowsIdentityFoundation-SDK-4.0.msi
Toggle Switch Control Library	1.1.1	ToggleSwitch 1.1.1.zip
Infragistics NetAdvantage Ultimate 2013.1	2013.1	NetAdvantage_20131_PlatformInstaller.zip
iTextSharp	5.5.1	itextsharp-all-5.5.1.zip
CLR Security	June 2010	clrsecurity_june10.zip
OpenSSL 1.0.2k	1.0.2k	openssl-1.0.2k.tar.gz
OpenSSL FIPS 2.0.10	2.0.10	openssl-fips-2.0.10.tar.gz
Community MSI Extensions	1.4	msiext-1.4.zip
TreeViewEx	3.0.0.0	TreeViewEx.dll

Table 1-16. Democracy Suite 5.5 ImageCast Precinct Election Firmware Compiler Descriptions

Firmware/Software	Version	Filename
g++ (GNU C++ compiler)	gcc3.4.0-20040603	m68k-uclinux-tools-c++-gcc3.4.0-20040603.sh

Table 1-17. Democracy Suite 5.5 ImageCast Precinct Firmware Build Environment Component Descriptions

Firmware/Software	Version	Filename
Ubuntu 16.04.1	16.04.1	ubuntu-16.04.1-desktop-i386.iso
Toolchain Installation Script	N/A	Toolchain.sh
m68k uClinux tools base gcc	3.4.0-20040603	m68k-uclinux-tools-base-gcc3.4.0-20040603.sh
m68k uClinux tools c++ gcc	3.4.0-20040603	m68k-uclinux-tools-c++-gcc3.4.0-20040603.sh
m68k uClinux tools gdb	20040603	m68k-uclinux-tools-gdb-20040603.sh
OpenSSL 1.0.2k	1.0.2k	openssl-1.0.2k.tar.gz
OpenSSL FIPS 2.0.10	2.0.10	openssl-fips-2.0.10.tar.gz

Table 1-18. Democracy Suite 5.5 ImageCast X Firmware Build Environment Component Descriptions

Firmware/Software	Version	Filename
Ubuntu 14.04.4	14.04.4	ubuntu-14.04.4-desktop-amd64.iso

Table 1-19. D-Suite 5.5 Configuration Files

Configuration File	Version	Filename
Machine Configuration File (MCF)	5.5.10.20_20180806	MCF_5.5.10.20_20180806.mcf
Device Configuration File (DCF)	5.4.01_20170521	DCF_5.4.01_20170521.dcf

Table 1-20. D-Suite 5.5 Voting System Equipment

Component	Serial Number
Proprietary Hardware	
ImageCast Precinct Optical Scanner PCOS-320C	AAFAJFM0061, AAFAJFN0030, AAFAJGI6764, AAFAJEL0352
ImageCast Precinct Optical Scanner PCOS-320A	AANAGCP0347, AANAGCP0002
ICP Ballot Box BOX-330A	AAUCCFX0083, AAUCCGI0011
ICX Inline EMI Filter	[DVS-EMIFILTER-001] thru [DVS-EMIFILTER-003]
COTS Hardware	

Table 1-20. D-Suite 5.5 Voting System Equipment *(continued)*

Component	Serial Number
ICX aValue 15” Tablet (SID-15V)	0E14AF00014, B03G005400006, B033G00540008, 9E274118, 1D274118, Baytrail98D750C0, Baytrail12034DCC, Baytrail9A6550C8
ICX aValue 21” Tablet (SID-21V)	0E14AF00027, B03G005500019, 03G005500009, 0039BZ2D, 0039B209, Baytrail0039B22D, BaytrailF1B2587F, BaytrailF1B25983
A Value 21" ICX DRE (Prime)	1707101522, 1707101789, 1707101730, 1707101887, 1707101710, 1707101725, 1707101731, 1708100916, 1708100876, 1708100915, 1707101845, 1707101778, 1717101720, 1707101845, 1707101722, 1707202552, 1711300282, 1707100089, 1707101795, 1707101793, 17101793
SII Thermal Printer	1115271A, 1115273A, 115270A, 1115275A
KFI VRP3 Thermal Printer (VVPAT)	KPR000000715, KPR0000078339, KPR0000078377, KRP000000711, KPR000000712, KPR170900010119, KPR0000078337, KPR0000078364, KPR170900008115, KPR0000078339, KPR170900008116, KPR170900010347, KPR170900009733, KPR170900010120, KPR170900010119, KPR170900010337, KPR170900010338, KPR170900010348
Dell OptiPlex 7440 All In One	HVNRFB2, HVNQFB2, HVNPFB2
Dell PowerEdge R630	4Z07T52
Dell PowerEdge R640	JMP9CM2
Canon imageFormula DR-G1130 Scanner	GF301092, GF304418
Canon DR-M160II Scanner	GX333569, GX333573, GX324846, GX326272, GX319353
Dell Precision T3420 PC	HS0VFB2, HS0TFB2, HS0RFB2, HS0SFB2, 4TB3MN2, F575HH2
HP LaserJet Pro Printer M402dn	PHBQF20342, PHBQF20345, PHBQC12619, PHBQC19613, PHBQC12519, PHBQD18790, PHBQC12616, PHBQG09329
HP LaserJet Pro Printer M402dne	PHB5D00782, PHB5D04714, PHB5F04770, PHB5B18304, PHB5D04713
Dell OptiPlex 9030 All-In-One	CF73S52
Dell Ultrasharp 24” Monitor U2414H	1PVZ152, 62VZ152
Dell OptiPlex 3050 All-In-One	19YWWK2
Smart Card Reader ACR39	RR374-010362

Table 1-21. D-Suite 5.5 Voting System Support Equipment

Component	Serial Number
Dell Monitor KM632	FYNTY12, CKX6Y12, CN-0524N3-72461-59H-6U5U
Dell Monitor P2414Hb	CN-0524N3-74261-5AH-2DNU, CN-0524N3-74261-5AH-2DAU
Dell DVD Multi Recorder GP60NB60	[DVS-Dell-001]
Dell Latitude E7450 Laptop	30GFH72, 369FH72
Dell Latitude e3480 Laptop	1VD3NJ2
Maxim iButton Programmer DS9490R# with DS1402	[DVS-Maxim-001] thru [DVS-Maxim-006]
APC Smart-UPS SMT1500	3S1536X06436, 3S1536X06475, 3S1536X06461, 3S1536X06485, 3S1536X06484, 3S1536X06322, 3S1536X07467, 3S1536X06485, 3S1536X06272, 3S1536X06201, 3S1536X07305, 3S1504X00395, 3S1504X00396, 351716X02289, W51530180004, 3S171X06059
Dell X1008 Network Switch	4R8XX42, 26SXX42
Dell X1018 Network Switch	6TN7Y42, 63SXX42
Enabling Devices Sip and Puff	[DVS-enabling devices-001] - [DVS-enabling devices-002]
Cyber Acoustics Headphones ACM-70	[DVS-cyber acoustics-001] - [DVS-cyber acoustics-005]
4-Way Joystick Controller S26	PME QC 1550 12, [DVS-JOY-001], [DVS-JOY-002]
Enablemart # 88906 Rocker (Paddle) Switch	[DVS-paddle-001]
Dell PowerConnect 2808 Network Switch	3S2P0Z1
IOGEAR SDHC/microSDHC 0U51USC410 Card Reader	8632, 8633
Lexar USB 3.0 Dual-Slot Reader	24020845007435
Hoodman Steel USB 3.0 UDMA Reader 102015	[DVS-hoodman-001]
ATI Handset	98862010101-035, 98862010103-075, 00659010100-046, 98862010100-232, 093015-1-1, 00659010100-035
ATI-USB Handset	02440010100-011, [DVS-ATIUSB-001], [DVS-ATIUSB-002], B104326-1-4-040, B104326-1-4-035
ACS PC-Linked Smart Card Reader ACR39U	RR374-006272, RR374-010356, RR374-010365
Lexar Professional CF Card Reader Workflow CFR1	24050361400108, 24050361401994, 24050361401991, 24050361401990
CORCOM Filter P/N#: 15EMC1	[DVS-CorcomEMIFilter-001]
Delta Filter P/N#: 16PDCG5C	[DVS-DeltaEMIFILTER-001]
Kingston Card Reader FCR-HS4	08738174208132

1.1.2 Description of Modification

The Dominion Democracy Suite 5.5-B Voting System is a modified voting system configuration that includes upgrades to the components of the D-Suite 5.5 Voting System. The list below includes changes between this system and the baseline of the Democracy Suite 5.5 Voting System:

GENERAL MODIFICATIONS

- Addition of ImageCast Evolution (ICE), a precinct-level, optical scan, ballot counter (tabulator) designed to perform three major functions: ballot scanning and tabulation, ballot review and second chance voting, and accessible voting and ballot marking. *Submitted version: ICE firmware version 5.5.6.5, model number PCOS 410A.*

- Addition of InoTec HiPro 821 Scanner as a component for the ImageCast Central Count (ICC). *Submitted version: ICC software application version 5.5.32.5, HiPro 821 Scanner driver version 1.2.3.17.*

- Addition of Canon imageFORMULA DR-M260 Scanner as a component for the ImageCast Central Count (ICC). *Submitted version: ICC software application version 5.5.32.5, DR-M260 Scanner driver version 1.1 SP2.*

- Addition of ImageCast Precinct 2 (ICP2) optical ballot counter. The ICP2 is a precinct-based optical scan ballot tabulator that is used in conjunction with ImageCast compatible ballot storage boxes. *Submitted version: ICP2 firmware version 5.5.1.8, model number PCOS-330A.*

1.1.3 Initial Assessment

Testing from the previous test campaign was used to establish the baseline. The focus of this test campaign is the addition of the ImageCast Evolution (ICE) optical ballot hybrid precinct-based scanner and BMD, the InoTec HiPro 821 Scanner, the ImageCast Precinct 2 (ICP2) optical ballot scanner, and the Canon imageFORMULA DR-M260 Scanner. It was determined the following tasks would be required to verify compliance of the modifications:

- Source Code Review, Compliance Build, Trusted Build, and Build Document Review
- System Integration Testing
- Technical Documentation Package (TDP) Review
- Functional Configuration Audit (FCA)
- System Loads & Hardening
- Physical Configuration Audit (PCA)
- Security Testing

- Hardware Testing
- Usability & Accessibility Testing
- Volume & Stress Testing
- Accuracy Testing

1.1.4 Regression Test

Regression testing for this test campaign will consist of the execution of the System Integration Testing.

1.2 References

- Election Assistance Commission 2005 Voluntary Voting System Guidelines (VVSG) Version 1.0, Volume I, "Voting System Performance Guidelines", and Volume II, "National Certification Testing Guidelines"
- Election Assistance Commission Testing and Certification Program Manual, Version 2.0
- Election Assistance Commission Voting System Test Laboratory Program Manual, Version 2.0
- National Voluntary Laboratory Accreditation Program NIST Handbook 150, 2016 Edition, "NVLAP Procedures and General Requirements (NIST HB 150-2016)", dated July 2016
- National Voluntary Laboratory Accreditation Program NIST Handbook 150-22, 2008 Edition, "Voting System Testing (NIST Handbook 150-22)", dated May 2008
- United States 107th Congress Help America Vote Act (HAVA) of 2002 (Public Law 107-252), dated October 2002
- Pro V&V, Inc. Quality Assurance Manual, Revision 1.0
- Election Assistance Commission "Approval of Voting System Testing Application Package" letter dated May 6, 2016
- EAC Requests for Interpretation (RFI) (listed on www.eac.gov)
- EAC Notices of Clarification (NOC) (listed on www.eac.gov)
- Dominion Voting Systems Technical Data Package *(A listing of the D-Suite 5.5-B documents submitted for this test campaign is listed in Section 4.6 of this Test Plan)*

1.3 Terms and Abbreviations

This subsection lists terms and abbreviations relevant to the hardware, the software, or this Test Plan.

"ADA" – Americans with Disabilities Act 1990

"BMD" – Ballot Marking Device

"CM" – Configuration Management

"COTS" – Commercial Off-The-Shelf

"DRE" – Direct Record Electronic

"EAC" – United States Election Assistance Commission

"EMS" – Election Management System

"FCA" – Functional Configuration Audit

"HAVA" – Help America Vote Act

"ICC" – ImageCast Central

"ICE" – ImageCast Evolution

"ICP" – ImageCast Precinct

"ICX" – ImageCast X

"ISO" – International Organization for Standardization

"NOC" – Notice of Clarification

"PCA" – Physical Configuration Audit

"QA" – Quality Assurance

"RFI" – Request for Interpretation

"TDP" – Technical Data Package

"UPS" – Uninterruptible Power Supply

"VSTL" – Voting System Test Laboratory

"VVPAT" – Voter Verifiable Paper Audit Trail

"VVSG" – Voluntary Voting System Guidelines

1.4 Project Schedule

The Project Schedule for the test campaign is located in Appendix A. The dates on the schedule are not firm dates but planned estimates based on the anticipated project work flow.

1.5 Scope of Testing

The scope of testing focused on the addition of the ImageCast Evolution (ICE) optical ballot hybrid precinct-based scanner and BMD, the ICP2 optical ballot counter, the InoTec HiPro 821 Scanner, and the Canon imageFORMULA DR-M260 Scanner. To evaluate the D-Suite 5.5-B test requirements, the submitted modifications were evaluated against each section of the EAC 2005 VVSG to determine the applicable tests to be performed.

Based on this assessment, it was determined that multiple areas within the EAC 2005 VVSG would be evaluated to encompass the required tests. A breakdown of the areas and associated tests is listed below:

- EAC 2005 VVSG Volume 1, Section 2: Functional Requirements
  - System Integration Testing
  - Functional Configuration Audit (FCA)
  - Physical Configuration Audit (PCA), including System Loads & Hardening
  - Technical Documentation Package (TDP) Review
  - Volume & Stress Testing
  - Accuracy Testing
- EAC 2005 VVSG Volume 1, Section 3: Usability & Accessibility
  - Usability & Accessibility Testing
  - Technical Documentation Package (TDP) Review
- EAC 2005 VVSG Volume 1, Section 4: Hardware Requirements
  - Hardware Testing
  - Technical Documentation Package (TDP) Review
- EAC 2005 VVSG Volume 1, Section 5: Software Requirements
  - Source Code Review, Compliance Build, Trusted Build, and Build Document Review
  - Technical Documentation Package (TDP) Review
  - Functional Configuration Audit (FCA)
- EAC 2005 VVSG Volume 1, Section 7: Security Requirements
  - Security Testing

- Technical Documentation Package (TDP) Review
- Functional Configuration Audit (FCA)

1.5.1 Block Diagram

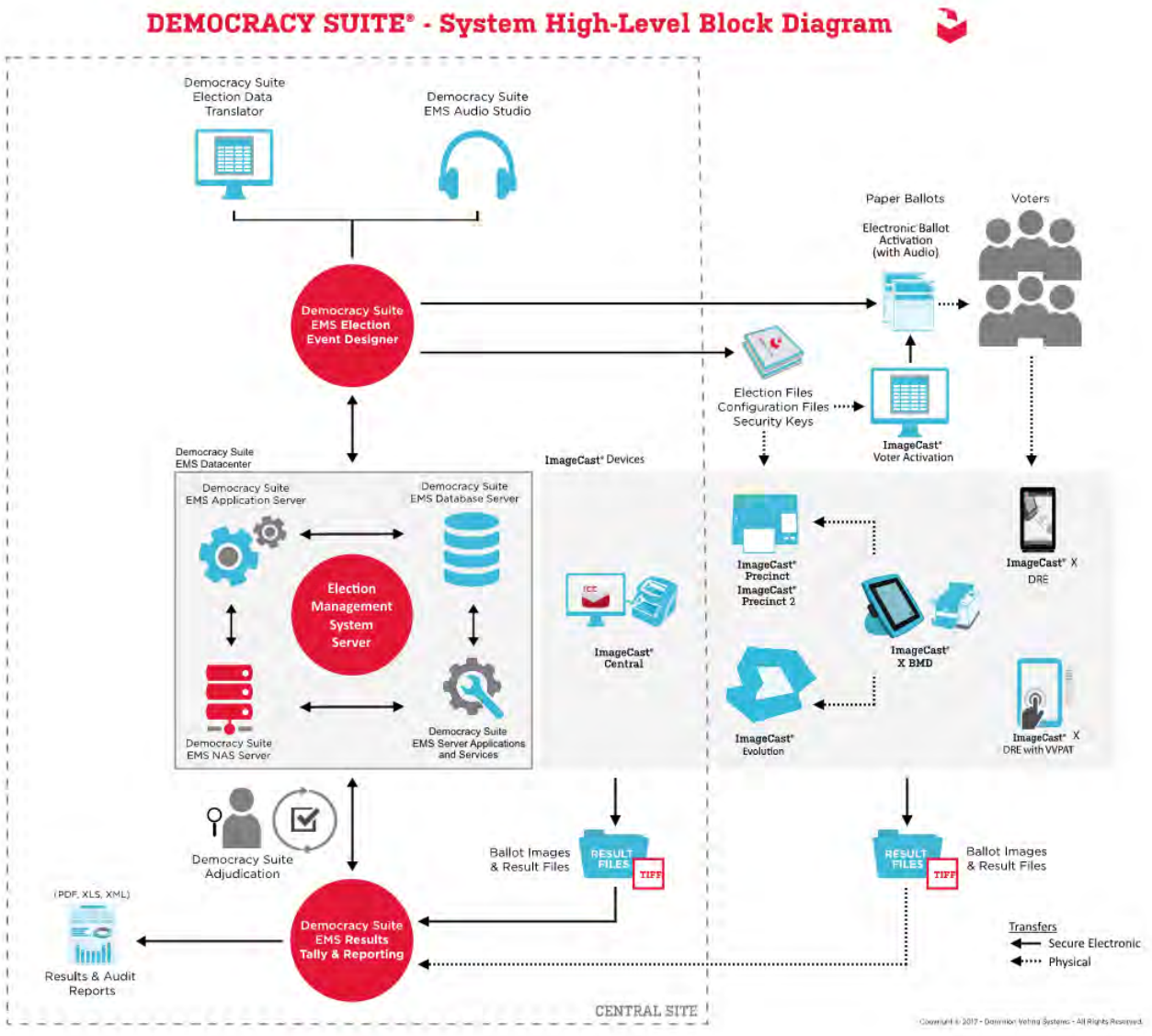


Figure 1-1. D-Suite 5.5-B System Overview

1.5.2 System Limits

The system limits that Dominion Voting Systems has stated to be supported by the D-Suite 5.5-B are provided in the table below.

Table 1-22. D-Suite 5.5-B System Limits by Configuration

Characteristic	Configuration Values		Limiting Component
	Standard	Express	
Landscape Ballot Orientation			
Ballot positions	292	292	*22-inch Landscape Ballot (240 candidates + 24 write-ins + 28 Yes/No choices)
Precincts in an election	1000	250	Memory
Contests in an election	1000	250	Memory
Candidates/Counters in an election	10000	2500	Memory
Candidates/Counters in a precinct	240	240	*22-inch Ballot
Candidates/Counters in a tabulator	10000	2500	Memory
Ballot Styles in an election	3000	750	Memory
Contests in a ballot style	38	38	*22-inch Landscape Ballot (24 candidacy contests + 14 Propositions)
Candidates in a contest	240	240	*22-inch Ballot
Ballot styles in a precinct	5	5	Memory
Number of political parties	30	30	Memory
“Vote for” in a contest	24	24	*22-inch Landscape Ballot
Supported languages in an election	5	5	Memory
Number of write-ins	24	24	*22-inch Landscape Ballot
Portrait Ballot Orientation			
Ballot positions	462	462	*22-inch Portrait Ballot
Precincts in an election	1000	250	Memory
Contests in an election	1000	250	Memory
Candidates/Counters in an election	10000	2500	Memory
Candidates/Counters in a precinct	462	462	*22-inch Portrait Ballot
Candidates/Counters in a tabulator	10000	2500	Memory
Ballot Styles in an election	3000	750	Memory
Contests in a ballot style	156	156	*22-inch Portrait Ballot

Table 1-22. D-Suite 5.5-B System Limits by Configuration *(continued)*

Characteristic	Configuration Values		Limiting Component
	Standard	Express	
Candidates in a contest	231	231	*22-inch Portrait Ballot (Column Span 3)
Ballot styles in a precinct	5	5	Memory
Number of political parties	30	30	No Limitation
"Vote for" in a contest	30	30	No Limitation
Supported languages in an election	5	5	Memory
Number of write-ins	462	462	*22-inch Portrait Ballot

***The 22-inch Ballot length applies only to hand-marked paper ballots.**

1.5.3 Supported Languages

The following languages are supported by the D-Suite 5.5-B System:

Table 1-23. D-Suite 5.5-B Supported Languages

Language	ICE	ICP	ICX
Alaska Native	Yes, if using Latin alphabet	Yes	No
Apache	Audio only	Audio only	No
Bengali	Yes	Yes	Yes
Chinese	Yes	Yes	Yes
English	Yes	Yes	Yes
Eskimo	Yes, if using Latin alphabet	Yes	No
Filipino	Yes, if using Latin alphabet	Yes	No
French	Yes	Yes	Yes
Hindi	Yes	Audio only	Yes
Japanese	Yes	Yes	Yes
Jicarilla	Audio only	Audio only	No
Keres	Audio only	Audio only	No
Khmer	Yes	Audio only	No
Korean	Yes	Yes	Yes
Navajo	Audio only	Audio only	No
Seminole	Audio only	Audio only	No
Spanish	Yes	Yes	Yes
Tagalog	No	No	Yes
Thai	Yes	Audio only	Yes
Towa	Audio only	Audio only	No
Ute	Audio only	Audio only	No
Vietnamese	Yes	Yes	Yes
Yuman	Audio only	Audio only	No

Support for all stated languages will be verified; however, only English and Spanish language ballots will be cast during the performance of functional testing. Additionally, one character based language (Chinese) will be tested during System Integration Testing.

For the character based language, the ballot will be created by Pro V&V and voted utilizing both paper ballots and ADA voting devices along with all applicable peripherals. The Chinese Language for the ballot will be created using a readily available online translation tool. The translated language text will be entered into the Election Event Designer Application. A ballot preview will be generated in the EED application. The Chinese characters displayed in the ballot preview will be compared to the characters generated by the online translation tool, to ensure that the characters match. The ballots will then be generated and printed, and the election loaded onto the tabulators and the BMD units. The Chinese characters displayed on both the printed ballots and displayed on the BMD units will be compared to the original Chinese Characters generated by the online translation tool to verify that the characters match.

1.5.4 Supported Functionality

The D-Suite 5.5-B is designed to support the following voting variations:

- General Election
- Closed Primary
- Open Primary
- Early Voting
- Partisan/Non-Partisan Offices
- Write-In Voting
- Primary Presidential Delegation Nominations
- Split Precincts
- Vote for N of M
- Ballot Rotation
- Provisional or Challenged Ballots

1.5.5 VVSG

The D-Suite 5.5-B Voting System shall be evaluated against the relevant requirements contained in the EAC 2005 VVSG, Version 1.0.

1.5.6 RFIs

There are no RFIs released by the EAC as of the date of this Test Plan that pertain to this test campaign that were not in effect at the time of the baseline system certification.

1.5.7 NOCs

There are no NOCs released by the EAC as of the date of this Test Plan that pertain to this test campaign that were not in effect at the time of the baseline system certification.

2.0 PRE-CERTIFICATION TESTING AND ISSUES

This section describes previous testing performed prior to submitting the voting system to the EAC.

2.1 Evaluation of Prior VSTL Testing

Pro V&V evaluated to the published Final Test Report for the D-Suite 5.5 System in order to baseline the current system under test. It was determined that Accuracy and Hardware Testing for the following components would be re-used to satisfy requirements for this test campaign: ICX BMD, ICX DRE, ICP, and ICX DRE w/VVPAT.

2.2 Evaluation of Prior Non-VSTL Testing

No prior non-VSTL testing of the D-Suite 5.5 modifications were considered for this test campaign.

2.3 Known Field Issues

D-Suite 5.5-B is a modification to a previously certified system and has not been fielded.

3.0 MATERIALS REQUIRED FOR TESTING

The following sections list all materials needed to enable the test engagement to occur.

The materials required for testing of the D-Suite 5.5-B System include all materials to enable the test campaign to occur. This includes the applicable hardware and software as well as the TDP, test support materials, and deliverable materials, as described in the following subsections.

3.1 Software

This subsection lists the proprietary and COTS software to be provided by the manufacturer as part of the test campaign.

In addition to the baseline system software identified in Section 1.1.1 of this Test Plan, the following software is required for test performance: ICC Software application version 5.5.4.1, which has been updated from the baseline version, and ICE firmware version 5.5.6.1.

Pro V&V will perform a comparison on the submitted source code against the previously certified versions. Regression testing will be performed to verify successful implementation of changes.

3.2 Equipment

This subsection lists the proprietary and COTS equipment to be provided by the manufacturer as part of the test campaign.

For COTS equipment, every effort will be made to verify that the COTS equipment has not been modified for use. This will be accomplished by performing research using the COTS equipment manufacturer's websites based on the serial numbers and service tag numbers for each piece of equipment. Assigned test personnel will evaluate COTS hardware, system software and communications components for proven performance in commercial applications other than voting. For PCs, laptops, and servers, the service tag information will be compared to the system information found on each machine. Physical external and internal examination will also be performed when the equipment is easily accessible without the possibility of damage. Hard drives, RAM memory, and other components will be examined to verify that the components match the information found on the COTS equipment manufacturer's websites.

All hardware required for testing is identified in Section 1.1 of this test plan.

3.3 Test Materials

This subsection lists the test materials required to execute the required tests throughout the test campaign.

Table 3-1. Required Test Materials

Material	Description(s)
Tamper Proof Security Seals	Adhesive tamper proof security seal, Novavision Part# XSG21-08RESN
Printer Cartridges	HP LaserJet CF226X
Smart Cards	Programmable Smart Cards
ImageCast Precinct Cleaning Sheets	Cleaning Sheets for ImageCast Precinct tabulator Part# CSHT-100B
Stereo Breakout Cable	3.5mm stereo male plug to dual 3.5mm mono female plugs
3.5mm Stereo Cable	3.5mm stereo male plug to 3.5mm stereo female plug
Compact Flash Cards	SanDisk Ultra 4Gb and Centon 16GB Compact Flash Cards
iButton Security Tokens	iButton Security Token with lanyards
Permanent Markers	Fine Tip Sharpie Permanent Markers
Ethernet Cables	Cat5e Ethernet Cables
ICE Paper Rolls	Replacement Thermal Paper Rolls for the ImageCast Evolution tabulator
ICP Paper Rolls	Replacement Thermal Paper Rolls for the ImageCast Precinct tabulator
Sip & Puff Disposable Straws	Disposable straws for use with the Sip & Puff input device
Ballot Stock	Ballot Paper Stock for printing ballots

Table 3-1. Required Test Materials *(continued)*

Material	Description(s)
A/C Power Cables	3-Prong A/C Power Cables
USB Thumb drives	4 GB, 8 GB, and 16 GB USB Thumb drives

3.4 Proprietary Data

All data and documentation considered by the manufacturer to be proprietary will be identified and documented in an independent submission along with a Notice of Protected Information.

4.0 TEST SPECIFICATIONS

Certification testing of the Dominion D-Suite 5.5-B Voting System submitted for evaluation will be performed to ensure the applicable requirements of the EAC 2005 VVSG and the EAC Testing and Certification Program Manual, Version 2.0 are met. Additionally, all EAC Request for Interpretations (RFI) and Notices of Clarification (NOC) relevant to the system under test will be incorporated in the test campaign. A complete listing of the EAC RFIs and NOCs is available on the EAC website.

4.1 Requirements (Strategy of Evaluation)

To evaluate the D-Suite 5.5-B test requirements, the submitted modifications were evaluated against each section of the EAC 2005 VVSG to determine the applicable tests to be performed. Based on this assessment, it was determined the following evaluations would be required to verify compliance of the modifications:

Technical Documentation Package (TDP) Review

A TDP Review will be performed to ensure that all submitted modifications are accurately documented and that the documents meet the requirements of the EAC 2005 VVSG. The preliminary TDP is performed to gather information concerning the system under test and its capabilities or design intentions. Additionally, a TDP review will be performed throughout the test campaign. The TDP Review includes the Initial Review, the Regulatory/Compliance Review, and the Final Review. This review is conducted to determine if the submitted technical documentation meets the regulatory, customer-stated, or end-user requirements and includes reviewing the documents for stated functionality review and verification.

Section 2: Functional Requirements

The requirements in this section shall be tested during the FCA and System Integration Test. This evaluation will utilize baseline test cases as well as specifically designed test cases and will include predefined election definitions for the input data.

The FCA targets the specific functionality claimed by the manufacturer to ensure the product functions as documented. This testing uses both positive and negative test data to test the robustness of the system. The FCA encompasses an examination of manufacturer tests, and the

conduct of additional tests, to verify that the system hardware and software perform all the functions described in the manufacturer's documentation submitted in the TDP (such as system operations, voter manual, maintenance, and diagnostic testing manuals). It includes a test of system operations in the sequence in which they would normally be performed. These system operations and functional capabilities are categorized as follows by the phase of election activity in which they are required:

- Overall System Capabilities: These functional capabilities apply throughout the election process. They include security, accuracy, integrity, system audit ability, election management system, vote tabulation, ballot counters, telecommunications, and data retention.

- Pre-voting Capabilities: These functional capabilities are used to prepare the voting system for voting. They include ballot preparation, the preparation of election-specific software (including firmware), the production of ballots, the installation of ballots and ballot counting software (including firmware), and system and equipment tests.

- Voting System Capabilities: These functional capabilities include all operations conducted at the polling place by voters and officials including the generation of status messages.

- Post-voting Capabilities: These functional capabilities apply after all votes have been cast. They include closing the polling place; obtaining reports by voting machine, polling place, and precinct; obtaining consolidated reports; and obtaining reports of audit trails.

- Maintenance, Transportation and Storage Capabilities: These capabilities are necessary to maintain, transport, and store voting system equipment.

The system integration testing addresses the integration of the hardware and software. This testing focuses on the compatibility of the voting system software components and subsystems with one another and with other components of the voting system. During test performance, the system is configured as would be for normal field use.

Section 3: Usability and Accessibility Requirements

The requirements in this section shall be tested during the Usability and Accessibility Testing. This evaluation will utilize baseline test cases as well as specifically designed test cases and will include predefined election definitions for the input data.

The usability testing focuses on the usability of the system being tested. Usability is defined generally as a measure of the effectiveness, efficiency, and satisfaction achieved by a specified set of users with a given product in the performance of specified tasks. In the context of voting, the primary user is the voter, the product is the voting system, and the task is the correct recording of the voter ballot selections. Additional requirements for task performance are independence and privacy: the voter should normally be able to complete the voting task without assistance from others, and the voter selections should be private. Accessibility evaluates the requirements for accessibility. These requirements are intended to address HAVA 301 (a) (3) (B).

Section 4: Hardware Requirements

The hardware tests specified in the VVSG are divided into two categories: non-operating and operating. The non-operating tests apply to the elements of the system that are intended for use at poll site locations and are intended to simulate the storage and transport of equipment between the storage facility and the polling location. The Operating tests apply to the entire system, including hardware components that are used as part of the voting system telecommunications capability, and are intended to simulate conditions that the voting system may encounter during operation. Prior to and immediately following each required non-operating and operating test, the system shall be subjected to an operational status check.

The requirements in this section shall be tested and/or evaluated by personnel verified by Pro V&V to be qualified to perform the testing.

Section 5: Software Requirements

The requirements in this section shall be tested utilizing a combination of review and functional testing during the source code review, TDP review, and FCA. Trusted builds from previously certified versions will be used as the baseline for testing. The ICE and ICP2 components will be subjected to the full suite of testing.

To perform the source code review, Pro V&V will review the submitted source code to the EAC 2005 VVSG and the manufacturer-submitted coding standards. Prior to initiating the software review, Pro V&V shall verify that the submitted documentation is sufficient to enable: (1) a review of the source code and (2) Pro V&V to design and conduct tests at every level of the software structure to verify that design specifications and performance guidelines are met. The source code review includes a compliance build and a trusted build of the submitted source code.

Section 7: Security Requirements

The requirements in this section shall be tested during the source code review, security tests, and FCA.

To evaluate the integrity of the system, Pro V&V will develop specifically designed test cases in an attempt to defeat the access controls and security measures documented in the system TDP as well verifying compliance to EAC RFI 2012-05. A threat matrix will be created to determine the risks and vulnerabilities. An evaluation of the system will be accomplished by utilizing a combination of functional testing, source code review, and static code analyzers.

During the security testing, the system shall be inspected for various controls and measures that are in place to meet the objectives of the security standards which include: protection of the critical elements of the voting system; establishing and maintaining controls to minimize errors; protection from intentional manipulation, fraud and malicious mischief; identifying fraudulent or erroneous changes to the voting system; and protecting the secrecy in the voting process.

4.1.1 Rationale for 'Not Applicable' Requirements

All requirements that were excluded from the previous test campaign (D-Suite 5.5) were also deemed not applicable to this test campaign due to the submitted modifications not impacting the specific requirements. These requirements are identified below:

- Volume I, Section 6.2.6 (Telecommunications Requirements: Integrity)
- Volume I, Section 7.5.2-7.5.4 (Security: Protection Against External Threats, Monitoring and Responding to External Threats, and Shared Operating Environment)
- Volume I, Section 7.6 (Use of Public Communications Networks)
- Volume I, Section 7.7 (Wireless Communications)

The rationale for not evaluating the D-Suite 5.5-B to the indicated sections is described in following table. Specific requirements that are excluded from this test campaign are identified in the EAC spreadsheet.

Table 4-1. Not Applicable Requirements

EAC 2005 VVSG Version 1 Volume I, Section	Rationale for 'Not Applicable'
6.2.6	These requirements are written for use of public networks. The D-Suite 5.5-B does not utilize public networks.
7.5.2-7.5.4	These requirements are written for use of public networks. The D-Suite 5.5-B does not utilize public networks.
7.6	D-Suite 5.5-B does not support transmission over public networks.
7.7	No wireless technology is utilized in this system.

4.2 Hardware Configuration and Design

The hardware configuration and design for the modification has changed from the baseline system. The ImageCast Evolution (ICE) has been added to the system configuration. Also, the InoTec HiPro 821 Scanner and the Canon imageFORMULA DR-M260 Scanner are newly introduced COTS document scanners for use with the ICC. Additionally, the ICP2 has been added to this configuration.

4.3 Software System Functions

The software system functions for the previously certified voting system (D-Suite 5.5) remain unchanged for the submitted modifications. An update to the ICC was presented for evaluation, along with the ICE and ICPs firmware applications, which are new to this configuration.

4.4 Test Case Design

Test cases are designed based on the manufacturer's design specifications and the relevant technical requirements set forth by the VVSG. Test cases shall be based on the following aspects of the voting system:

- Hardware qualitative examination design
- Hardware environmental test case design
- Software module test case design and data
- Software functional test case design
- System level test case design

Test cases shall provide information regarding the sequence of actions to be performed for the execution of a test, the requirements being met, the test objective, test configuration, equipment needed, special requirements, assumptions, and pass/fail criteria. Once the test cases are finalized, they will be validated and published for use in the test campaign. The validation of the test case will be accomplished by technical review and approval. This validation will include the following: confirmation of adequate test coverage of all requirements; confirmation that test case results are not ambiguous and gave objective pass/fail criteria; and confirmation that any automated test suites will produce valid results.

4.4.1 Hardware Qualitative Design

Previous hardware examinations were performed on the certified baseline system (D-Suite 5.5). The ICX BMD, ICX DRE, ICP, ICP2, and the ICX DRE with VVPAT hardware testing will be re-used from the previous certification test campaign (D-Suite 5.5-B). The full suite of hardware and electrical testing (as listed below) will be performed on the ICE and ICP2components of the D-Suite 5.5-B System. The Canon M260 and InoTec HiPro Scanner components will be subjected to Temperature-Power Variation Testing only.

Electrical Tests:

- Electrical Power Disturbance
- Electromagnetic Radiation
- Electrostatic Disruption
- Electromagnetic Susceptibility
- Electrical Fast Transient
- Lightning Surge
- Conducted RF Immunity
- Magnetic Fields Immunity
- Electrical Supply

Environmental Tests:

- Bench Handling

- Vibration
- Low Temperature
- High Temperature
- Humidity
- Temperature Power Variation
- Acoustic

4.4.2 Hardware Environmental Test Case Design

The voting system hardware shall be subjected to the tests specified in Section 4.4.1. Testing will be performed by personnel verified by Pro V&V to be qualified to perform the test. Pro V&V will utilize third-party test facilities for performance of the electrical and environmental tests. Environmental and Electrical will be performed at the NTS Longmont facility located in Longmont, Colorado. All pre and post operational status checks shall be conducted by Pro V&V personnel.

4.4.3 Software Module Test Case Design and Data

Pro V&V shall review the manufacturer's program analysis, documentation, and module test case design and shall evaluate the test cases for each module with respect to flow control parameters and entry/exit data. As needed, Pro V&V shall design additional test cases to satisfy the coverage criteria specified in Volume II, Section 7.2.1.

Component Level Testing will be implemented during the FCA for each component and subcomponent. During the Source Code Review, Compliance Builds, and Security Testing, Pro V&V will utilize limited structural-based techniques (white-box testing). Additionally, specification-based techniques (black-box testing) will be utilized for the individual software components.

Pro V&V shall define the expected result for each test and the ACCEPT/REJECT criteria for certification. If the system performs as expected, the results will be accepted.

If the system does not perform as expected, an analysis will be performed to determine the cause. The test will be repeated in an attempt to reproduce the results. If the failure can be reproduced and the expected results are not met, the system will have failed the test. If the results cannot be reproduced, the test will continue. All errors encountered will be documented and tracked through resolution.

4.4.4 Software Functional Test Case Design and Data

Pro V&V shall review the manufacturer-submitted test plans and data to verify that the individual performance requirements specified in the EAC 2005 VVSG and the TDP are reflected in the software. As part of this process, Pro V&V shall review the manufacturer's test case design and prepare a detailed matrix of system functions and the test cases that exercise them. Pro V&V shall also prepare a test procedure describing all test ballots, operator procedures, and the data content

of output reports. Pro V&V shall define abnormal input data and operator actions and then design test cases to verify that the system is able to handle and recover from these abnormal conditions. During this review, emphasis shall be placed on those functions where the manufacturer data on module development, such as the system release notes and comments within the source code, reflects significant debugging problems, and on functional tests that resulted in high error rates.

Pro V&V shall define the expected result for each test and the ACCEPT/REJECT criteria for certification. If the system performs as expected, the results will be accepted.

If the system does not perform as expected, an analysis will be performed to determine the cause. The test will be repeated in an attempt to reproduce the results. If the failure can be reproduced and the expected results are not met, the system will have failed the test. If the results cannot be reproduced, the test will continue. All errors encountered will be documented and tracked through resolution.

4.4.5 System-Level Test Case Design

System Level testing will be implemented to evaluate the complete system. This testing will include all proprietary components and COTS components (software, hardware, and peripherals) in a configuration of the system's intended use. For software system tests, the tests shall be designed according to the stated design objective without consideration of its functional specification. The system level hardware and software test cases shall be prepared independently to assess the response of the hardware and software to a range of conditions.

4.5 Security Functions

The objective of the Security Testing is to evaluate the effectiveness of the voting system in detecting, preventing, recording, reporting, and recovering from security threats. To evaluate the integrity of the system, Pro V&V shall develop specifically designed test cases in an attempt to defeat the access controls and security measures documented in the system TDP. The submitted threat matrix identifying the system's risks and vulnerabilities shall be evaluated for completeness and to determine that mitigating controls are adequately implemented.

An evaluation of the system shall be accomplished by utilizing a combination of functional testing and source code review. All findings will be reported to the EAC and DVS. The test methods for performing the Security Testing are execution and review. Prior to performance of Security testing, the examiner will verify that security hardening scripts have been properly applied to system components per the system documentation. The examiner will review the submitted TDP to verify that documented access and physical controls are in place. Following the documented procedures, the examiner will configure the voting system for use and functionality to verify that the documented controls are in place and adequate and meet the stated requirements.

Physical Security will be tested by setting up the system as described in the TDP and then examining the effectiveness and comprehensiveness of physical security measures. Administrative Security will be tested by examining the system's documented security instructions and procedures for effectiveness and breadth. Logical security will be tested as part

of FCA testing by a recognized security expert who not only will review the physical and administrative testing outcomes, but will perform the following tests on system components: Vulnerability Scans, SCAP Scans, and Physical Bypass Attempts. Logical security testing will assess the effectiveness of the security hardening scripts applied during the system setup and install process.

4.6 TDP Evaluation

In order to determine compliance of the modified TDP documents with the EAC 2005 VVSG, a limited TDP review shall be conducted. This review will focus on TDP documents that have been modified since the certification of the baseline system. The review will consist of a compliance review to determine if each regulatory, state, or manufacturer-stated requirement has been met based on the context of each requirement. Results of the review of each document will be entered on the TDP Review Checklist and reported to the manufacturer for disposition of any anomalies. This process will be ongoing until all anomalies are resolved.

Any revised documents during the TDP review process will be compared with the previous document revision to determine changes made, and the document will be re-reviewed to determine whether subject requirements have been met. A listing of all documents contained in the D-Suite 5.5-B TDP is provided in Table 4-2.

Table 4-2. TDP Documents

Document Number	Description	Version
Adjudication Documents		
2.05	Democracy Suite Adjudication Software Design and Specification	5.5-B::122
2.08	Democracy Suite Adjudication System Operation Procedures	5.5-B::170
2.09	Democracy Suite Adjudication System Maintenance Manual	5.5-B::102
D-Suite Documents		
2.02	Democracy Suite System Overview	5.5-B::172
2.06	Democracy Suite System Security Specification	5.5-B::574
2.07	Democracy Suite System Test and Verification	5.5-B::196
2.10	Democracy Suite Personnel Deployment and Training Requirements	5.5-B::132
2.11	Democracy Suite Configuration Management Process	5.5-B::396
2.12	Democracy Suite Quality Assurance Program	5.5-B::160
2.13	Democracy Suite System Change Notes	5.5-B::173
EMS Documents		
2.03	Democracy Suite EMS Functional Description	5.5-B::383
2.05	Democracy Suite EMS Software Design and Specification	5.5-B::329
2.08	Democracy Suite EMS System Operations Procedures	5.5-B::727

Table 4-2. TDP Documents *(continued)*

Document Number	Description	Version
2.09	Democracy Suite EMS System Maintenance Manual	5.5-B::148
---	Democracy Suite EMS System Installation and Configuration Procedure	5.5-B::349
ImageCast Central Documents		
2.03	Democracy Suite ImageCast Central Functionality Description	5.5-B::191
2.05	Democracy Suite ImageCast Central Software Design and Specification	5.5-B::125
2.08	Democracy Suite ImageCast Central System Operation Procedures	5.5-B::213
---	Democracy Suite ImageCast Central Installation and Configuration Procedure	5.5-B::203
ImageCast Evolution Documents		
2.03	Democracy Suite ImageCast Evolution Functionality Description	5.5-B::120
2.04	Democracy Suite ImageCast Evolution System Hardware Specifications	5.5-B::332
2.05	Democracy Suite ImageCast Evolution Software Design and Specifications	5.5-B::175
2.08	Democracy Suite ImageCast Evolution System Operation Procedures	5.5-B::241
2.09	Democracy Suite ImageCast Evolution System Maintenance Manual	5.5-B::165
ImageCast Precinct Documents		
2.03	Democracy Suite ImageCast Precinct Functionality Description	5.5-B::182
2.04	Democracy Suite ImageCast Precinct System Hardware Specification	5.5-B::153
2.04.1	Democracy suite ImageCast Precinct System Hardware Characteristics	5.5-B::98
2.05	Democracy Suite ImageCast Precinct Software Design and Specification	5.5-B::155
2.08	Democracy Suite ImageCast Precinct System Operation Procedures	5.5-B::277
2.09	Democracy Suite ImageCast Precinct System Maintenance Manual	5.5-B::125
ImageCast Precinct2 Documents		
2.03	Democracy Suite ImageCast Precinct 2 Functionality Description	5.5-B::10
2.04	Democracy Suite ImageCast Precinct 2 System Hardware Specifications	5.5-B-11
2.05	Democracy Suite Imagecast Precinct 2 Software Design and Specifications	5.5-B::16
2.08	Democracy Suite Imagecast Precinct 2 System Operation Procedures	5.5-B::10
2.09	Democracy Suite Imagecast Precinct 2 System Maintenance Manual	5.5-B::9
ImageCast X Documents		

Table 4-2. TDP Documents *(continued)*

Document Number	Description	Version
2.03	Democracy Suite ImageCast X Functionality Description	5.5-B::97
2.05	Democracy Suite ImageCast X Software Design and Specification	5.5-B::98
2.08	Democracy Suite ImageCast X System Operation Procedures	5.5-B::85
---	Democracy Suite ImageCast X System Installation and Configuration	5.5-B::87
2.09	Democracy Suite ImageCast X System Maintenance Manual	5.5-B::76
User Guides		
---	Democracy Suite ImageCast Adjudication User Guide	5.5-B::141
---	Democracy Suite Election Data Translator User Guide	5.5-B::89
---	Democracy Suite EMS Audio Studio User Guide	5.5-B::38
---	Democracy Suite EMS Election Event Designer User Guide	5.5-B::339
---	Democracy Suite EMS Results Tally and Reporting User Guide	5.5-B::145
---	Democracy Suite ImageCast Central User Guide	5.5-B::137
---	Democracy Suite ImageCast Precinct User Guide	5.5-B::56
---	Democracy Suite ImageCast Voter Activation User Guide	5.5-B::53
---	Democracy Suite ImageCast X User Guide	5.5-B::252
---	Democracy Suite ImageCast Precinct 2 User Guide	5.5-B::6
---	Canon imageFORMULA DR-M160II User Manual	---
---	Canon imageFORMULA DR-M260 User Manual	---
---	Canon imageFORMULA DR-G1130 DR-G1100 User Manual	---
---	HiPro User Manual	1.2
Supplementary Documents		
----	Common Industry Format for Usability Test Report ImageCast X 5.2 with VVPAT	5.5::1
---	Dell Latitude E7450 Owner's Manual	Rev. A00
---	SID-15V-Z37-A1R User Manual	Rev. 1.0
---	SID-21V-Z37-A1R User Manual	Rev. 1.0
---	Cyber Acoustics ACM-70B Stereo Headphones Product Sheet	---
---	Democracy Suite ImageCast C++ Coding Standard	5.5-B::59
---	Democracy Suite C# Automated Code Review Process	5.5-B::54
---	Dell Latitude E7450/Latitude 7450 Regulatory Compliance Sheet	Rev. A09
---	Dell OptiPlex 9020 AIO Regulatory Compliance Sheet	Rev. A09

Table 4-2. TDP Documents *(continued)*

Document Number	Description	Version
---	Dell OptiPlex 9030 AIO Regulatory Compliance Sheet	Rev. A09
---	Dell Networking X-Series Specification Sheet	Ver. 1.9
---	Dell OptiPlex 9020 All-in-One Technical Specification Sheet	---
---	Dell OptiPlex 9030 All-in-One Technical Specification Sheet	---
---	Dell OptiPlex 3050 All-in-One Technical Specification Sheet	---
---	Google Java Style Dominion XML	---
---	Dominion Voting Systems Java Coding Standards	1.0
---	Dominion Voting Systems JavaScript Coding Standards	1.0
---	ICX Machine Configuration File (MCF) Parameters Settings	5.5-B::31
---	Democracy Suite ImageCast Device Configuration Files	5.5-B::105
---	Democracy Suite ImageCast Printing and Finishing Specification	5.5-B::99
---	Democracy Suite ImageCast Total Results File Format	5.5-B::62
---	Democracy Suite ImageCast Election Definition Files	5.5-B::88
---	Democracy Suite ImageCast Precinct Extracting Firmware Contents	5.5-B::41
---	Democracy Suite ImageCast Precinct Firmware Update Procedure	5.5-B::68
---	Democracy Suite ImageCast Precinct Level One (L1) Maintenance Manual	5.5-B::67
---	Democracy Suite ImageCast Precinct Technical Guide	5.5-B::57
---	Usability Test Report of ImageCast Precinct 5.0 with 36 Participants for VVSG 1.0	5.0::10
---	Usability Test Report of ImageCast X 5.0 with 36 Participants for VVSG 1.0	5.0::13
---	YEDU.E95462 Uninterruptible Power-supply Equipment Sheet	---
---	Dell Latitude E7440 Regulatory Compliance Sheet	Rev. A09
---	Dell Latitude 3480 Regulatory Compliance Sheet	Rev. A11
---	Dell PowerEdge R630 Regulatory Compliance Sheet	Rev. A10
---	Dell Precision T1700 MT Regulatory Compliance Sheet	Rev. A09
---	Dell PowerConnect 2808 Product Safety. EMC, and Environmental Datasheet	---
---	Dell PowerConnect 2816 Product Safety. EMC, and Environmental Datasheet	---
---	Smart Pro SM1500 Datasheet	---
---	APC Smart-UPS 230V Product Information Sheet	---
---	HP M402dn Datasheet	Rev. 2

Table 4-2. TDP Documents *(continued)*

Document Number	Description	Version
---	HP M402dne Datasheet	May 2017
---	Dell Latitude 3480 Owner's Manual	Rev. A00
---	Dell Latitude 3470 Owner's Manual	Rev. A00
---	Dell Precision T3420 Owner's Manual	Rev. A00
---	aValue HID-21V-BTX-A1R User Manual	Rev. 2.0
---	aValue SID-15V-Z37-A1R Data Sheet	---
---	aValue SID-21V-Z37-A1R Data Sheet	---
---	APC Installation and Operation Back-UPS Pro BR1000G	10/2014
---	APC Smart-UPS SMT1500 Operation Manual	03/2013
---	Dell OptiPlex 7440 All-In-One Owner's Manual	Rev. A01
---	Dell OptiPlex 3050 All-In-One Owner's Manual	Rev. A01
---	Dell P2417H Monitor User's Guide	Rev. A01
---	Dell PowerEdge R630 Owner Manual	Rev. A03
---	Lexar Pro USB 3 Dual Slot Reader	---
---	Usability Study of Dominion Voting Systems ImageCast Evolution Versions 4.1.1.1 and 4.6.1.1	1.0.0::37
---	Democracy Suite ImageCast Evolution Firmware Installation Procedure	5.5-B::96
---	Democracy Suite ImageCast Evolution Level One (L1) Maintenance Manual	5.5-B::134
---	Democracy Suite ImageCast Evolution Machine Behavior Settings	5.5-B::96
---	Seiko SII RP-D10 Series User's Guide	Jan. 2018
---	Dell EMC PowerEdge R640 Installation and Service Manual	Rev. A01
---	Dell OptiPlex 7060 Small Form Factor Service Manual	Rev. A00
---	Dell Latitude E7470 Owner's Manual	Rev. A02
---	APC Operation Manual Smart-UPS 750/1000/1500/2200/3000 VA	---
---	ACR38x CCID Smart Card Reader Reference Manual	V6.05
---	ACR39 Series PC-linked Smart Card Readers Reference Manual	V1.04
---	Ablenet Single Switch Quickstart Guide	---
---	The Programing Group High-Integrity C++Coding Standard Manual	Ver. 2.2
---	HIC++ Standards Model for C++	9.5.4
---	Dominion Voting Voter-verified paper audit trail (VVPAT) Model: VRP3 User Manual Safety Precautions	07 2018

Table 4-2. TDP Documents *(continued)*

Document Number	Description	Version
---	Democracy Suite ImageCast Precinct 2 Machine Behavior Settings	5.5-B::10
---	APC Smart-UPS 1500 Specification Sheet	---
---	Democracy Suite ImageCast Precinct 2 Extracting Firmware Contents and Verifying SHA256 Values	5.5-B::13
---	Democracy Suite ImageCast Precinct 2 Level One (L1) Maintenance Manual	5.5-B::9
---	APC Back-UPS BE600M1 User Manual	09/2015
---	APC Back-UPS SMT1500C Operation Manual	01/2017
---	Avalue HID-21V-BTX FactSheet (---)	---
---	Avalue SID 21V Quick Reference	Feb 2018
---	Dell Latitude 3490 Owners Manual	Rev. A01
---	Dell OptiPlex 3050 AIO EMC Emissions Compliance Sheet	Rev. A11
---	Dell Latitude 3400 Setup and Specification Guide	Rev. A00
---	Dell PowerEdge R640 Technical Guide	Rev. A00
---	Dell Networking X Series User Guide	Rev. A06
---	Dell P2419H Monitor User's Guide	Rev. A05
---	DisplayLink DL 125 Product Brief	---
---	HIC Coding Standard	2.2
---	Kingston USB 3.0 High-Speed Media Reader Datasheet	---
---	Lenovo ThinkCentre TIO24Gen3Touch Monitor User Guide	May 2017
---	Dell Optiplex 7050 Tower Owners Manual (A01)	Rev. A01
---	Dell Optiplex 7060 Small Form Factor Service Manual	Rev. A00
---	Dell Optiplex 7060 Tower Setup and Specifications Guide	Rev. A01
---	Dell Precision 3430 Small Form Factor Service Manual	Rev. A00
---	Dell Precision 3430 Small Form Factor Setup and Specifications Guide	Rev. A00
---	Scamax 8x1 Scanner Brochure	---
---	Tripp Lite SmartPro SM1500RMXL2UTAA Datasheet	---
Build Documents		
---	Democracy Suite ImageCast Evolution Firmware Build, Prerequisite Setup and Installation	5.5-B::95
---	Democracy Suite ImageCast Precinct Firmware Build and Install	5.5-B::90
---	Democracy Suite ImageCast X Build	5.5-B::55

Table 4-2. TDP Documents *(continued)*

Document Number	Description	Version
---	Democracy Suite Windows Build Document	5.5-B::40
---	Democracy Suite ImageCast Precinct 2 Build Environment and Prerequisite Setup, Firmware Build and Installation	5.5-B::24

4.7 Source Code Review

Pro V&V will review the submitted source code to the EAC 2005 VVSG and the manufacturer-submitted coding standards. Prior to initiating the software review, Pro V&V shall verify that the submitted documentation is sufficient to enable: (1) a review of the source code and (2) Pro V&V to design and conduct tests at every level of the software structure to verify that design specifications and performance guidelines are met.

For the ICE software, a combination of Automated Source Code Review and Manual Source Code Review methods will be used to review the source code. For all other components, the submitted source code will be compared to the previously certified Democracy Suite 5.5 voting system versions to determine the changes, if any. A combination of Automated Source Code Review and Manual Source Code Review methods will then be used to review the changes in the source code. In addition, 10% of the source code comments will be manually reviewed.

4.8 QA and CM System Review

The Dominion Voting Systems Quality and Configuration Management Manuals shall be reviewed for their fulfillment of Volume I, Sections 8 and 9, and the requirements specified in Volume II, Section 2. The requirements for these sections establish the quality assurance and configuration standards for voting systems to which manufacturers must conform and require voting system manufacturers to implement a quality assurance and configuration management program that is conformant with recognized ISO standards. As part of the review process, the Dominion TDP documents will be reviewed to determine if the stated policies are being followed.

4.9 Physical Configuration Audit (PCA)

The Physical Configuration Audit (PCA) compares the voting system components submitted for qualification to the manufacturer's technical documentation, and shall include the following activities:

- Establish a configuration baseline of software and hardware to be tested; confirm whether manufacturer's documentation is sufficient for the user to install, validate, operate, and maintain the voting system
- Verify software conforms to the manufacturer's specifications; inspect all records of manufacturer's release control system; if changes have been made to the baseline version, verify manufacturer's engineering and test data are for the software version submitted for certification

- If the hardware is non-COTS, Pro V&V shall review drawings, specifications, technical data, and test data associated with system hardware to establish system hardware baseline associated with software baseline

- Review manufacturer's documents of user acceptance test procedures and data against system's functional specifications; resolve any discrepancy or inadequacy in manufacturer's plan or data prior to beginning system integration functional and performance tests

- Subsequent changes to baseline software configuration made during testing, as well as system hardware changes that may produce a change in software operation are subject to re-examination

4.10 Functional Configuration Audit (FCA)

The Functional Configuration Audit (FCA) encompasses an examination of manufacturer's tests, and the conduct of additional tests, to verify that the system hardware and software perform all the functions described in the manufacturer's documentation submitted in the TDP. In addition to functioning according to the manufacturer's documentation tests will be conducted to ensure all applicable EAC 2005 VVSG requirements are met.

4.11 Accuracy

The accuracy test ensures that each component of the voting system can each process 1,549,703 consecutive ballot positions correctly within the allowable target error rate. The Accuracy test is designed to test the ability of the system to "capture, record, store, consolidate and report" specific selections and absences of a selection. The required accuracy is defined as an error rate. This rate is the maximum number of errors allowed while processing a specified volume of data.

In an effort to achieve this and to verify the proper functionality of the units under test, the following methods will be used to test components of the voting system:

For paper-based voting systems the ballot positions on a paper ballot must be scanned to detect selections for individual candidates and contests and the conversion of those selections detected on the paper ballot converted into digital data. The accuracy requirements for the ICE and the ICC units will be met by the execution of the standard accuracy test utilizing pre-marked and hand-marked ballots of each ballot length supported by the system, and ballots produced by the ICX BMD.

The ICE and ICC units will be tested by utilizing a combination of hand marked (70%) and pre-marked (30%) ballots to achieve an accuracy rate greater than 1,549,703 correct ballot positions.

The ICX BMD, ICX DRE, ICP, and the ICX DRE with VVPAT Accuracy test will be reused from the Dominion 5.5 EAC Campaign

4.12 Volume & Stress

Tests to investigate the system's response to conditions that tend to overload the system's capacity to process, store, and report data. The test parameters will focus on the system's stated limits and the ballot logic for areas such as the maximum number of active voting positions, maximum number of ballot styles, maximum candidates, maximum contests, and stated limits within the EMS. This test will be utilized to ensure the system can achieve the manufacturer's TDP claims of what the system can support. Testing will be performed by exercising an election definition and test cases developed specifically to test for volume and stress conditions of the system being tested.

4.13 System Integration

System Integration is a system level test for the integrated operation of both hardware and software. It evaluates the compatibility of the voting system software components or subsystems with one another, and with other components of the voting system environment. This is determined through functional tests integrating the voting system software with the remainder of the system. During this area of testing, the system shall be configured exactly as it would for normal field use. This includes connecting all supporting equipment and peripherals including ballot boxes, voting booths (regular and accessible), and any physical security equipment such as locks and ties.

Pro V&V personnel shall properly configure and test the system by following the procedures detailed in the D-Suite 5.5-B voting system technical documentation.

5.0 TEST DATA

The following subsections provide information concerning test data recording, criteria, and reduction.

5.1 Test Data Recording

All equipment utilized for test data recording shall be identified in the test data package. The output test data shall be recorded in an appropriate manner as to allow for data analysis. For source code and TDP reviews, results shall be compiled in reports and submitted to Dominion for resolution.

5.2 Test Data Criteria

The D-Suite 5.5-B Voting System shall be evaluated against all applicable requirements contained in the EAC 2005 VVSG. The acceptable range for system performance and the expected results for each test case shall be derived from the manufacturer-submitted technical documentation and the EAC 2005 VVSG.

6.0 TEST PROCEDURE AND CONDITIONS

The following subsections detail the facility requirements, test setup conditions, and sequence of testing.

6.1 Facility Requirements

Unless otherwise annotated, all testing shall be conducted at the Pro V&V test facility located in Huntsville, AL, by personnel verified by Pro V&V to be qualified to perform the test.
Unless otherwise specified herein, testing shall be performed at the following standard ambient conditions and tolerances:

- Temperature: 68-75◦ F (±3.6◦F)
- Relative Humidity: Local Site Humidity
- Atmospheric Pressure: Local Site Pressure
- Time Allowable Tolerance: ±5%

Testing performed at third-party laboratories will be subjected to the test parameters and tolerances defined by the test facility and will be reported in the final Test Report.

6.2 Test Set-up

All voting system equipment shall be received and documented using Pro V&V proper QA procedures. Upon receipt of all hardware, an inspection will be performed to verify that the equipment received is free from obvious signs of damage and/or degradation that may have occurred during transit. If present, this damage shall be recorded, photographed, and reported to the Dominion Representative. Additionally, a comparison shall be made between the recorded serial numbers/part numbers and those listed on shipper's manifest and any discrepancies shall be reported to the Dominion Representative. TDP items and all source code received shall be inventoried and maintained by Pro V&V during the test campaign.

During test performance, the system shall be configured as it would be for normal field use. This includes connecting all supporting equipment and peripherals.

6.3 Test Sequence

The D-Suite 5.5-B Voting System will be evaluated against all applicable requirements in the EAC 2005 VVSG. There is no required sequence for test performance.

6.4 Test Operations Procedure

Pro V&V will identify PASS/FAIL criteria for each executed test case. The PASS/FAIL criteria will be based on the specific expected results of the system. In the case of an unexpected result that deviates from what is considered standard, normal, or expected, a root cause analysis will be performed.

Pro V&V will evaluate every EAC 2005 VVSG requirement applicable to the Democracy Suite 5.5-B voting system. Any deficiencies noted will be reported to the EAC and the manufacturer. If it is determined that there is insufficient data to determine compliance, this test plan will be altered and additional testing will be performed.

APPENDIX A

PROJECT SCHEDULE

Task Name	Start Date	End Date	Duration
TDP	**02/11/19**	**06/03/19**	**80d**
Initial Review	02/11/19	03/04/19	16d
Compliance Review	03/05/19	05/28/19	60d
Final review	05/29/19	06/03/19	4d
TRR	02/12/19	02/13/19	2d
Test Plan	**02/11/19**	**05/16/19**	**69d**
Test Plan Creation	03/04/19	03/20/19	13d
Vendor Review & Comments	03/21/19	03/27/19	5d
EAC Submission & Review	03/28/19	04/24/19	20d
EAC Comment Review & Update	04/25/19	04/30/19	4d
EAC Submission & Review of Revision	05/01/19	05/14/19	10d
EAC Approved Test Plan	05/15/19	05/16/19	2d
Source Code Review	**02/11/19**	**04/10/19**	**43d**
Source Code Delivered	02/19/19	02/19/19	1d
Source Code Review Automated	02/20/19	02/20/19	1d
Source Code Review Manual	02/20/19	03/05/19	10d
Source Code Re-Review	03/06/19	03/06/19	1d
Document Review	03/07/19	03/07/19	1d
Compliance Build	03/08/19	03/11/19	2d
System Delivery & Setup	**03/12/19**	**04/26/19**	**34d**
Equipment Delivered	03/18/19	04/26/19	30d
PCA	03/18/19	04/26/19	30d
System Setup Loads & Hardening	03/12/19	04/26/19	34d
Hardware Testing	**02/15/19**	**05/15/19**	**64d**
Electrical Testing (ICE) - TUV	02/15/19	02/21/19	5d
Environmental Testing (ICE) - NTS	02/19/19	03/08/19	14d
Temp Power(ICE, M260,&HiPro)-NTS	03/11/19	03/15/19	5d
Temp Power (HiPro) - NTS	04/15/19	04/19/19	5d
Maintainability	05/14/19	05/14/19	1d
Acoustic Test	05/15/19	05/15/19	1d
System Level Testing	**03/25/19**	**05/23/19**	**44d**
FCA	03/25/19	04/26/19	25d
Security	04/29/19	04/30/19	2d
Usability	04/29/19	04/30/19	2d
Accessibility	05/01/19	05/01/19	1d
Volume & Stress	05/02/19	05/08/19	5d
Accuracy	05/09/19	05/13/19	3d
Regression Testing	05/14/19	05/14/19	1d
Trusted Build	05/15/19	05/16/19	2d
System Integration	05/17/19	05/23/19	5d

Test Report	**05/17/19**	**07/24/19**	**46d**
Test Report Creation	05/17/19	05/29/19	8d
Vendor Review & Comments	05/30/19	05/31/19	2d
EAC Submission & Review	06/03/19	06/28/19	20d
EAC Comment Review & Update	07/01/19	07/08/19	4d
EAC Submission & Review of Revision	07/09/19	07/22/19	10d
EAC Approved Test Report	07/23/19	07/24/19	2d

700 Boulevard South
Suite 102
Huntsville, AL 35802
Phone (256)713-1111
Fax (256)713-1112

Test Report for EAC 2005 VVSG Certification Testing Dominion Voting Systems Democracy Suite (D-Suite) Version 5.5-B Voting System

EAC Project Number: DVS-DemSuite5.5-B

Version: Rev. 02

Date: 08/21/2019

EAC Lab Code 1501

NVLAP LAB CODE 200908-0

SIGNATURES

Approved by: _____ 8/21/19
Michael Walker, VSTL Project Manager — Date

Approved by: _____ 8/21/19
Wendy Owens, VSTL Program Manager — Date

REVISIONS

Revision	Description	Date
00	Initial Release	08/05/2019
01	Updated with EAC Comments	08/20/2019
02	Added ECO information to section 2.2.1.2	08/21/2019

TABLE OF CONTENTS

1.0 INTRODUCTION **1**

1.1 Description and Overview of EAC System Being Modified 1

1.2 References 14

1.3 Terms and Abbreviations 14

2.0 CERTIFICATION TEST BACKGROUND 15

2.1 Revision History 15

2.2 Scope of Testing 16

2.2.1 Modification Overview 17

2.2.1.1 Detailed List of Changes 17

2.2.1.2 ECO Assessment 17

2.2.2 Block Diagram 19

2.2.3 System Limits 20

2.2.4 Supported Languages 21

2.2.5 Supported Functionality 22

2.2.6 VVSG 22

2.2.7 RFIs 22

2.2.8 NOCs 23

3.0 TEST FINDINGS AND RECOMMENDATION 23

3.1 Summary Findings and Recommendation 23

3.1.1 Physical Configuration Audit (PCA) 23

3.1.2 TDP Review 24

3.1.3 QA & CM System Review 30

3.1.4 Source Code Review, Compliance Build, Trusted build, and Build Documentation Review 30

3.1.5 Security Testing 31

3.1.6 System Level Testing 31

3.1.6.1 Functional Configuration Audit (FCA) 32

3.1.6.2 Volume & Stress 33

3.1.6.3 Accuracy 34

3.1.6.4 System Integration 34

3.1.7 Usability and Accessibility Testing 35

3.1.8 Hardware Testing 36

3.2 Anomalies and Resolutions 39
3.3 Deficiencies and Resolutions 39
4.0 RECOMMENDATION FOR CERTIFICATION 39

ATTACHMENT A HARDWARE TEST REPORTS A-1
ATTACHMENT B AS-RUN TEST PLAN B-1

1.0 INTRODUCTION

The purpose of this Test Report is to document the procedures that Pro V&V, Inc. followed to perform certification testing during a system modification campaign for the Dominion Voting Systems Democracy Suite (D-Suite) 5.5-B Voting System to the requirements set forth for voting systems in the U.S. Election Assistance Commission (EAC) 2005 Voluntary Voting System Guidelines (VVSG), Version 1.0. Certification testing of D-Suite 5.5-B was performed to ensure the applicable requirements of the EAC VVSG 1.0 and the EAC Testing and Certification Program Manual, Version 2.0 were met. Additionally, all EAC Request for Interpretations (RFI) and Notices of Clarification (NOC) relevant to the system under test were incorporated in the test campaign.

Prior to submitting the voting system for testing, Dominion Voting Systems submitted an application package to the EAC for certification of the D-Suite 5.5-B Voting System. The application was accepted by the EAC and the project was assigned the unique Project Number of DVS-DemSuite5.5-B.

1.1 Description and Overview of EAC Certified System Being Modified

The EAC Certified System that is the baseline for the submitted modification is described in the following subsections. All information presented was derived from the previous Certification Test Report, the EAC Certificate of Conformance and/or the System Overview.

The D-Suite 5.5-B Voting System is a paper-based optical scan voting system with a hybrid paper/DRE option consisting of the following major components: The Election Management System (EMS), the ImageCast Central (ICC), the ImageCast Precinct (ICP and ICP2), the ImageCast X (ICX) DRE w/ Reports Printer, ImageCast X (ICX) DRE w/VVPAT, the ImageCast Evolution (ICE), and the ImageCast X (ICX) BMD. The D-Suite 5.5-B Voting System configuration is a modification from the EAC approved D-Suite 5.5 system configuration.

The following subsections describe the baselined D-Suite 5.5 Voting System.

Election Management System (EMS)

The D-Suite 5.5 EMS consists of various components running as either a front-end/client application or as a back-end/server application. A listing of the applications and a brief description of each is presented below.

Front-end/Client applications:

- EMS Adjudication: Represents the client component responsible for adjudication, including reporting and generation of adjudicated result files from ImageCast Central tabulators and adjudication of write-in selections from ImageCast Precinct and ImageCast Central tabulators. This client component is installed on both the server and the client machines.

- EMS Audio Studio: A client application that represents an end-user helper application used to record audio files for a given election project. As such, it is utilized during the pre-voting phase of the election cycle.

- EMS Election Data Translator: End-user application used to export election data from election project and import election data into election project.

- EMS Election Event Designer: A client application that integrates election definition functionality together with ballot styling capabilities and represents a main pre-voting phase end-user application

- ImageCast Voter Activation: An application, installed on a workstation or laptop at the polling place, which allows the poll workers to program smart cards for voters. The smart cards are used to activate voting sessions on ImageCast X.

- EMS Results Tally and Reporting: A client application that integrates election results acquisition, validation, tabulation, reporting, and publishing capabilities and represents the main post-voting phase end-user application.

Back-end/Server applications:

- EMS Adjudication Service: Represents a server side application which provides ballot information such as contests, candidates and their coordinates from EMS to the Adjudication application.

- EMS Application Server: Represents a server side application responsible for executing long running processes, such as rendering ballots, generating audio files and election files, etc.

- EMS Database Server: Represents a server side RDBMS repository of the election project database which holds all the election project data, including pre-voting and post-voting data.

- EMS Data Center Manager: A server application that represents a system level configuration application used in EMS back-end data center configuration.

- EMS File System Service: A back-end application that acts as a stand-alone service that runs on client machines, enabling access to low level operating system API for partitioning CF cards, reading raw partition on ICP CF card, etc.

- EMS NAS Server: Represents a server side file repository of the election project file based artifacts, such as ballots, audio files, reports, log files, election files, etc.

- Smart Card Helper Service: A service that is installed on a workstation or laptop at the polling place, and provides required data format for programming smart cards for ImageCast devices, or, for jurisdiction's voting registration system in case of integration.

ImageCast Precinct (ICP)

The ICP device is a hybrid precinct optical scan paper/DRE ballot counter designed to provide six major functionalities: ballot scanning, second chance voting, accessible voting, ballot review, tabulation, and poll worker functions.

For ballot scanning functionality the ICP scans marked paper ballots, interprets voter marks on the paper ballots and stores the ballots for tabulation when the polls are closed.

Second Chance voting refers to scenarios in which an error has been detected on the voter's paper ballot (e.g., blank ballot, undervoted ballot, overvoted ballot, misread ballot, cross-over voted ballot), and the ICP notifies the voter by displaying a message or providing an audio visual cue, that one of these situations has been detected, and offers the voter an opportunity to reject and fix their ballot, or to cast the ballot as-is.

Accessible voting allows voters with disabilities to listen to an audio representation of a ballot and use a hand held controller called an Audio Tactile Interface (ATI) to make vote selections, which are then saved directly to the ICP when the voter casts their Accessible Voting ballot.

The Ballot Review feature allows a voter to review their vote selections using an audio or visual representation, which displays or presents the voter with a complete listing of all contests contained on the ballot and an indication of the results which will be recorded for each contest once the voter's ballot is cast.

The Tabulation of paper ballots and Accessible Voting ballots cast by voters is performed when the polls are closed on the ICP unit and the unit tabulates the results, generates results files for aggregation into RTR, and prints a results report containing the results of the ballots cast.

For poll worker functions the ICP contains a small touch-screen LCD to allow the poll worker to initiate polling place activities, diagnostics and reports.

ImageCast Central (ICC) Count Scanner

The ICC is a high-speed, central ballot scan tabulator based on Commercial off the Shelf (COTS) hardware, coupled with the custom-made ballot processing application software. It is used for high speed scanning and counting of paper ballots.

ImageCast X (ICX)

The Democracy Suite ImageCast X (ICX) consists exclusively of COTS available hardware and operating system, while the applications installed on top customize its behavior to turn it into a Ballot Marking Device (BMD) or a Direct-Recording Electronic (DRE) device with or without a Voter Verifiable Paper Audit Trail (VVPAT). ICX application is the application that verifies voter's session eligibility, using the smart card and then presents the appropriate ballot to the voter. When a voter is satisfied with choices selected, ICX application verifies them and produces an Electronic Mobile Ballot or stores the votes onto a memory device. The ICX is designed to perform the following functions:

- Ballot marking and printing of electronic mobile ballots (in BMD mode)
- Ballot review and second chance voting
- Accessible voting and ballot marking
- Saving voting results (in DRE mode)
- Printing votes on a voter verifiable paper audit trail device (when VVPAT is in use)

1.1.1 Baseline Certified System

The baseline system for this modification is the D-Suite 5.5 Voting System. The tables below describe the certified equipment and firmware versions. Detailed descriptions of the D-Suite 5.5 test campaign are contained in Pro V&V Report No.TR-01-01-DVS-2017-02.01 Rev. B, which is available for viewing on the EAC's website at www.eac.gov.

This subsection lists the proprietary and COTS software to be provided by the manufacturer as part of the test campaign.

Table 1-1. Democracy Suite 5.5 EMS Software Component Descriptions

Software	Version	Filename	Configuration	
			Standard	Express
EMS Election Event Designer (EED)	5.5.12.1	setup.exe: EED_FED_CERT_Setup_x64.msi	X	X
EMS Results Tally and Reporting (RTR)	5.5.12.1	setup.exe: RTR_FED_CERT_Setup_x64.msi	X	X
EMS Application Server	5.5.12.1	setup.exe: APPS_FED_CERT_Setup_x64.msi	X	X
EMS File System Service (FSS)	5.5.12.1	setup.exe: FSSSetup.msi	X	X
EMS Audio Studio (AS)	5.5.12.1	setup.exe: EMSAudioStudioSetup.msi	X	X
EMS Data Center Manager (DCM)	5.5.12.1	DemocracySuiteEMS_DCM.exe	X	X
EMS Election Data Translator (EDT)	5.5.12.1	setup.exe: EDTSetup_x86.msi EDTSetup_x64.msi	X	X
ImageCast Voter Activation (ICVA)	5.5.12.1	setup.exe: ICVASetup.msi	X	X
EMS Adjudication (Adj.)	5.5.8.1	DVS ImageCast Adjudication Client Setup.msi	X	X
EMS Adjudication Service	5.5.8.1	DVS Adjudication Services Setup.msi	X	X
Smart Card Helper Service	5.5.12.1	setup.exe: SmartCardServiceSetup.msi	X	X

Table 1-2. Democracy Suite 5.5 ImageCast Precinct Software Component Descriptions

Firmware/Software	Version	Filename
Election Firmware	5.5.3-0002	cf2xx.sig
Firmware Updater	5.5.3-0002	firmUp.enc
Firmware Extractor	5.5.3-0002	FirmwareExtract.enc
Kernel (uClinux)	5.5.3-0002	image.bin.gz
Boot Loader (COLILO)	20040221	colilo.bin
Asymmetric Key Generator	5.5.3-0002	Keygen.enc
Asymmetric Key Exchange Utility	5.5.3-0002	KeyExchange.enc
Firmware Extractor (Uses Technician Key)	5.5.3-0002	TechExtract.enc

Table 1-3. Democracy Suite 5.5 ImageCast Central Software Component Descriptions

Firmware/Software	Version	Filename
ImageCast Central Application	5.5.3.0002	ICCSetup.exe

Table 1-4. Democracy Suite 5.5 ImageCast X Software Component Descriptions

Firmware/Software	Version	Filename
ICX Application	5.5.10.25	ICX.apk

Table 1-5. Democracy Suite 5.5 EMS Client/Server Software Component Descriptions

Firmware/Software	Version	Filename	Configuration	
			Standard	Express
Microsoft Windows Server	2012 R2 Standard	Physical Media from Microsoft	X	
Microsoft Windows	10 Professional	Physical Media from Microsoft	X	X
.NET Framework	3.5	Physical Media from Microsoft	X	X
Microsoft Visual J#	2.0	vjredist64.exe vjredist.exe	X	X
Microsoft Visual C++ 2013 Redistributable	2013	vcredist_x64.exe vcredist_x86.exe	X	X
Microsoft Visual C++ 2015 Redistributable	2015	vc_redist.x64.exe vc_redist.x86.exe	X	X
Java Runtime Environment	7u80	jre-7u80-windows-x64.exe jre-7u80-windows-i586.exe	X	X
Java Runtime Environment	8u144	jre-8u144-windows-x64.exe jre-8u144-windows-i586.exe	X	X
Microsoft SQL Server 2016 Standard	2016 Standard	Physical Media from Microsoft	X	

Table 1-5. Democracy Suite 5.5 EMS Client/Server Software Component Descriptions *(continued)*

Firmware/Software	Version	Filename	Configuration	
			Standard	Express
Microsoft SQL Server 2016 Service Pack 1	2016 SP1	SQLServer2016SP1-KB3182545-x64-ENU.exe	X	
Microsoft SQL Server 2016 SP1 Express	2016 SP1	SQLEXPRADV_x64_ENU.exe		X
Cepstral Voices	6.2.3.801	Allison (English): Cepstral_Allison_windows_6.2.3.801.exe Alejandra (Spanish): Cepstral_Alejandra_windows_6.2.3.801.exe	X	X
Arial Narrow Fonts	2.37a	ARIALN.TTF ARIALNB.TTF ARIALNBI.TTF ARIALNI.TTF	X	X
Maxim iButton Driver	4.05	install_1_wire_drivers_x86_v405.msi install_1_wire_drivers_x64_v405.msi	X	X
Adobe Reader DC	AcrobatDC	AcroRdrDC1501020060_en_US.exe	X	X
Microsoft Access Database Engine	2010	AccessDatabaseEngine.exe AccessDatabaseEngine_x64.exe	X	X
Open XML SDK 2.0 for Microsoft Office	2.0	OpenXMLSDKv2.msi	X	X

Table 1-6. Democracy Suite 5.5 EMS Software Platform Unmodified COTS Component Descriptions

Firmware/Software	Version	Filename
Infragistics NetAdvanatage Win Forms 2011.1	2011 Vol.1	NetAdvantage_WinForms_20111.msi
Infragistics NetAdvanatage WPF 2012.1	2012 Vol.1	NetAdvantage_WPF_20121.msi
TX Text Control Library for .NET	16.0	TXText Control.NET for Windows Forms 16.0.exe
SOX	14.3.1	sox.exe , libgomp-1.dll, pthreadgc2.dll, zlib1.dll
NLog	1.0.0.505	NLog.dll
iTextSharp	5.0.5	itextsharp.dll
OpenSSL	1.0.2k & 2.0.14 FIPS	openssl.exe, libeay32.dll, ssleay32.dll

Table 1-6. Democracy Suite 5.5 EMS Software Platform Unmodified COTS Component Descriptions *(continued)*

Firmware/Software	Version	Filename
SQLite	1.0.103.0	System.Data.SQLite.DLL (32-bit and 64-bit)
Lame	3.99.4	lame.exe
Speex	1.0.4	speexdec.exe and speexenc.exe
Ghostscript	9.04	gsdll32.dll (32-bit and 64-bit)
One Wire API for .NET	4.0.2.0	OneWireAPI.NET.dll
Avalon-framework-cvs-20020806	20020806	avalon-framework-cvs-20020806.jar
Batik	0.20-5	batik.jar
Fop	0.20-5	fop.jar
Microsoft Visual J# 2.0 Redistributable Package-Second Edition(x64)	2.0	vjc.dll , vjsjbc.dll, vjslibcw.dll, vjsnativ.dll , vjssupuilib.dll , vjsvwaux.dll
Entity framework	6.1.3	EntityFramework.dll
Spreadsheetlight	3.4.3	SpreadsheetLight.dll, SpreadsheetLight.xml
Open XML SDK 2.0 For Microsoft Office	2.0.5022.0	DocumentFormat.OpenXml.dll, DocumentFormat.OpenXml.xml

Table 1-7. Democracy Suite 5.5 ImageCast Precinct Unmodified COTS Component Descriptions

Firmware/Software	Version	Filename
OpenSSL 1.0.2k	1.0.2k	openssl-1.0.2k.tar.gz
OpenSSL FIPS 2.0.10	2.0.10	openssl-fips-2.0.10.tar.gz
Zlib	1.2.3	Zlib-1.2.3.tar.gz

Table 1-8. Democracy Suite 5.5 ImageCast X Unmodified COTS Component Descriptions

Firmware/Software	Version	Filename
Google Text-to-Speech Engine	3.11.12	ARM: com.google.android.tts_3.11.12-210311121_minAPI19(armeabi-v7a)(nodpi).apk x86: com.google.android.tts_3.11.12-210311123_minAPI15(x86)(nodpi).apk
ICX Prime Android 5.1.1 Image	0405	0405_5.1.1-01.12_user_android_x86.iso
ICX Classic Android 4.4.4 Image	0.0.98	byt_t_crv2_64-ota-BCX18-V0.0.98.zip

Table 1-9. Democracy Suite 5.5 ImageCast Central Software Build Library Source Code (Unmodified COTS)

Firmware/Software	Version	Filename
OpenSSL 1.0.2k	1.0.2k	openssl-1.0.2k.tar.gz
OpenSSL FIPS 2.0.10	2.0.10	openssl-fips-2.0.10.tar.gz

Table 1-10. Democracy Suite 5.5 ImageCast Central Runtime Software Components (Unmodified COTS)

Firmware/Software	Version	Filename
1-Wire Driver (x86)	4.05	install_1_wire_drivers_x86_v405.msi
1-Wire Driver (x64)	4.05	install_1_wire_drivers_x64_v405.msi
Canon DR-G1130 TWAIN Driver	1.2 SP6	G1130_DRIT_V12SP6.exe
Canon DR-M160II TWAIN Driver	1.2 SP6	M160II_DRIT_V12SP6.exe
Visual C++ 2013 Redistributable (x86)	12.0.30501	vcredist_x86.exe

Table 1-11. Democracy Suite 5.5 ImageCast Precinct Modified COTS Software Component Descriptions

Firmware/Software	Version	Filename
uClinux	20070130	uClinux-dist-20070130.tar.gz
COLILO Bootloader	20040221	Colilo20040221.tar.gz

Table 1-12. Democracy Suite 5.5 ImageCast X Modified COTS Software Component Descriptions

Firmware/Software	Version	Filename
Zxing Barcode Scanner	4.7.5	BS-4.7.5.zip
SoundTouch	1.9.2	Soundtouch-1.9.2.tar.gz

Table 1-13. Democracy Suite 5.5 EMS Software Build Environment Component Descriptions

Firmware/Software	Version	Filename
Windows 10 Professional	10 Professional	Physical Media from Microsoft
.NET Framework 3.5	3.5	Physical Media from Microsoft
Internet Information Server (IIS)	10.0	Physical Media from Microsoft
7-Zip	9.20 (64 Bit)	7z920-x64.msi
Visual Studio 2015 Professional with Update 3	2015 Update 3	en_visual_studio_professional_2015_with_update_3_x86_x64_web_installer_8922978.exe

Table 1-13. Democracy Suite 5.5 EMS Software Build Environment Component Descriptions
(continued)

Firmware/Software	Version	Filename
.NetDiscUtils	0.10	DiscUtilsBin-0.10.zip
Infragistics NetAdvantage Win Forms 2011.1	2011.1	NetAdvantage_WinForms_20111.msi
Infragistics Net Advantage – WPF 2012.1	2012.1	NetAdvantage_WPF_20121.msi
TX Text Control 16.0.NET	16	TX Text Control.NET for Windows Forms 16.0.exe
Speex	1.0.4	speex_win32_1.0.4_setup.exe
Microsoft Visual J#	2.0	vjredist64.exe
iTextSharp	5.0.5	itextsharp-5.0.5-dll.zip
Ghostscript	9.0.4	gs904w32.exe gs904w64.exe
Nlog	1.0.0.505	NLog-1.0-Refresh-bin.zip
OneWireAPI.NET	4.0	1-wiresdkver400_beta2.zip
Lame	3.99.4	lame3.99.4-20120130.zip
Sox	14.3.1	sox-14.3.1-win32.zip
Avalon Framework	20020806	avalon-framework-cvs-20020806.jar.zip
Fop	0.20-5	fop-0.20.5.jar
Batik	0.20-5	batik-1.5-fop-0.20-5.jar
SQLite	1.0.103.0	sqlite-netFx46-setup-bundle-x64-2015-1.0.103.0.exe
OpenSSL 1.0.2k	1.0.2k	openssl-1.0.2k.tar.gz
OpenSSL FIPS 2.0.10	2.0.10	openssl-fips-2.0.10.tar.gz
Strawberry Perl	5.24.1.1	strawberry-perl-5.24.1.1-64bit.msi
Patch	2.5.9-7	patch-2.5.9-7-bin.zip
ISOnewspaper	30.4	ISOnewspaper30v4_gr.icc.zip
Ogg Vorbis Encoder	2.88	oggenc2.88-1.3.5-generic.zip
Ogg Vorbis Encoder	1.10.1	oggdecV1.10.1.zip
Prism Mvvm	1.1.1	prism.mvvm.1.1.1.nupkg
Bitmiracle.libtiff.net	2.4.560	Bitmiracle.libtiff.net.2.4.560.nupkg
Prism	4.0.0	prism.4.0.0.nupkg
Prism.UnityExtensions	4.0.0	prism.unityextensions.4.0.0.nupkg
PDF Printing	2.9.5.2	PDFPrinting.zip
Entity Framework	6.1.3.net45	entityframework.6.1.3.nupkg

Table 1-13. Democracy Suite 5.5 EMS Software Build Environment Component Descriptions
(continued)

Firmware/Software	Version	Filename
WiX	3.10	Wix310.exe
Spreadsheet Light	3.4.3	spreadsheetlight.3.4.3.nupkg
Open XML SDK 2.0 for Microsoft Office	2.0	OpenXMLSDKv2.msi
Adobe Reader DC	AcrobatDC	AcroRdrDC1501020060_en_US.exe
Arial Narrow Fonts	2.37a	ArialNarrowFonts.zip
SSH.NET	2016.1.0	SSH.NET-2016.1.0-bin.zip
SSMS	14.0.17119.0	SSMS-Setup-ENU.exe
TwainDSM	2.3.0	Twaindsm-2.3.0.win.bin

Table 1-14. Democracy Suite 5.5 ICC Software Build Environment Component Descriptions

Firmware/Software	Version	Filename
NASM Assembler	2.12.02	nasm-2.12.02-win32.zip
OpenSSL 1.0.2k	1.0.2k	openssl-1.0.2k.tar.gz
OpenSSL FIPS 2.0.10	2.0.10	openssl-fips-2.0.10.tar.gz
CSC3-2010	N/A	CSC3-2010.crl
tss-ca-g2	N/A	tss-ca-g2.crl

Table 1-15. Democracy Suite 5.5 Adjudication Software Build Environment Component Descriptions

Firmware/Software	Version	Filename
Microsoft Enterprise Library	5.0	Enterprise Library 5.0.msi
Microsoft Prism	4.0.0	Prism.4.0.0.nupkg
Microsoft Identity Foundation SDK	4.0	WindowsIdentityFoundation-SDK-4.0.msi
Toggle Switch Control Library	1.1.1	ToggleSwitch 1.1.1.zip
Infragistics NetAdvantage Ultimate 2013.1	2013.1	NetAdvantage_20131_PlatformInstaller.zip
iTextSharp	5.5.1	itextsharp-all-5.5.1.zip
CLR Security	June 2010	clrsecurity_june10.zip
OpenSSL 1.0.2k	1.0.2k	openssl-1.0.2k.tar.gz
OpenSSL FIPS 2.0.10	2.0.10	openssl-fips-2.0.10.tar.gz
Community MSI Extensions	1.4	msiext-1.4.zip
TreeViewEx	3.0.0.0	TreeViewEx.dll

Table 1-16. Democracy Suite 5.5 ImageCast Precinct Election Firmware Compiler Descriptions

Firmware/Software	Version	Filename
g++ (GNU C++ compiler)	gcc3.4.0-20040603	m68k-uclinux-tools-c++-gcc3.4.0-20040603.sh

Table 1-17. Democracy Suite 5.5 ImageCast Precinct Firmware Build Environment Component Descriptions

Firmware/Software	Version	Filename
Ubuntu 16.04.1	16.04.1	ubuntu-16.04.1-desktop-i386.iso
Toolchain Installation Script	N/A	Toolchain.sh
m68k uClinux tools base gcc	3.4.0-20040603	m68k-uclinux-tools-base-gcc3.4.0-20040603.sh
m68k uClinux tools c++ gcc	3.4.0-20040603	m68k-uclinux-tools-c++-gcc3.4.0-20040603.sh
m68k uClinux tools gdb	20040603	m68k-uclinux-tools-gdb-20040603.sh
OpenSSL 1.0.2k	1.0.2k	openssl-1.0.2k.tar.gz
OpenSSL FIPS 2.0.10	2.0.10	openssl-fips-2.0.10.tar.gz

Table 1-18. Democracy Suite 5.5 ImageCast X Firmware Build Environment Component Descriptions

Firmware/Software	Version	Filename
Ubuntu 14.04.4	14.04.4	ubuntu-14.04.4-desktop-amd64.iso

Table 1-19. D-Suite 5.5 Configuration Files

Configuration File	Version	Filename
Machine Configuration File (MCF)	5.5.10.20_20180806	MCF_5.5.10.20_20180806.mcf
Device Configuration File (DCF)	5.4.01_20170521	DCF_5.4.01_20170521.dcf

Table 1-20. D-Suite 5.5 Voting System Equipment

Component	Serial Number
Proprietary Hardware	
ImageCast Precinct Optical Scanner PCOS-320C	AAFAJFM0061, AAFAJFN0030, AAFAJGI6764, AAFAJEL0352
ImageCast Precinct Optical Scanner PCOS-320A	AANAGCP0347, AANAGCP0002
ICP Ballot Box BOX-330A	AAUCCFX0083, AAUCCGI0011
ICX Inline EMI Filter	[DVS-EMIFILTER-001] thru [DVS-EMIFILTER-003]
COTS Hardware	

Table 1-20. D-Suite 5.5 Voting System Equipment *(continued)*

Component	Serial Number
ICX aValue 15” Tablet (SID-15V)	0E14AF00014, B03G005400006, B033G00540008, 9E274118, 1D274118, Baytrail98D750C0, Baytrail12034DCC, Baytrail9A6550C8
ICX aValue 21” Tablet (SID-21V)	0E14AF00027, B03G005500019, 03G005500009, 0039BZ2D, 0039B209, Baytrail0039B22D, BaytrailF1B2587F, BaytrailF1B25983
A Value 21" ICX DRE (Prime)	1707101522, 1707101789, 1707101730, 1707101887, 1707101710, 1707101725, 1707101731, 1708100916, 1708100876, 1708100915, 1707101845, 1707101778, 1717101720, 1707101845, 1707101722, 1707202552, 1711300282, 1707100089, 1707101795, 1707101793, 17101793
SII Thermal Printer	1115271A, 1115273A, 115270A, 1115275A
KFI VRP3 Thermal Printer (VVPAT)	KPR000000715, KPR0000078339, KPR0000078377, KRP000000711, KPR000000712, KPR170900010119, KPR0000078337, KPR0000078364, KPR170900008115, KPR0000078339, KPR170900008116, KPR170900010347, KPR170900009733, KPR170900010120, KPR170900010119, KPR170900010337, KPR170900010338, KPR170900010348
Dell OptiPlex 7440 All In One	HVNRFB2, HVNQFB2, HVNPFB2
Dell PowerEdge R630	4Z07T52
Dell PowerEdge R640	JMP9CM2
Canon imageFormula DR-G1130 Scanner	GF301092, GF304418
Canon DR-M160II Scanner	GX333569, GX333573, GX324846, GX326272, GX319353
Dell Precision T3420 PC	HS0VFB2, HS0TFB2, HS0RFB2, HS0SFB2, 4TB3MN2, F575HH2
HP LaserJet Pro Printer M402dn	PHBQF20342, PHBQF20345, PHBQC12619, PHBQC19613, PHBQC12519, PHBQD18790, PHBQC12616, PHBQG09329
HP LaserJet Pro Printer M402dne	PHB5D00782, PHB5D04714, PHB5F04770, PHB5B18304, PHB5D04713
Dell OptiPlex 9030 All-In-One	CF73S52
Dell Ultrasharp 24” Monitor U2414H	1PVZ152, 62VZ152
Dell OptiPlex 3050 All-In-One	19YWWK2
Smart Card Reader ACR39	RR374-010362

Table 1-21. D-Suite 5.5 Voting System Support Equipment

Component	Serial Number
Dell Monitor KM632	FYNTY12, CKX6Y12, CN-0524N3-72461-59H-6U5U
Dell Monitor P2414Hb	CN-0524N3-74261-5AH-2DNU, CN-0524N3-74261-5AH-2DAU
Dell DVD Multi Recorder GP60NB60	[DVS-Dell-001]
Dell Latitude E7450 Laptop	30GFH72, 369FH72
Dell Latitude e3480 Laptop	1VD3NJ2
Maxim iButton Programmer DS9490R# with DS1402	[DVS-Maxim-001] thru [DVS-Maxim-006]
APC Smart-UPS SMT1500	3S1536X06436, 3S1536X06475, 3S1536X06461, 3S1536X06485, 3S1536X06484, 3S1536X06322, 3S1536X07467, 3S1536X06485, 3S1536X06272, 3S1536X06201, 3S1536X07305, 3S1504X00395, 3S1504X00396, 351716X02289, W51530180004, 3S171X06059
Dell X1008 Network Switch	4R8XX42, 26SXX42
Dell X1018 Network Switch	6TN7Y42, 63SXX42
Enabling Devices Sip and Puff	[DVS-enabling devices-001] - [DVS-enabling devices-002]
Cyber Acoustics Headphones ACM-70	[DVS-cyber acoustics-001] - [DVS-cyber acoustics-005]
4-Way Joystick Controller S26	PME QC 1550 12, [DVS-JOY-001], [DVS-JOY-002]
Enablemart # 88906 Rocker (Paddle) Switch	[DVS-paddle-001]
Dell PowerConnect 2808 Network Switch	3S2P0Z1
IOGEAR SDHC/microSDHC 0U51USC410 Card Reader	8632, 8633
Lexar USB 3.0 Dual-Slot Reader	24020845007435
Hoodman Steel USB 3.0 UDMA Reader 102015	[DVS-hoodman-001]
ATI Handset	98862010101-035, 98862010103-075, 00659010100-046, 98862010100-232, 093015-1-1, 00659010100-035
ATI-USB Handset	02440010100-011, [DVS-ATIUSB-001], [DVS-ATIUSB-002], B104326-1-4-040, B104326-1-4-035
ACS PC-Linked Smart Card Reader ACR39U	RR374-006272, RR374-010356, RR374-010365
Lexar Professional CF Card Reader Workflow CFR1	24050361400108, 24050361401994, 24050361401991, 24050361401990
CORCOM Filter P/N#: 15EMC1	[DVS-CorcomEMIFilter-001]
Delta Filter P/N#: 16PDCG5C	[DVS-DeltaEMIFILTER-001]
Kingston Card Reader FCR-HS4	08738174208132

1.2 References

- Election Assistance Commission 2005 Voluntary Voting System Guidelines (VVSG) Version 1.0, Volume I, "Voting System Performance Guidelines", and Volume II, "National Certification Testing Guidelines"
- Election Assistance Commission Testing and Certification Program Manual, Version 2.0
- Election Assistance Commission Voting System Test Laboratory Program Manual, Version 2.0
- National Voluntary Laboratory Accreditation Program NIST Handbook 150, 2016 Edition, "NVLAP Procedures and General Requirements (NIST HB 150-2016)", dated July 2016
- National Voluntary Laboratory Accreditation Program NIST Handbook 150-22, 2008 Edition, "Voting System Testing (NIST Handbook 150-22)", dated May 2008
- United States 107th Congress Help America Vote Act (HAVA) of 2002 (Public Law 107-252), dated October 2002
- Pro V&V, Inc. Quality Assurance Manual, Revision 1.0
- Election Assistance Commission "Approval of Voting System Testing Application Package" letter dated May 6, 2016
- EAC Requests for Interpretation (RFI) (listed on www.eac.gov)
- EAC Notices of Clarification (NOC) (listed on www.eac.gov)
- Dominion Voting Systems Technical Data Package *(A listing of the D-Suite 5.5-B documents submitted for this test campaign is listed in Section 3.1.2 of this Test Report)*

1.3 Terms and Abbreviations

This subsection lists terms and abbreviations relevant to the hardware, the software, or this Test Plan.

"ADA" – Americans with Disabilities Act 1990

"BMD" – Ballot Marking Device

"CM" – Configuration Management

"COTS" – Commercial Off-The-Shelf

"DRE" – Direct Record Electronic

"EAC" – United States Election Assistance Commission

"EMS" – Election Management System

"FCA" – Functional Configuration Audit

"HAVA" – Help America Vote Act

"ICC" – ImageCast Central

"ICE" – ImageCast Evolution

"ICP" – ImageCast Precinct

"ICX" – ImageCast X

"ISO" – International Organization for Standardization

"NOC" – Notice of Clarification

"PCA" – Physical Configuration Audit

"QA" – Quality Assurance

"RFI" – Request for Interpretation

"TDP" – Technical Data Package

"UPS" – Uninterruptible Power Supply

"VSTL" – Voting System Test Laboratory

"VVPAT" – Voter Verifiable Paper Audit Trail

"VVSG" – Voluntary Voting System Guidelines

2.0 CERTIFICATION TEST BACKGROUND

The D-Suite 5.5-B system is a modification of a previously certified system (D-Suite 5.5). Pro V&V performed an evaluation of results from the previous test campaign to determine the scope of testing required for certification of the D-Suite 5.5-B. Based on this evaluation, Pro V&V determined that testing from the previous test campaign would establish the baseline and that the focus of this test campaign would be on the documented system updates.

2.1 Revision History

The table below details the version history of the D-Suite 5.5-B System:

Table 2-1. D-Suite 5.5-B System Revision History

System Version	Certification Type	Baseline System	Certification Number
D-Suite 5.0	New System	--- (Original System)---	DVS-DemSuite5.0
D-Suite 5.5	Modification	D-Suite 5.0	DVS-DemSuite5.5
D-Suite 5.5-B	Modification	D-Suite 5.5	DVS-DemSuite5.5-B *

*Upon grant of certification by the EAC

2.2 Scope of Testing

The scope of testing focused on the addition of the ImageCast Evolution (ICE) optical ballot hybrid precinct-based scanner and BMD, the ICP2 optical ballot counter, the InoTec HiPro 821 Scanner, and the Canon imageFORMULA DR-M260 Scanner. To evaluate the D-Suite 5.5-B test requirements, the submitted modifications were evaluated against each section of the EAC 2005 VVSG to determine the applicable tests to be performed.

Based on this assessment, it was determined that multiple areas within the EAC 2005 VVSG would be evaluated to encompass the required tests. A breakdown of the areas and associated tests is listed below:

- EAC 2005 VVSG Volume 1, Section 2: Functional Requirements
  - System Integration Testing
  - Functional Configuration Audit (FCA)
  - Physical Configuration Audit (PCA), including System Loads & Hardening
  - Technical Documentation Package (TDP) Review
  - Volume & Stress Testing
  - Accuracy Testing
- EAC 2005 VVSG Volume 1, Section 3: Usability & Accessibility
  - Usability & Accessibility Testing
  - Technical Documentation Package (TDP) Review
- EAC 2005 VVSG Volume 1, Section 4: Hardware Requirements
  - Hardware Testing
  - Technical Documentation Package (TDP) Review
- EAC 2005 VVSG Volume 1, Section 5: Software Requirements
  - Source Code Review, Compliance Build, Trusted Build, and Build Document Review
  - Technical Documentation Package (TDP) Review
  - Functional Configuration Audit (FCA)
- EAC 2005 VVSG Volume 1, Section 7: Security Requirements
  - Security Testing
  - Technical Documentation Package (TDP) Review
  - Functional Configuration Audit (FCA)

2.2.1 Modification Overview

The Dominion Democracy Suite 5.5-B Voting System is a modified voting system configuration that includes upgrades to the components of the D-Suite 5.5 Voting System. Section 2.2.1.1 details changes between this system and the baseline of the Democracy Suite 5.5 Voting System.

To verify the modifications were successfully addressed throughout the test campaign, each modification was tracked and verified to be addressed during the execution of the relevant test area. For example, source code changes were verified during the source code review. Modifications requiring functional test verification were evaluated by executing the standard Accuracy Test, the System Integration Test, or during performance of the FCA. Modifications that were not adequately evaluated during the performance of these tests were subjected to specifically designed test cases. Additionally, Pro V&V functionally verified that any corrected issues from the baseline system were not present in the modified system and that all enhancements implemented did not adversely impact system performance.

2.2.1.1 Detailed List of Changes

General Modifications

- Addition of ImageCast Evolution (ICE), a precinct-level, optical scan, ballot counter (tabulator) designed to perform three major functions: ballot scanning and tabulation, ballot review and second chance voting, and accessible voting and ballot marking. *Submitted version: ICE firmware version 5.5.6.5, model number PCOS 410A.*

- Addition of InoTec HiPro 821 Scanner as a component for the ImageCast Central Count (ICC). *Submitted version: ICC software application version 5.5.32.5, HiPro 821 Scanner driver version 1.2.3.17.*

- Addition of Canon imageFORMULA DR-M260 Scanner as a component for the ImageCast Central Count (ICC). *Submitted version: ICC software application version 5.5.32.5, DR-M260 Scanner driver version 1.1 SP2.*

- Addition of ImageCast Precinct 2 (ICP2) optical ballot counter. The ICP2 is a precinct-based optical scan ballot tabulator that is used in conjunction with ImageCast compatible ballot storage boxes. *Submitted version: ICP2 firmware version 5.5.1.8, model number PCOS-330A.*

EMS Election Event Designer

- Added support for Ballot ID creation by Precinct Portion

ICC

- Corrected drop-out of red colored ovals when using the HiPro scanner

ICP

- Added support for the new election file revision number of 0x0307 which increased the field size of the 'Number of Ballots' field in the VIF ELECTION.DVD file from an unsigned short (2 bytes) to an unsigned integer (4 bytes)

ICX

- Corrected discrepancy between Total Ballots Cast and Report Tape after results are deleted manually from the ICX
- Corrected issue where the application was not providing a warning for low paper amount on VVPAT tape

2.2.1.2 ECO Assessment

Since certification of previous versions of D-Suite systems that are relevant to the D-Suite 5.5-B configuration, DVS has implemented various Engineering Change Orders (ECOs), each of which were evaluated and determined to be De Minimis in nature. Although testing was not warranted during implementation of these ECOs, they are either included as part of the D-Suite 5.5-B system test campaign or may be applied to the D-Suite 5.5-B system. A listing of these ECOs, along with a brief description is provided below:

- ECO 100503 - Adding a COTS collapsible ballot box to AVL for use with the ICP
- ECO 100521 - Added DELL P2419H monitor as a display device for server and client workstations
- ECO 100527 - Added DELL Latitude 3490 computer with updated i3-8130U processor (Dual Core, 4MB Cache, 2.2GHz) to DVS PN 190-000061 (a client workstation)
- ECO 100543 - Update to the DR-G1130 Scanner LCD Panel User Interface
- ECO 100588 - Added new models of VVPAT printer for use with the D-Suite ICX workstation due to previous model becoming commercially unavailable
- ECO 100596 - Added DELL Latitude 3400 computer as a client workstation due to the DELL Latitude 3490 computer becoming commercially unavailable for purchase
- ECO 100597 - Added DELL PowerEdge R640 computer with new processor and RAM as an AVL to the existing R640 server computer configurations
- ECO 100602 - Added DELL Precision 3431 computer in an EMS Express Server and EMS Client Workstation configuration due to the DELL Precision 3430 computer becoming commercially unavailable for purchase
- ECO 100603 - Added DELL P2418HT monitor as a display device for ICC HiPro scanner workstation configuration due to the Lenovo 10QXPAR1US monitor becoming commercially unavailable for purchase

Note: The ECOs listed above were approved by the EAC prior to the issue date of this final test report.

2.2.2 Block Diagram

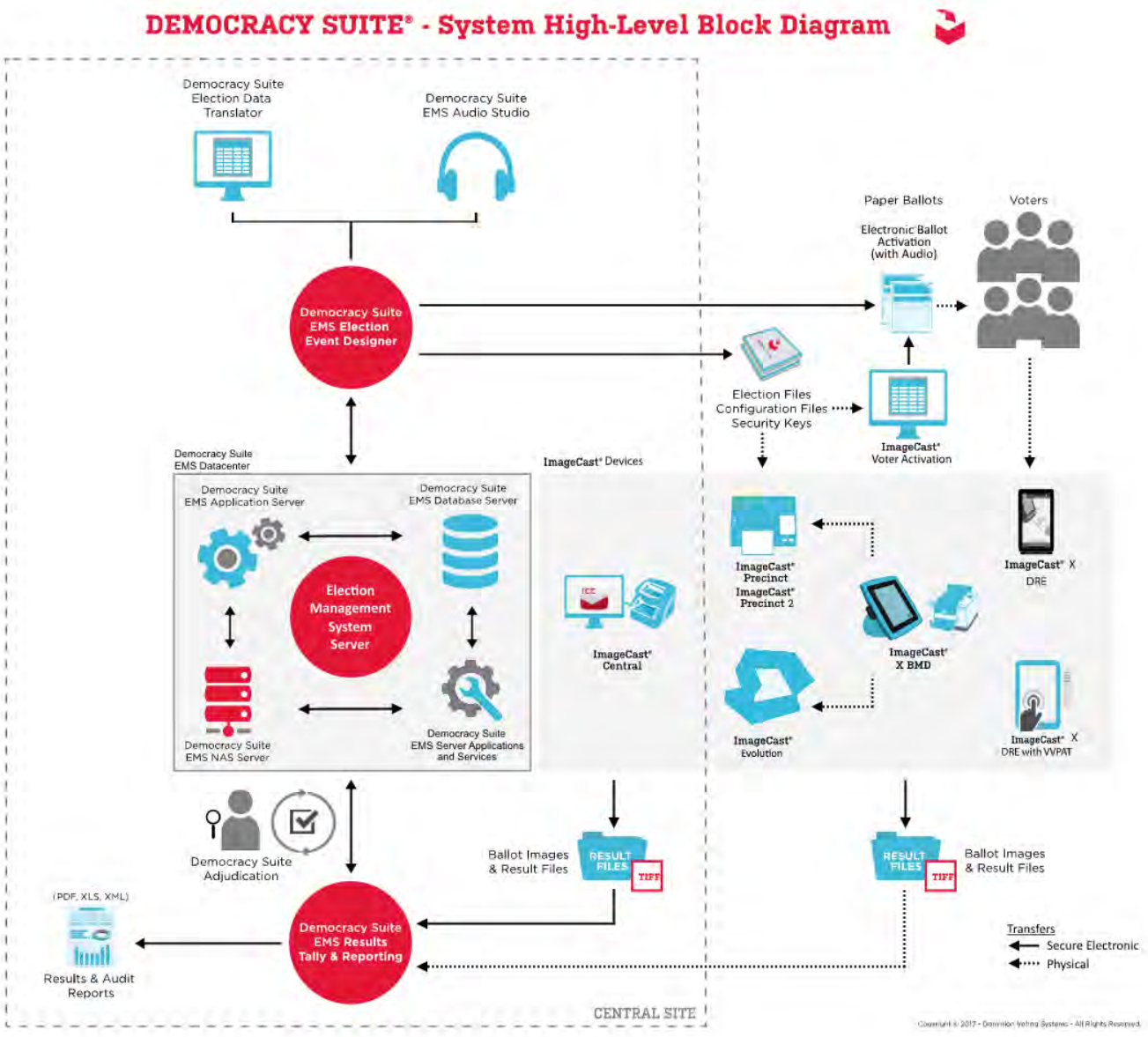


Figure 1-1. D-Suite 5.5-B System Overview

2.2.3 System Limits

The system limits verified to be supported by the D-Suite 5.5-B System during this test campaign or during testing of the baselined system are provided in the table below.

Table 2-2. D-Suite 5.5-B System Limits by Configuration

Characteristic	Configuration Values		Limiting Component
	Standard	Express	
Portrait Ballot Orientation			
Ballot positions	462	462	*22-inch Portrait Ballot
Precincts in an election	1000	250	Memory
Contests in an election	1000	250	Memory
Candidates/Counters in an election	10000	2500	Memory
Candidates/Counters in a precinct	462	462	*22-inch Portrait Ballot
Candidates/Counters in a tabulator	10000	2500	Memory
Ballot Styles in an election	3000	750	Memory
Contests in a ballot style	156	156	*22-inch Portrait Ballot
Candidates in a contest	231	231	*22-inch Portrait Ballot (Column Span 3)
Ballot styles in a precinct	5	5	Memory
Number of political parties	30	30	No Limitation
“Vote for” in a contest	30	30	No Limitation
Supported languages in an election	5	5	Memory
Number of write-ins	462	462	*22-inch Portrait Ballot
Landscape Ballot Orientation			
Ballot positions	292	292	*22-inch Landscape Ballot (240 candidates + 24 write-ins + 28 Yes/No choices)
Precincts in an election	1000	250	Memory
Contests in an election	1000	250	Memory
Candidates/Counters in an election	10000	2500	Memory
Candidates/Counters in a precinct	240	240	*22-inch Ballot
Candidates/Counters in a tabulator	10000	2500	Memory
Ballot Styles in an election	3000	750	Memory
Contests in a ballot style	38	38	*22-inch Landscape Ballot (24 candidacy contests + 14 Propositions)

Table 2-2. D-Suite 5.5-B System Limits by Configuration *(continued)*

Characteristic	Configuration Values		Limiting Component
	Standard	Express	
Candidates in a contest	240	240	*22-inch Ballot
Ballot styles in a precinct	5	5	Memory
Number of political parties	30	30	Memory
"Vote for" in a contest	24	24	*22-inch Landscape Ballot
Supported languages in an election	5	5	Memory
Number of write-ins	24	24	*22-inch Landscape Ballot

***The 22-inch Ballot length applies only to hand-marked paper ballots.**

2.2.4 Supported Languages

Support for the following languages was verified during this test campaign or during testing of the baselined system:

Table 2-3. D-Suite 5.5-B Supported Languages

Language	ICE	ICP	ICX
Alaska Native	Yes, if using Latin alphabet	Yes	No
Apache	Audio only	Audio only	No
Bengali	Yes	Yes	Yes
Chinese	Yes	Yes	Yes
English	Yes	Yes	Yes
Eskimo	Yes, if using Latin alphabet	Yes	No
Filipino	Yes, if using Latin alphabet	Yes	No
French	Yes	Yes	Yes
Hindi	Yes	Audio only	Yes
Japanese	Yes	Yes	Yes
Jicarilla	Audio only	Audio only	No
Keres	Audio only	Audio only	No
Khmer	Yes	Audio only	No
Korean	Yes	Yes	Yes
Navajo	Audio only	Audio only	No
Seminole	Audio only	Audio only	No
Spanish	Yes	Yes	Yes
Tagalog	No	No	Yes
Thai	Yes	Audio only	Yes
Towa	Audio only	Audio only	No
Ute	Audio only	Audio only	No
Vietnamese	Yes	Yes	Yes
Yuman	Audio only	Audio only	No

Support for all stated languages was verified; however, only English and Spanish language ballots were cast during the performance of functional testing. Additionally, one character based language (Chinese) was tested during System Integration Testing.

For the character based language, the ballot was created by Pro V&V and voted utilizing both paper ballots and ADA voting devices along with all applicable peripherals. The Chinese Language for the ballot was created using a readily available online translation tool. The translated language text was entered into the Election Event Designer Application. A ballot preview was generated in the EED application. The Chinese characters displayed in the ballot preview were compared to the characters generated by the online translation tool, to ensure that the characters matched. The ballots were then generated and printed, and the election loaded onto the tabulators and the BMD units. The Chinese characters displayed on both the printed ballots and displayed on the BMD units were compared to the original Chinese Characters generated by the online translation tool to verify that the characters matched.

2.2.5 Supported Functionality

The D-Suite 5.5-B was verified to support the following voting variations:

- General Election
- Closed Primary
- Open Primary
- Early Voting
- Partisan/Non-Partisan Offices
- Write-In Voting
- Primary Presidential Delegation Nominations
- Split Precincts
- Vote for N of M
- Ballot Rotation
- Provisional or Challenged Ballots

2.2.6 VVSG

The D-Suite 5.5-B Voting System was evaluated against the relevant requirements contained in the EAC 2005 VVSG, Version 1.0.

2.2.7 RFIs

There are no RFIs released by the EAC as of the date of this Test Report that pertain to this test campaign that were not in effect at the time of the baseline system certification.

2.2.8 NOCs

There are no NOCs released by the EAC as of the date of this Test Report that pertain to this test campaign that were not in effect at the time of the baseline system certification.

3.0 TEST FINDINGS AND RECOMMENDATION

The D-Suite 5.5-B Voting System was evaluated against the relevant requirements contained in the EAC 2005 VVSG, Volumes I and II. The focus of this test campaign is the addition of the ImageCast Evolution (ICE) optical ballot hybrid precinct-based scanner and BMD, the ICP2 optical ballot counter, the InoTec HiPro 821 Scanner, and the Canon imageFORMULA DR-M260 Scanner. The summary findings and recommendations for each area of testing are provided in the following sections.

3.1 Summary Findings and Recommendation

Summary findings for the System Level Testing (System Integration Testing, Accuracy Test, Volume & Stress Testing, and FCA), Hardware Testing, Usability & Accessibility Testing, Security Testing, and Source Code Review are detailed in the relevant sections of this report. In addition to these areas of testing, a PCA (including System Loads & Hardening), a TDP Review, and a QA & CM System Review were performed, as described below.

3.1.1 Physical Configuration Audit (PCA)

The Physical Configuration Audit (PCA) compares the voting system components submitted for qualification to the manufacturer's technical documentation, and shall include the following activities:

- Establish a configuration baseline of software and hardware to be tested; confirm whether manufacturer's documentation is sufficient for the user to install, validate, operate, and maintain the voting system
- Verify software conforms to the manufacturer's specifications; inspect all records of manufacturer's release control system; if changes have been made to the baseline version, verify manufacturer's engineering and test data are for the software version submitted for certification
- If the hardware is non-COTS, Pro V&V shall review drawings, specifications, technical data, and test data associated with system hardware to establish system hardware baseline associated with software baseline
- Review manufacturer's documents of user acceptance test procedures and data against system's functional specifications; resolve any discrepancy or inadequacy in manufacturer's plan or data prior to beginning system integration functional and performance tests

- Subsequent changes to baseline software configuration made during testing, as well as system hardware changes that may produce a change in software operation are subject to re-examination

Summary Findings

During execution of the PCA, the components of the D-Suite 5.5-B were documented by component name, model, serial number, major component, and any other relevant information needed to identify the component. For COTS equipment, every effort was made to verify that the COTS equipment had not been modified for use. Additionally, each technical document submitted in the TDP was recorded by document name, description, document number, revision number, and date of release. At the conclusion of the test campaign, test personnel verified that any changes made to the software, hardware, or documentation during the test process were fully and properly documented.

3.1.2 TDP Review

In order to determine compliance of the modified TDP documents with the EAC 2005 VVSG, a limited TDP review was conducted. This review focused on TDP documents that have been modified since the certification of the baseline system. The review consisted of a compliance review to determine if each regulatory, state, or manufacturer-stated requirement had been met based on the context of each requirement. Results of the review of each document were entered on the TDP Review Checklist and reported to the manufacturer for disposition of any anomalies. This process was ongoing until all anomalies were resolved.

Summary Findings

The submitted TDP was determined to be in compliance with the requirements set forth in the EAC 2005 VVSG. A listing of all documents contained in the D-Suite 5.5-B TDP is provided in Table 3-1.

Table 3-1. TDP Documents

Document Number	Description	Version
Adjudication Documents		
2.05	Democracy Suite Adjudication Software Design and Specification	5.5-B::122
2.08	Democracy Suite Adjudication System Operation Procedures	5.5-B::170
2.09	Democracy Suite Adjudication System Maintenance Manual	5.5-B::102
D-Suite Documents		
2.02	Democracy Suite System Overview	5.5-B::172
2.06	Democracy Suite System Security Specification	5.5-B::574
2.07	Democracy Suite System Test and Verification	5.5-B::196
2.10	Democracy Suite Personnel Deployment and Training Requirements	5.5-B::132

Table 3-1. TDP Documents *(continued)*

Document Number	Description	Version
2.11	Democracy Suite Configuration Management Process	5.5-B::396
2.12	Democracy Suite Quality Assurance Program	5.5-B::160
2.13	Democracy Suite System Change Notes	5.5-B::173
EMS Documents		
2.03	Democracy Suite EMS Functional Description	5.5-B::383
2.05	Democracy Suite EMS Software Design and Specification	5.5-B::329
2.08	Democracy Suite EMS System Operations Procedures	5.5-B::727
2.09	Democracy Suite EMS System Maintenance Manual	5.5-B::148
---	Democracy Suite EMS System Installation and Configuration Procedure	5.5-B::349
ImageCast Central Documents		
2.03	Democracy Suite ImageCast Central Functionality Description	5.5-B::191
2.05	Democracy Suite ImageCast Central Software Design and Specification	5.5-B::125
2.08	Democracy Suite ImageCast Central System Operation Procedures	5.5-B::213
---	Democracy Suite ImageCast Central Installation and Configuration Procedure	5.5-B::203
ImageCast Evolution Documents		
2.03	Democracy Suite ImageCast Evolution Functionality Description	5.5-B::120
2.04	Democracy Suite ImageCast Evolution System Hardware Specifications	5.5-B::332
2.05	Democracy Suite ImageCast Evolution Software Design and Specifications	5.5-B::175
2.08	Democracy Suite ImageCast Evolution System Operation Procedures	5.5-B::241
2.09	Democracy Suite ImageCast Evolution System Maintenance Manual	5.5-B::165
ImageCast Precinct Documents		
2.03	Democracy Suite ImageCast Precinct Functionality Description	5.5-B::182
2.04	Democracy Suite ImageCast Precinct System Hardware Specification	5.5-B::153
2.04.1	Democracy suite ImageCast Precinct System Hardware Characteristics	5.5-B::98
2.05	Democracy Suite ImageCast Precinct Software Design and Specification	5.5-B::155
2.08	Democracy Suite ImageCast Precinct System Operation Procedures	5.5-B::277
2.09	Democracy Suite ImageCast Precinct System Maintenance Manual	5.5-B::125
ImageCast Precinct2 Documents		

Table 3-1. TDP Documents *(continued)*

Document Number	Description	Version
2.03	Democracy Suite ImageCast Precinct 2 Functionality Description	5.5-B::10
2.04	Democracy Suite ImageCast Precinct 2 System Hardware Specifications	5.5-B-11
2.05	Democracy Suite Imagecast Precinct 2 Software Design and Specifications	5.5-B::16
2.08	Democracy Suite Imagecast Precinct 2 System Operation Procedures	5.5-B::10
2.09	Democracy Suite Imagecast Precinct 2 System Maintenance Manual	5.5-B::9
ImageCast X Documents		
2.03	Democracy Suite ImageCast X Functionality Description	5.5-B::97
2.05	Democracy Suite ImageCast X Software Design and Specification	5.5-B::98
2.08	Democracy Suite ImageCast X System Operation Procedures	5.5-B::85
---	Democracy Suite ImageCast X System Installation and Configuration	5.5-B::87
2.09	Democracy Suite ImageCast X System Maintenance Manual	5.5-B::76
User Guides		
---	Democracy Suite ImageCast Adjudication User Guide	5.5-B::141
---	Democracy Suite Election Data Translator User Guide	5.5-B::89
---	Democracy Suite EMS Audio Studio User Guide	5.5-B::38
---	Democracy Suite EMS Election Event Designer User Guide	5.5-B::339
---	Democracy Suite EMS Results Tally and Reporting User Guide	5.5-B::145
---	Democracy Suite ImageCast Central User Guide	5.5-B::137
---	Democracy Suite ImageCast Precinct User Guide	5.5-B::56
---	Democracy Suite ImageCast Voter Activation User Guide	5.5-B::53
---	Democracy Suite ImageCast X User Guide	5.5-B::252
---	Democracy Suite ImageCast Precinct 2 User Guide	5.5-B::6
---	Canon imageFORMULA DR-M160II User Manual	---
---	Canon imageFORMULA DR-M260 User Manual	---
---	Canon imageFORMULA DR-G1130 DR-G1100 User Manual	---
---	HiPro User Manual	1.2
Supplementary Documents		
----	Common Industry Format for Usability Test Report ImageCast X 5.2 with VVPAT	5.5::1
---	Dell Latitude E7450 Owner's Manual	Rev. A00
---	SID-15V-Z37-A1R User Manual	Rev. 1.0

Table 3-1. TDP Documents *(continued)*

Document Number	Description	Version
---	SID-21V-Z37-A1R User Manual	Rev. 1.0
---	Cyber Acoustics ACM-70B Stereo Headphones Product Sheet	---
---	Democracy Suite ImageCast C++ Coding Standard	5.5-B::59
---	Democracy Suite C# Automated Code Review Process	5.5-B::54
---	Dell Latitude E7450/Latitude 7450 Regulatory Compliance Sheet	Rev. A09
---	Dell OptiPlex 9020 AIO Regulatory Compliance Sheet	Rev. A09
---	Dell OptiPlex 9030 AIO Regulatory Compliance Sheet	Rev. A09
---	Dell Networking X-Series Specification Sheet	Ver. 1.9
---	Dell OptiPlex 9020 All-in-One Technical Specification Sheet	---
---	Dell OptiPlex 9030 All-in-One Technical Specification Sheet	---
---	Dell OptiPlex 3050 All-in-One Technical Specification Sheet	---
---	Google Java Style Dominion XML	---
---	Dominion Voting Systems Java Coding Standards	1.0
---	Dominion Voting Systems JavaScript Coding Standards	1.0
---	ICX Machine Configuration File (MCF) Parameters Settings	5.5-B::31
---	Democracy Suite ImageCast Device Configuration Files	5.5-B::105
---	Democracy Suite ImageCast Printing and Finishing Specification	5.5-B::99
---	Democracy Suite ImageCast Total Results File Format	5.5-B::62
---	Democracy Suite ImageCast Election Definition Files	5.5-B::88
---	Democracy Suite ImageCast Precinct Extracting Firmware Contents	5.5-B::41
---	Democracy Suite ImageCast Precinct Firmware Update Procedure	5.5-B::68
---	Democracy Suite ImageCast Precinct Level One (L1) Maintenance Manual	5.5-B::67
---	Democracy Suite ImageCast Precinct Technical Guide	5.5-B::57
---	Usability Test Report of ImageCast Precinct 5.0 with 36 Participants for VVSG 1.0	5.0::10
---	Usability Test Report of ImageCast X 5.0 with 36 Participants for VVSG 1.0	5.0::13
---	YEDU.E95462 Uninterruptible Power-supply Equipment Sheet	---
---	Dell Latitude E7440 Regulatory Compliance Sheet	Rev. A09
---	Dell Latitude 3480 Regulatory Compliance Sheet	Rev. A11
---	Dell PowerEdge R630 Regulatory Compliance Sheet	Rev. A10
---	Dell Precision T1700 MT Regulatory Compliance Sheet	Rev. A09

Table 3-1. TDP Documents *(continued)*

Document Number	Description	Version
---	Dell PowerConnect 2808 Product Safety. EMC, and Environmental Datasheet	---
---	Dell PowerConnect 2816 Product Safety. EMC, and Environmental Datasheet	---
---	Smart Pro SM1500 Datasheet	---
---	APC Smart-UPS 230V Product Information Sheet	---
---	HP M402dn Datasheet	Rev. 2
---	HP M402dne Datasheet	May 2017
---	Dell Latitude 3480 Owner's Manual	Rev. A00
---	Dell Latitude 3470 Owner's Manual	Rev. A00
---	Dell Precision T3420 Owner's Manual	Rev. A00
---	aValue HID-21V-BTX-A1R User Manual	Rev. 2.0
---	aValue SID-15V-Z37-A1R Data Sheet	---
---	aValue SID-21V-Z37-A1R Data Sheet	---
---	APC Installation and Operation Back-UPS Pro BR1000G	10/2014
---	APC Smart-UPS SMT1500 Operation Manual	03/2013
---	Dell OptiPlex 7440 All-In-One Owner's Manual	Rev. A01
---	Dell OptiPlex 3050 All-In-One Owner's Manual	Rev. A01
---	Dell P2417H Monitor User's Guide	Rev. A01
---	Dell PowerEdge R630 Owner Manual	Rev. A03
---	Lexar Pro USB 3 Dual Slot Reader	---
---	Usability Study of Dominion Voting Systems ImageCast Evolution Versions 4.1.1.1 and 4.6.1.1	1.0.0::37
---	Democracy Suite ImageCast Evolution Firmware Installation Procedure	5.5-B::96
---	Democracy Suite ImageCast Evolution Level One (L1) Maintenance Manual	5.5-B::134
---	Democracy Suite ImageCast Evolution Machine Behavior Settings	5.5-B::96
---	Seiko SII RP-D10 Series User's Guide	Jan. 2018
---	Dell EMC PowerEdge R640 Installation and Service Manual	Rev. A01
---	Dell OptiPlex 7060 Small Form Factor Service Manual	Rev. A00
---	Dell Latitude E7470 Owner's Manual	Rev. A02
---	APC Operation Manual Smart-UPS 750/1000/1500/2200/3000 VA	---
---	ACR38x CCID Smart Card Reader Reference Manual	V6.05

Table 3-1. TDP Documents *(continued)*

Document Number	Description	Version
---	ACR39 Series PC-linked Smart Card Readers Reference Manual	V1.04
---	Ablenet Single Switch Quickstart Guide	---
---	The Programing Group High-Integrity C++Coding Standard Manual	Ver. 2.2
---	HIC++ Standards Model for C++	9.5.4
---	Dominion Voting Voter-verified paper audit trail (VVPAT) Model: VRP3 User Manual Safety Precautions	07 2018
---	Democracy Suite ImageCast Precinct 2 Machine Behavior Settings	5.5-B::10
---	APC Smart-UPS 1500 Specification Sheet	---
---	Democracy Suite ImageCast Precinct 2 Extracting Firmware Contents and Verifying SHA256 Values	5.5-B::13
---	Democracy Suite ImageCast Precinct 2 Level One (L1) Maintenance Manual	5.5-B::9
---	APC Back-UPS BE600M1 User Manual	09/2015
---	APC Back-UPS SMT1500C Operation Manual	01/2017
---	Avalue HID-21V-BTX FactSheet (---)	---
---	Avalue SID 21V Quick Reference	Feb 2018
---	Dell Latitude 3490 Owners Manual	Rev. A01
---	Dell OptiPlex 3050 AIO EMC Emissions Compliance Sheet	Rev. A11
---	Dell Latitude 3400 Setup and Specification Guide	Rev. A00
---	Dell PowerEdge R640 Technical Guide	Rev. A00
---	Dell Networking X Series User Guide	Rev. A06
---	Dell P2419H Monitor User's Guide	Rev. A05
---	DisplayLink DL 125 Product Brief	---
---	HIC Coding Standard	2.2
---	Kingston USB 3.0 High-Speed Media Reader Datasheet	---
---	Lenovo ThinkCentre TIO24Gen3Touch Monitor User Guide	May 2017
---	Dell Optiplex 7050 Tower Owners Manual (A01)	Rev. A01
---	Dell Optiplex 7060 Small Form Factor Service Manual	Rev. A00
---	Dell Optiplex 7060 Tower Setup and Specifications Guide	Rev. A01
---	Dell Precision 3430 Small Form Factor Service Manual	Rev. A00
---	Dell Precision 3430 Small Form Factor Setup and Specifications Guide	Rev. A00
---	Scamax 8x1 Scanner Brochure	---

Table 3-1. TDP Documents *(continued)*

Document Number	Description	Version
---	Tripp Lite SmartPro SM1500RMXL2UTAA Datasheet	---
Build Documents		
---	Democracy Suite ImageCast Evolution Firmware Build, Prerequisite Setup and Installation	5.5-B::95
---	Democracy Suite ImageCast Precinct Firmware Build and Install	5.5-B::90
---	Democracy Suite ImageCast X Build	5.5-B::55
---	Democracy Suite Windows Build Document	5.5-B::40
---	Democracy Suite ImageCast Precinct 2 Build Environment and Prerequisite Setup, Firmware Build and Installation	5.5-B::24

3.1.3 QA & CM System Review

The Dominion Voting Systems Quality and Configuration Management Manuals were reviewed for their fulfillment of Volume I, Sections 8 and 9, and the requirements specified in Volume II, Section 2. The requirements for these sections establish the quality assurance and configuration standards for voting systems to which manufacturers must conform and require voting system manufacturers to implement a quality assurance and configuration management program that is conformant with recognized ISO standards. As part of the review process, the Dominion Voting Systems TDP documents were reviewed to determine if the stated policies were being followed.

Summary Findings

This testing utilized the TDP Review in conjunction with the PCA to determine compliance to the EAC 2005 VVSG requirements and the requirements stated in the Dominion Voting Systems technical documentation. The review of the Quality Assurance and Configuration Management documentation focused on the Dominion Voting Systems' adherence to its stated QA and CM processes. No discrepancies were noted during the reviews.

3.1.4 Source Code Review, Compliance Build, Trusted build, and Build Documentation Review

Pro V&V reviewed the submitted source code to the EAC 2005 VVSG and the manufacturer-submitted coding standards. Prior to initiating the software review, Pro V&V verified that the submitted documentation was sufficient to enable: (1) a review of the source code and (2) Pro V&V to design and conduct tests at every level of the software structure to verify that design specifications and performance guidelines are met.

For the ICE software, a combination of Automated Source Code Review and Manual Source Code Review methods was used to review the source code. For all other components, the submitted source code was compared to the previously certified Democracy Suite 5.5 voting system versions to determine the changes, if any. A combination of Automated Source Code Review and Manual Source Code Review methods was used to review the changes in the source code. In addition, 10% of the source code comments were manually reviewed.

Summary Findings

- Automated Source Code Review: The Automated Source Code Review was performed to review the changes in the source code from the previously certified voting system. No source code issues were found during the Automated Source Code review.

- Manual Source Code Review: The Manual Source Code review was performed on 10% of the comments for compliance to VVSG Volume 1 Section 5.2.7. No source code issues were found during the Manual Source Code review.

- Compliance Build: The compliance build was performed following the compliance review. Once the compliance review was performed and the source was deemed stable enough to proceed with testing, the source code and all additional packages were compiled into a Compliance Build.

Trusted Build: The trusted build consisted of inspecting customer submitted source code, COTS, and Third Party software products and combining them to create the executable code. This inspection followed the documented process from the "United States Election Assistance Commission Voting System Testing and Certification Program Manual" Section 5.5 – 5.7. Performance of the trusted build includes the build documentation review. The Trusted Build was performed following the completion of the Functional Configuration Audit.

3.1.5 Security Testing

A complete security evaluation was performed on a previously certified version of the D-Suite System. The submitted modifications were evaluated during the source code review, security tests, and FCA.

To evaluate the integrity of the system, Pro V&V developed specifically designed test cases in an attempt to defeat the access controls and security measures documented in the system TDP as well verifying compliance to EAC RFI 2012-05. During the security testing, the system was inspected for various controls and measures that were in place to meet the objectives of the security standards which included: protection of the critical elements of the voting system; establishing and maintaining controls to minimize errors; protection from intentional manipulation, fraud and malicious mischief; identifying fraudulent or erroneous changes to the voting system; and protecting the secrecy in the voting process.

Summary Findings

As a result of the Security Testing, it was determined that the D-Suite 5.5-B met the requirements of the security review. Any deficiencies encountered during testing were successfully resolved.

3.1.6 System Level Testing

System Level testing was implemented to evaluate the complete system. This testing included all proprietary components and COTS components (software, hardware, and peripherals) in a configuration of the system's intended use. For software system tests, the tests were designed

according to the stated design objective without consideration of its functional specification. The system level hardware and software test cases were prepared independently to assess the response of the hardware and software to a range of conditions. Pro V&V reviewed the manufacturer's program analysis, documentation, and module test case design and evaluated the test cases for each module with respect to flow control parameters and entry/exit data.

System Level Testing included the evaluations of the following test areas FCA, Accuracy Testing, Volume & Stress, and System Integration Testing. Each of these areas is reported in detail in the subsections that follow.

Component Level Testing was implemented during the FCA for each component and subcomponent. During the source code review, compliance builds, and security testing, Pro V&V utilized limited structural-based techniques (white-box testing). Additionally, specification-based techniques (black-box testing) were utilized for the individual software components.

Pro V&V defined the expected result for each test and the ACCEPT/REJECT criteria for certification. If the system performed as expected, the results were accepted. If the system did not perform as expected, an analysis was performed to determine the cause. If needed, the test was repeated in an attempt to reproduce the results. If the failure could be reproduced and the expected results were not met, the system was determined to have failed the test. If the results could not be reproduced, the test continued. Any errors encountered were documented and tracked through resolution.

To verify the modifications were successfully addressed throughout the test campaign, each modification was tracked and verified to be addressed during the execution of the relevant test area. For example, source code changes were verified during the source code review. Modifications requiring functional test verification were evaluated by executing the standard Accuracy Test, the System Integration Test, or during performance of the FCA. Modifications that were not adequately evaluated during the performance of these tests were subjected to specifically designed test cases.

3.1.6.1 Functional Configuration Audit (FCA)

The functional configuration audit encompasses an examination of manufacturer's tests, and the conduct of additional tests, to verify that the system hardware and software perform all the functions described in the manufacturer's documentation submitted in the TDP.

In addition to functioning according to the manufacturer's documentation, tests will be conducted to insure all applicable EAC 2005 VVSG requirements are met.

For this campaign FCA testing included several exhaustive paths applied in concert:

- FCA-VVSG Testing: Each component of the system was evaluated against a standardized test-case suite centered upon requirements stated in the VVSG and administered through a test-management software tool. All applicable tests-cases were performed while any non-applicable test-cases were logged as "n/a" for substantiation. The system operations and functional

capabilities were categorized in the tool as follows by the phase of election activity in which they are required:

- Pre-voting Capabilities: These functional capabilities are used to prepare the voting system for voting. They include ballot preparation, the preparation of election-specific software (including firmware), the production of ballots, the installation of ballots and ballot counting software (including firmware), and system and equipment tests.

- Voting System Capabilities: These functional capabilities include all operations conducted at the polling place by voters and officials including the generation of status messages.

- Post-voting Capabilities: These functional capabilities apply after all votes have been cast. They include closing the polling place; obtaining reports by voting machine, polling place, and precinct; tabulation of paper ballots at the central location; accumulation of results from all voting methods; obtaining consolidated reports; and obtaining reports of audit trails.

- FCA-Claims Testing: System user instructions and procedures found in the TDP were followed to verify their accuracy and completeness. In addition any functional claims discovered in the TDP that were not specifically examined in other areas or that were items of interest were also tested.

- FCA-Mapping: Any modified functional paths (buttons, dropdowns, etc.) were mapped by qualified VSTL personnel, to help ensure all functional options had been noted and exercised. Any items of interest were examined and/or tested.

All issues (if any) found during these efforts are detailed in Section 3.3. Any issues noted were tracked using an issue tracking software program and issue tracking spreadsheets.

Summary Findings

All functional tests were successfully executed. During execution of the test procedure, it was verified that the D-Suite 5.5-B System successfully completed the system level integration tests with all actual results obtained during test execution matching the expected results.

3.1.6.2 Volume & Stress

The Volume & Stress Tests are utilized to investigate the system's response to conditions that tend to overload the system's capacity to process, store, and report data.

The test parameters focused on the system's stated limits and the ballot logic for areas such as the maximum number of active voting positions, maximum number of ballot styles, maximum candidates, maximum contests, and stated limits within the EMS. This test is utilized to ensure the system could achieve the manufacturer's TDP claims of what the system can support. Testing was performed by exercising multiple election definitions and test cases developed specifically to test for volume and stress conditions of the system being tested.

Summary Findings

During the performance of the Volume and Stress Test, the ICC configured with the Canon DR-M260 scanner encountered a significant number of double feeds when casting 22" ballots. To address the issue Dominion Voting Systems provided a "T" shaped support to provide support for these long ballots, as well as advised that smaller batches of ballots were used when scanning. These changes were documented and addressed the double feed issue and the ICC configured with the Canon DR-M260 scanner successfully completed the Volume and Stress Test. Volume and stress testing was successfully performed on the D-Suite 5.5-B System.

3.1.6.3 Accuracy

The accuracy test ensures that each component of the voting system can each process 1,549,703 consecutive ballot positions correctly within the allowable target error rate. The Accuracy test is designed to test the ability of the system to "capture, record, store, consolidate and report" specific selections and absences of a selection. The required accuracy is defined as an error rate. This rate is the maximum number of errors allowed while processing a specified volume of data. For paper-based voting systems the ballot positions on a paper ballot must be scanned to detect selections for individual candidates and contests and the conversion of those selections detected on the paper ballot converted into digital data.

Summary Findings

The accuracy requirements for the ICE, ICP2, and the ICC units were met by the execution of the standard accuracy test utilizing hand-marked ballots of each ballot length supported by the system, and ballots produced by the ICX BMD, to achieve an accuracy rate greater than 1,549,703 correct ballot positions.

The ICX BMD, ICX DRE, ICP, and the ICX DRE with VVPAT Accuracy test were reused from the Dominion 5.5 EAC Campaign.

3.1.6.4 System Integration

System Integration is a system level test for the integrated operation of both hardware and software. System Integration evaluates the compatibility of the voting system software components or subsystems with one another, and with other components of the voting system environment. This compatibility was determined through functional tests integrating the voting system software with the remainder of the system. During test performance, the system was configured exactly as it would for normal field use. This included connecting all supporting equipment and peripherals including ballot boxes, voting booths (regular and accessible), and any physical security equipment such as locks and ties.

Summary Findings

During System Integration testing, three General Elections and three Primary Elections were successfully exercised on the voting system, as described below:

Three general elections with the following breakdowns:

- General Election GEN-01: A basic election held in 4 precincts, one of which is a split precinct. This election contains 19 contests compiled into 4 ballot styles. 5 of the contests are in all 4 ballot styles. The other 15 contests are split between at least 2 of the precincts with a maximum of 4 different contest spread across the 4 precincts.

- General Election GEN-02: A basic election held in 3 precincts. This election contains 15 contests compiled into 3 ballot styles. 10 of the contests are in all 3 ballot styles with the other five split across the 3 precincts.

- General Election GEN-03: A basic election held in 2 precincts. This election contains 8 contests and compiled into 2 ballot styles. 4 of the contests are in both ballot styles. The other 4 contests are split between the two precincts. This election is designed to functionally test the handling of multiple ballot styles, support for at least three languages including a character-based language, support for common voting variations, and audio support for at least three languages and an ADA binary input device.

Three primary elections with the following breakdowns:

- Primary Election PRIM-01: Open Primary Election in two precincts. This election contained thirty contests compiled into five ballot styles. Each ballot style contains 6 contests.

- Primary Election PRIM-02: Open Primary Election held in two precincts. This election contained thirteen contests compiled into three ballot styles. One contest is in all three ballot styles; all other contests are independent.

- Primary Election PRIM-03: A basic election held in 2 precincts. This election contains 10 contests and is compiled into 2 ballot styles. 2 of the contests are in both ballot styles. The other 8 contests are split between the two parties' ballots. This Primary Election is designed to functionally test the handling of multiple ballot styles, support for at least three languages including a character-based language, support for common voting variations, and audio support for at least three languages and an ADA binary input device.

The D-Suite 5.5-B System successfully passed the System Integration Test. During execution of the test procedure, it was verified that the D-Suite 5.5-B System successfully completed the system level integration tests with all actual results obtained during test execution matching the expected results.

3.1.7 Usability and Accessibility Testing

Usability & Accessibility testing was performed to evaluate the D-Suite 5.5-B System to the applicable requirements. Testing specifically focused on the modifications implemented since the certification of the baseline system.

Usability was defined generally as a measure of the effectiveness, efficiency, and satisfaction achieved by a specified set of users with a given product in the performance of specified tasks.

The Accessibility portion of testing evaluated the requirements for accessibility. These requirements are intended to address HAVA 301 (a) (3) (B).

During test performance, the D-Suite 5.5-B System was configured as per the Dominion Voting Systems TDP. The configured system was tested to the VVSG 1.0 requirements utilizing TestLink which maintains all applicable test cases. Utilization of both negative and positive inputs were entered into the system and documented into TestLink to allow for traceability and reproducibility. All components were evaluated for applicable requirements in which all deficiencies were documented within TestLink and Mantis for tracking purposes. Regression testing was performed on all identified issues to ensure resolution and compliance to the requirements.

Summary Findings

The D-Suite 5.5-B System successfully met the requirements of the Usability and Accessibility evaluation. Any deficiencies encountered during testing were successfully resolved.

3.1.8 Hardware Testing

The ICX BMD, ICX DRE, ICP, the ICX DRE with Report Printer, and the ICX DRE with VVPAT hardware testing were re-used from the previous certification test campaign (D-Suite 5.5). The components added to the modified system required the full suite of hardware and electrical testing as detailed in the 2005 VVSG. These tests are listed below:

Electrical Tests:

- Electrical Power Disturbance
- Electromagnetic Radiation
- Electrostatic Disruption
- Electromagnetic Susceptibility
- Electrical Fast Transient
- Lightning Surge
- Conducted RF Immunity
- Magnetic Fields Immunity
- Electrical Supply

Environmental Tests:

- Bench Handling
- Vibration
- Low Temperature
- High Temperature

- Humidity
- Temperature Power Variation
- Acoustic

Pro V&V utilized third party testing during the performance of hardware testing. All electrical hardware testing was performed at the TUV SUD Canada, Inc. facility located in Ontario, Canada. All testing at the TUV SUD Canada, Inc. facility was witnessed on-site by Pro V&V personnel. All environmental hardware testing was performed at the NTS Longmont facility located in Longmont, Colorado. All testing at the NTS Longmont facility was witnessed on-site by Pro V&V personnel, with the exception of Temperature Power Variation in which Pro V&V qualified staff executed all testing.

Summary Findings

Electrical Testing was performed on the ICE and ICP2 components of the D-Suite 5.5-B System. The procedures and results for this testing are included in the following TUV SUD Canada, Inc. reports:

- Report File #: 7169005633E-00, presented in Attachment A-1
- Report File #: 7169006118E-00, presented in Attachment A-2

The test results from this testing are summarized below:

Table 3-2. Electrical Hardware Test Results

Standard/Method	Description	Criteria	Class/Level	Result
FCC 15.107 ICES-003 VVSG Vol. 1 4.1.2.9	Power Line Conducted Emissions	Normal Operation & No Data Loss	Class B	Pass
FCC 15.109 ICES-003 VVSG Vol. 1 4.1.2.9	Radiated Emissions	Normal Operation & No Data Loss	Class B	Pass
EN61000-4-11 VVSG Vol. 1 4.1.2.5	Electrical Power Disturbance	Normal Operation & No Data Loss	Various	Pass
EN61000-4-4 VVSG Vol. 1 4.1.2.6	Electrical Fast Transient	Normal Operation & No Data Loss	±2kV - Mains	Pass
EN61000-4-5 VVSG Vol. 1 4.1.2.7	Lightning Surge	Normal Operation & No Data Loss	±2kV Line - Line ±2kV Line - Ground	Pass
EN61000-4-2 VVSG Vol. 1 4.1.2.8	Electrostatic Disruption	Normal Operation & No Data Loss	±8kV Contact ±15kV Air	Pass
EN61000-4-3 VVSG Vol. 1 4.1.2.10	Electromagnetic Susceptibility	Normal Operation & No Data Loss	10 V/m, 80 MHz – 1 GHz	Pass

Table 3-2. Electrical Hardware Test Results *(continued)*

Standard/Method	Description	Criteria	Class/Level	Result
EN61000-4-6 VVSG Vol. 1 4.1.2.11	Conducted RF Immunity	Normal Operation & No Data Loss	10 Vrms, 150 kHz – 80 MHz	Pass
EN61000-4-8 VVSG Vol. 1 4.1.2.12	Magnetic Immunity	Normal Operation & No Data Loss	30 A/m	Pass

Environmental Testing was performed on the ICE and ICP2 components of the D-Suite 5.5-B System. The Canon M260 and InoTec HiPro Scanner components were subjected to Temperature-Power Variation Testing only.

The procedures and results for this testing are included in the following NTS Test reports:

- Test Report No. PR094223, presented in Attachment A-3 *(ICE)*
- Test Report No. PR097523, presented in Attachment A-4 *(InoTec HiPro Scanner and ICP2)*

The test results from this testing are summarized below:

Table 3-3. Environmental Hardware Test Results

Standard/Method	Description	Criteria	Result
MIL-STD-810D, 516.3, I-3.8 VVSG Vol. 1 4.1.2.14, VVSG Vol. 2 4.6.2	Shock – Bench Handling	Normal Operation & No Data Loss	Pass
MIL-STD-810D, 514.3, I-3.2.1 VVSG Vol. 1 4.1.2.14, VVSG Vol 2 4.6.3	Vibration - Basic Transportation	Normal Operation & No Data Loss	Pass
MIL-STD-810D, 502.2, II-3 VVSG Vol 1 4.1.2.14, VVSG Vol 2 4.6.4	Low Temperature - Storage	Normal Operation & No Data Loss	Pass
MIL-STD-810D, 501.2, I-3.2 VVSG Vol 1 4.1.2.14, VVSG Vol 2 4.6.5	High Temperature - Storage	Normal Operation & No Data Loss	Pass
MIL-STD-810D, 507.2, I-3.2 VVSG Vol 1 4.1.2.14, VVSG Vol 2 4.6.5	Humidity – Hot/Humid	Normal Operation & No Data Loss	Pass
MIL-STD-810D, 501.2/502.2 VVSG Vol 1 4.1.2.13, 4.3.3, VVSG Vol 2 4.7.1	Reliability, Temp-Power Variation Testing	Normal Operation & No Data Loss	Pass
VVSG Vol. 1 3.1.7.1, 3.2.2.2 (c)	Acoustic Noise Level Test	Normal Operation & No Data Loss	Pass
VVSG Vol. 1 4.1.2.4	Electrical Supply	Normal Operation & No Data Loss	Pass
VVSG Vol. 1 4.7.2	Maintainability	Ease of Maintenance	Pass

3.2 Anomalies and Resolutions

When a result is encountered during test performance that deviates from what is standard or expected, a root cause analysis is performed. Pro V&V considers it an anomaly if no root cause can be determined. In instances in which a root cause is established, the results are then considered deficiencies.

Summary Findings

There were no anomalies encountered during this test campaign.

3.3 Deficiencies and Resolutions

Any violation of the specified requirement or a result encountered during test performance that deviates from what is standard or expected in which a root cause is established was considered to be a deficiency. Any deficiencies encountered were logged throughout the test campaign into the Pro V&V tracking system (Mantis) for disposition and resolution. In each instance, if applicable, the resolutions were verified to be resolved through all required means of testing (regression testing, source code review, and TDP update) as needed. Table 3.4 details the noted deficiencies.

Table 3-4. Noted Deficiencies

ID#	Test Category	Deficiency	Resolution
476	Volume and Stress	A significant number of double feeds occurred while scanning 22" ballots on the ICC configured with the Canon DR-M260 scanner.	Dominion supplied a "T" shaped support to provide support for long ballots, as well as advised that smaller batch sizes be used when scanning.
477	System Loads and Hardening	An error occurred when restarting an ICP2 unit after installing the 5.5.1.1 firmware on the unit. Running the installation process a second time addresses the issue.	This issue was addressed in the 5.5.1.8 release of the ICP2 firmware.
479	General	Using the ATI to vote a ballot caused the ICX application ver. 5.5.13.2 to crash and restart.	This issue was caused by the incorrect build resources being supplied to the VSTL. The correct build resources were supplied and the ICX application version 5.5.13.2 was rebuilt.

4.0 RECOMMENDATION FOR CERTIFICATION

The D-Suite 5.5-B Voting System, as presented for testing, successfully met the requirements set forth for voting systems in the U.S. Election Assistance Commission (EAC) 2005 Voluntary Voting System Guidelines (VVSG), Version 1.0. Additionally, Pro V&V, Inc. has determined

that the D-Suite 5.5-B functioned as a complete system during System Integration Testing. Based on the test findings, Pro V&V recommends the EAC grant the D-Suite 5.5-B System, as identified in Tables 4-1 through 4-29, certification to the EAC 2005 VVSG.

Table 4-1. Democracy Suite 5.5-B EMS Software Component Descriptions

Software	Version	Filename	Configuration	
			Standard	Express
EMS Election Event Designer (EED)	5.5.32.4	setup.exe: EED_FED_CERT_Setup_x64.msi	X	X
EMS Results Tally and Reporting (RTR)	5.5.32.4	setup.exe: RTR_FED_CERT_Setup_x64.msi	X	X
EMS Application Server	5.5.32.4	setup.exe: APPS_FED_CERT_Setup_x64.msi	X	X
EMS File System Service (FSS)	5.5.32.4	setup.exe: FSSSetup.msi	X	X
EMS Audio Studio (AS)	5.5.32.4	setup.exe: EMSAudioStudioSetup.msi	X	X
EMS Data Center Manager (DCM)	5.5.32.4	DemocracySuiteEMS_DCM.exe	X	X
EMS Election Data Translator (EDT)	5.5.32.4	setup.exe: EDTSetup_x86.msi EDTSetup_x64.msi	X	X
ImageCast Voter Activation (ICVA)	5.5.32.4	setup.exe: ICVASetup.msi	X	X
EMS Adjudication (Adj.)	5.5.32.1	DVS ImageCast Adjudication Client Setup.msi	X	X
EMS Adjudication Service	5.5.32.1	DVS Adjudication Services Setup.msi	X	X
Smart Card Helper Service	5.5.32.4	setup.exe: SmartCardServiceSetup.msi	X	X

Table 4-2. Democracy Suite 5.5-B ImageCast Precinct Software Component Descriptions

Firmware/Software	Version	Filename
Election Firmware	5.5.31.1	cf2xx.sig
Firmware Updater	5.5.31.1	firmUp.enc
Firmware Extractor	5.5.31.1	FirmwareExtract.enc
Kernel (uClinux)	5.5.31.1	image.bin.gz
Boot Loader (COLILO)	20040221	colilo.bin
Asymmetric Key Generator	5.5.31.1	Keygen.enc
Asymmetric Key Exchange Utility	5.5.31.1	KeyExchange.enc
Firmware Extractor (Uses Technician Key)	5.5.31.1	TechExtract.enc

Table 4-3. Democracy Suite 5.5-B ImageCast Central Software Component Descriptions

Firmware/Software	Version	Filename
ImageCast Central Application	5.5.32.5	ICCSetup.exe

Table 4-4. Democracy Suite 5.5-B ImageCast X Software Component Descriptions

Firmware/Software	Version	Filename
ICX Application	5.5.13.2	ICX.apk

Table 4-5. Democracy Suite 5.5-B ImageCast Precinct 2 Software Component Descriptions

Firmware/Software	Version	Filename
ICP2 Application	5.5.1.8	dvs-release-image-icp2-5.5.1.8.vhd.7z
ICP2 Application (for units with 2 GB RAM)	5.5.1.8	dvs-release-image-icp2-2G-5.5.1.8.vhd.7z
ICP2 Update Card	5.5.1.8	icp2-update-5.5.1.8

Table 4-6. Democracy Suite 5.5-B ImageCast Evolution Software Component Descriptions

Firmware/Software	Version	Filename
Voting Machine	5.5.6.5	GApplication-5.5.6.5.vhd.7z
Election Application	5.5.6.5	dvs
Linux Kernel	2.6.30.9-dvs-36	uImage
Linux Device File	1.6	mpc8347dvs.dtb
Root File System	5.0.31	rfs
Ram Disk	1.0.2	initrd.img
Motherboard FPGA	1.1.5	ice2_mc_p1.bit
Scanner Board FPGA	1.1.2	ice2_scb_p2.bit
Logger Controller	2.0.2	logger.bin
Power Controller	3.0.5	power.bin
Boot Loader	1.3.4.63	u-boot.bin
Integrated Printer	4.1.6	integratedPrinter.hex, printerFont.hex
Boot Startup Logo	6.0.0	logo_platform.bmp
Linux Startup Logo	6.0.0	logo_os.bmp
Application Startup Logo	6.0.0	application_startup_logo.bmp
Application Verification Logo	6.0.0	logo_application_verification.bmp
Ram Disk Verification Logo	6.0.0	logo_ramdisk_verification.bmp

Table 4-6. Democracy Suite 5.5-B ImageCast Evolution Software Component Descriptions
(continued)

Firmware/Software	Version	Filename
Linux Tree Verification Logo	6.0.0	logo_os_tree_verification.bmp
Linux Verification Logo	6.0.0	logo_os_verification.bmp
RFS Verification Logo	6.0.0	logo_rfs_verification.bmp

Table 4-7. Democracy Suite 5.5-B EMS Client/Server Software Component Descriptions

Firmware/Software	Version	Filename	Configuration	
			Standard	Express
Microsoft Windows Server	2012 R2 Standard	Physical Media from Microsoft	X	
Microsoft Windows	10 Professional	Physical Media from Microsoft	X	X
.NET Framework	3.5	Physical Media from Microsoft	X	X
Microsoft Visual J#	2.0	vjredist64.exe vjredist.exe	X	X
Microsoft Visual C++ 2013 Redistributable	2013	vcredist_x64.exe vcredist_x86.exe	X	X
Microsoft Visual C++ 2015 Redistributable	2015	vc_redist.x64.exe vc_redist.x86.exe	X	X
Java Runtime Environment	7u80	jre-7u80-windows-x64.exe jre-7u80-windows-i586.exe	X	X
Java Runtime Environment	8u144	jre-8u144-windows-x64.exe jre-8u144-windows-i586.exe	X	X
Microsoft SQL Server 2016 Standard	2016 Standard	Physical Media from Microsoft	X	
Microsoft SQL Server 2016 Service Pack 1	2016 SP1	SQLServer2016SP1-KB3182545-x64-ENU.exe	X	
Microsoft SQL Server 2016 SP1 Express	2016 SP1	SQLEXPRADV_x64_ENU.exe		X
Cepstral Voices	6.2.3.801	Allison (English): Cepstral_Allison_windows_6.2.3.801.exe Alejandra (Spanish): Cepstral_Alejandra_windows_6.2.3.801.exe	X	X
Arial Narrow Fonts	2.37a	ARIALN.TTF ARIALNB.TTF ARIALNBI.TTF ARIALNI.TTF	X	X
Maxim iButton Driver	4.05	install_1_wire_drivers_x86_v405.msi install_1_wire_drivers_x64_v405.msi	X	X

Table 4-7. Democracy Suite 5.5-B EMS Client/Server Software Component Descriptions
(continued)

Firmware/Software	Version	Filename	Configuration	
			Standard	Express
Adobe Reader DC	AcrobatDC	AcroRdrDC1501020060_en_US.exe	X	X
Microsoft Access Database Engine	2010	AccessDatabaseEngine.exe AccessDatabaseEngine_x64.exe	X	X
Open XML SDK 2.0 for Microsoft Office	2.0	OpenXMLSDKv2.msi	X	X

Table 4-8. Democracy Suite 5.5-B EMS Software Platform Unmodified COTS Component Descriptions

Firmware/Software	Version	Filename
Infragistics NetAdvantage Win Forms 2011.1	2011 Vol.1	NetAdvantage_WinForms_20111.msi
Infragistics NetAdvantage WPF 2012.1	2012 Vol.1	NetAdvantage_WPF_20121.msi
TX Text Control Library for .NET	16.0	TXText Control.NET for Windows Forms 16.0.exe
SOX	14.3.1	sox.exe , libgomp-1.dll, pthreadgc2.dll, zlib1.dll
NLog	1.0.0.505	NLog.dll
iTextSharp	5.0.5	itextsharp.dll
OpenSSL	1.0.2k & 2.0.14 FIPS	openssl.exe, libeay32.dll, ssleay32.dll
SQLite	1.0.103.0	System.Data.SQLite.DLL (32-bit and 64-bit)
Lame	3.99.4	lame.exe
Speex	1.0.4	speexdec.exe and speexenc.exe
Ghostscript	9.04	gsdll32.dll (32-bit and 64-bit)
One Wire API for .NET	4.0.2.0	OneWireAPI.NET.dll
Avalon-framework-cvs-20020806	20020806	avalon-framework-cvs-20020806.jar
Batik	0.20-5	batik.jar
Fop	0.20-5	fop.jar
Microsoft Visual J# 2.0 Redistributable Package-Second Edition(x64)	2.0	vjc.dll , vjsjbc.dll, vjslibcw.dll, vjsnativ.dll , vjssupuilib.dll , vjsvwaux.dll
Entity framework	6.1.3	EntityFramework.dll
Spreadsheetlight	3.4.3	SpreadsheetLight.dll, SpreadsheetLight.xml
Open XML SDK 2.0 For Microsoft Office	2.0.5022.0	DocumentFormat.OpenXml.dll, DocumentFormat.OpenXml.xml

Table 4-9. Democracy Suite 5.5-B ImageCast Precinct Unmodified COTS Component Descriptions

Firmware/Software	Version	Filename
OpenSSL 1.0.2k	1.0.2k	openssl-1.0.2k.tar.gz
OpenSSL FIPS 2.0.10	2.0.10	openssl-fips-2.0.10.tar.gz
Zlib	1.2.3	Zlib-1.2.3.tar.gz

Table 4-10. Democracy Suite 5.5-B ImageCast Precinct 2 Unmodified COTS Component Descriptions

Firmware/Software	Version	Filename
acl	2.2.52	acl-2.2.52.src.tar.gz
attr	2.4.47	attr-2.4.47.src.tar.gz
avahi	0.6.32	avahi-0.6.32.tar.gz
bash	4.3.30	bash-4.3.30.tar.gz
bash-completion	2.4	bash-completion-2.4.tar.xz
busybox	1.24.1	busybox-1.24.1.tar.bz2
bzip2	1.0.6	bzip2-1.0.6.tar.gz
coreutils	8.25	coreutils-8.25.tar.xz
cryptodev-linux	1.8	cryptodev-linux-1.8.tar.gz
cups	2.1.4	cups-2.1.4-source.tar.gz
db	6.0.35	db-6.0.35.tar.gz
dbus	1.10.10	dbus-1.10.10.tar.gz
dbus-glib	0.106	dbus-glib-0.106.tar.gz
dbus-test	1.10.10	dbus-1.10.10.tar.gz
depmodwrapper-cross	1	morty.tar.gz
e2fsprogs	1.43	e2fsprogs.git.tar.gz
expat	2.2.0	expat-2.2.0.tar.bz2
fontconfig	2.12.1	fontconfig-2.12.1.tar.gz
freetype	2.6.5	freetype-2.6.5.tar.bz2
gawk	4.1.3	gawk-4.1.3.tar.gz
gcc-runtime	6.2.0	gcc-6.2.0.tar.bz2
gettext	0.19.8.1	gettext-0.19.8.1.tar.gz
glib-2.0	2.48.2	glib-2.48.2.tar.xz
glibc	2.24	git2_sourceware.org.git.glibc.git.tar.gz

Table 4-10. Democracy Suite 5.5-B ImageCast Precinct 2 Unmodified COTS Component Descriptions *(continued)*

Firmware/Software	Version	Filename
glibc-initial	2.24	git2_sourceware.org.git.glibc.git.tar.gz
glibc-locale	2.24	git2_sourceware.org.git.glibc.git.tar.gz
gmp	6.1.1	gmp-6.1.1.tar.bz2
gnutls	3.5.3	gnutls-3.5.3.tar.xz
gobject-introspection	1.48.0	gobject-introspection-1.48.0.tar.xz
grep	2.25	grep-2.25.tar.xz
icu	57.1	icu4c-57_1-src.tgz
imx-gpu-viv	6.2.2.p0-aarch32	imx-gpu-viv-6.2.2.p0-aarch32.bin
kbd	2.0.3	kbd-2.0.3.tar.xz
kernel-module-imx-gpu-viv	6.2.2.p0	kernel-module-imx-gpu-viv-6.2.2.p0.tar.gz
kmod	23+gitAUTOINC+65a885df5f	git2_git.kernel.org.pub.scm.utils.kernel.kmod.kmod.git.tar.gz
libcap	2.25	libcap-2.25.tar.xz
libcgroup	0.41	libcgroup-0.41.tar.bz2
libcheck	0.10.0	check-0.10.0.tar.gz
libdaemon	0.14	libdaemon-0.14.tar.gz
libdrm	2.4.70	libdrm-2.4.70.tar.bz2
libevdev	1.5.2	libevdev-1.5.2.tar.xz
libffi	3.2.1	libffi-3.2.1.tar.gz
libgcc	6.2.0	libgcc-5-dev_5.4.0-6ubuntu1~16.04.10_amd64.deb
libgcc-initial	6.2.0	libgcc-5-dev_5.4.0-6ubuntu1~16.04.10_amd64.deb
libidn	1.33	libidn-1.33.tar.gz
libinput	1.8.4	libinput-1.8.4.tar.xz
libjpeg-turbo	1.5.0	libjpeg-turbo-1.5.0.tar.gz
libnss-mdns	0.1	nss-mdns-0.10.tar.gz
libpcap	1.7.4	libpcap-1.7.4.tar.gz
libpciaccess	0.13.4	libpciaccess-0.13.4.tar.bz2
libpcre	8.39	libpcre32-3_2%3a8.38-3.1_amd64.deb
libpng	1.6.24	libpng-1.6.24.tar.xz
libpthread-stubs	0.3	libpthread-stubs-0.3.tar.bz2

Table 4-10. Democracy Suite 5.5-B ImageCast Precinct 2 Unmodified COTS Component Descriptions *(continued)*

Firmware/Software	Version	Filename
libtool-cross	2.4.6	libtool-2.4.6.tar.gz
libusb1	1.0.20	libusb-1.0.20.tar.bz2
libusb-compat	0.1.5	libusb-compat-0.1.5.tar.bz2
libxkbcommon	0.6.1	libxkbcommon-0.6.1.tar.xz
libxml2	2.9.4	libxml2-2.9.4.tar.gz
linux-libc-headers	4.9	linux-4.9.tar.xz
log4cplus	1.2.0	log4cplus-1.2.0.tar.gz
m4	1.4.17	m4-1.4.17.tar.gz
mesa	12.0.1	mesa-12.0.1.tar.xz
mtdev	1.1.5	mtdev-1.1.5.tar.bz2
nettle	3.2	nettle-3.2.tar.gz
openssl	1.0.2k	openssl-1.0.2k.tar.gz
openssl-fips	2.0.10	openssl-fips-2.0.10.tar.gz
opkg-utils	0.3.2+gitAUTOINC+3ffe ce9bf1	opkg-0.3.3.tar.gz
pkgconfig	0.29.1+gitAUTOINC+87152c05be	git2_anongit.freedesktop.org.pkg-config.tar.gz
ppp	2.4.7	ppp-2.4.7.tar.gz
procps	3.3.12	procps-ng-3.3.12.tar.xz
qtbase	5.9.6+gitAUTOINC+f4c2fcc052	qtbase-5.9.6+gitAUTOINC+9c50112304.tar.gz
qtdeclarative	5.9.6+gitAUTOINC+dfb e918537	qtdeclarative-5.9.6+gitAUTOINC+283a900c4e.tar.gz
qtgraphicaleffects	5.9.6+gitAUTOINC+3d317f1bb0	qtgraphicaleffects-5.9.6+gitAUTOINC+f61dcaa5e5.tar.gz
qtquickcontrols2	5.9.6+gitAUTOINC+c51 eea8870	qtquickcontrols2-5.9.6+gitAUTOINC+c48b314ede.tar.gz
qtquickcontrols	5.9.6+gitAUTOINC+f050a32a43	qtquickcontrols-5.9.6+gitAUTOINC+ca6bba7163.tar.gz
qtsvg	5.9.6+gitAUTOINC+dec74295e8	qtsvg-5.9.6+gitAUTOINC+7a28db8f5b.tar.gz
qtxmlpatterns	5.9.6+gitAUTOINC+c7c5681004	qtxmlpatterns-5.9.6+gitAUTOINC+4dcae15a5a.tar.gz
quazip	0.7.3	quazip-0.7.3.tar.gz
readline	6.3	readline-6.3.tar.gz
run-postinsts	1	morty.tar.gz

Table 4-10. Democracy Suite 5.5-B ImageCast Precinct 2 Unmodified COTS Component Descriptions *(continued)*

Firmware/Software	Version	Filename
sed	4.2.2	sed-4.2.2.tar.gz
shadow	4.2.1	shadow-4.2.1.tar.xz
shadow-securetty	4.2.1	shadow-4.2.1.tar.xz
sqlite3	3.14.1	sqlite-autoconf-3140100.tar.gz
systemd	230+gitAUTOINC+3a74d4fc90	git2_github.com.systemd.systemd.git.tar.gz
tcl	8.6.6	tcl8.6.6-src.tar.gz
tslib	1.1	tslib-1.1.tar.xz
tzdata	2017a	tzdata2017a.tar.gz
usb-modeswitch	2.2.0	usb-modeswitch-2.2.0.tar.bz2
usb-modeswitch- data	20140529	usb-modeswitch-data-20140529.tar.bz2
util-linux	2.28.1	util-linux-2.28.1.tar.xz
util-macros	1.19.0	util-macros-1.19.0.tar.gz
xz	5.2.2	xz-5.2.2.tar.gz
zbar	0.1	zbar-0.10.tar.bz2
zlib	1.2.8	zlib-1.2.8.tar.xz
flac	1.3.1	flac-1.3.1.tar.xz
gst-plugins-base	1.10.4	gst-plugins-base-1.10.4.tar.xz
gst-plugins-good	1.10.4	gst-plugins-good-1.10.4.tar.xz
gstreamer	1.10.4	gstreamer-1.10.4.tar.xz
harfbuzz	1.3.0	harfbuzz-1.3.0.tar.bz2
libgudev	230	libgudev-230.tar.xz
libical	2.0.0	libical-2.0.0.tar.gz
libogg	1.3.2	libogg-1.3.2.tar.xz
libsamplerate	0.1.8	libsamplerate-0.1.8.tar.gz
libsndfile	1.0.27	libsndfile-1.0.27.tar.gz
libvorbis	1.3.5	libvorbis-1.3.5.tar.xz
speex	1.2rc2	speex-1.2rc2.tar.gz
speexdsp	1.2rc3	speexdsp-1.2rc3.tar.gz
taglib	1.9.1	taglib-1.9.1.tar.gz
qtmultimedia	5.9.6+gitAUTOINC+52f5785cfa	qtmultimedia-5.9.6+gitAUTOINC+52f5785cfa.tar.gz

Table 4-11. Democracy Suite 5.5-B ImageCast Evolution Unmodified COTS Component Descriptions

Firmware/Software	Version	Filename
BusyBox	1.20.2	busybox-1.20.2.tar.bz2
e2fsprogs	1.42.4	e2fsprogs-1.42.4.tar.gz
Expat XML Parser	2.1.0	expat-2.1.0.tar.gz
fontconfig	2.9.0	fontconfig-2.9.0.tar.gz
Freetype	2.4.9	freetype-2.4.9.tar.bz2
I2C Tools for Linux	3.1.0	i2c-tools-3.1.0.tar.bz2
JPEG library	8d	jpegsrc.v8d.tar.gz
libogg	1.3.0	libogg-1.3.0.tar.gz
libPNG	1.5.10	libpng-1.5.10.tar.gz
libusb	1.0.8	libusb-1.0.8.tar.bz2
libusb-compat	0.1.3	libusb-compat-0.1.3.tar.bz2
log4cplus	1.0.4.1	log4cplus-1.0.4.1.tar.bz2
openssl	1.0.2k	openssl-1.0.2k.tar.gz
openssl-fips	2.0.10	openssl-fips-2.0.10.tar.gz
PPP	2.4.5	ppp-2.4.5.tar.gz
quazip	0.5	quazip-0.5.tar.gz
Qt Everywhere Linux	4.7.3	qt-everywhere-opensource-src-4.7.3.tar.gz
skell	1.19	skell-1.19.tar.gz
SoundTouch	1.6.0	soundtouch-1.6.0.tar.gz
speex	1.2rc1	speex-1.2rc1.tar.gz
SQLite	3.7.13	sqlite-autoconf-3071300.tar.gz
Sysfs Utilities	2.1.0	sysfsutils-2.1.0.tar.gz
TIFF library	4.0.1	tiff-4.0.1.tar.gz
timezone	2012b	tzcode2012b.tar.gz
USB ModeSwitch	1.2.4	usb-modeswitch-1.2.4.tar.bz2
zlib	1.2.7	zlib-1.2.7.tar.bz2

Table 4-12. Democracy Suite 5.5-B ImageCast X Unmodified COTS Component Descriptions

Firmware/Software	Version	Filename
Google Text-to-Speech Engine	3.11.12	ARM: com.google.android.tts_3.11.12-210311121_minAPI19(armeabi-v7a)(nodpi).apk x86: com.google.android.tts_3.11.12-210311123_minAPI15(x86)(nodpi).apk
ICX Prime Android 5.1.1 Image	0405	0405_5.1.1-01.12_user_android_x86.iso
ICX Classic Android 4.4.4 Image	0.0.98	byt_t_crv2_64-ota-BCX18-V0.0.98.zip

Table 4-13. Democracy Suite 5.5-B ImageCast Central Software Build Library Source Code (Unmodified COTS)

Firmware/Software	Version	Filename
OpenSSL 1.0.2k	1.0.2k	openssl-1.0.2k.tar.gz
OpenSSL FIPS 2.0.10	2.0.10	openssl-fips-2.0.10.tar.gz

Table 4-14. Democracy Suite 5.5-B ImageCast Central Runtime Software Components (Unmodified COTS)

Firmware/Software	Version	Filename
1-Wire Driver (x86)	4.05	install_1_wire_drivers_x86_v405.msi
1-Wire Driver (x64)	4.05	install_1_wire_drivers_x64_v405.msi
Canon DR-G1130 TWAIN Driver	1.2 SP6	G1130_DRIT_V12SP6.exe
Canon DR-M160II TWAIN Driver	1.2 SP6	M160II_DRIT_V12SP6.exe
Visual C++ 2013 Redistributable (x86)	12.0.30501	vcredist_x86.exe
InoTec HiPro 821 TWAIN Driver	1.2.3.17	TwainSetup-ScamaxUSB3.exe
Canon DR-M260 TWAIN Driver	1.1 SP2	M260_DRIT_V11SP2.zip

Table 4-15. Democracy Suite 5.5-B ImageCast Precinct Modified COTS Software Component Descriptions

Firmware/Software	Version	Filename
uClinux	20070130	uClinux-dist-20070130.tar.gz
COLILO Bootloader	20040221	Colilo20040221.tar.gz

Table 4-16. Democracy Suite 5.5-B ImageCast Precinct 2 Modified COTS Software Component Descriptions

Firmware/Software	Version	Filename
Kernel	4.9.11	zImage
U-BOOT	2017.03	u-boot.bin

Table 4-17. Democracy Suite 5.5-B ImageCast Evolution Modified COTS Software Component Descriptions

Firmware/Software	Version	Filename
Kernel	2.6.30	uImage
U-BOOT	1.3.4	u-boot.bin

Table 4-18. Democracy Suite 5.5-B ImageCast X Modified COTS Software Component Descriptions

Firmware/Software	Version	Filename
Zxing Barcode Scanner	4.7.5	BS-4.7.5.zip
SoundTouch	1.9.2	Soundtouch-1.9.2.tar.gz

Table 4-19. Democracy Suite 5.5-B EMS Software Build Environment Component Descriptions

Firmware/Software	Version	Filename
Windows 10 Professional	10 Professional	Physical Media from Microsoft
.NET Framework 3.5	3.5	Physical Media from Microsoft
Internet Information Server (IIS)	10.0	Physical Media from Microsoft
7-Zip	9.20 (64 Bit)	7z920-x64.msi
Visual Studio 2015 Professional with Update 3	2015 Update 3	en_visual_studio_professional_2015_with_update_3_x86_x64_web_installer_8922978.exe
.NetDiscUtils	0.10	DiscUtilsBin-0.10.zip
Infragistics NetAdvantage Win Forms 2011.1	2011.1	NetAdvantage_WinForms_20111.msi
Infragistics Net Advantage – WPF 2012.1	2012.1	NetAdvantage_WPF_20121.msi
TX Text Control 16.0.NET	16	TX Text Control.NET for Windows Forms 16.0.exe
Speex	1.0.4	speex_win32_1.0.4_setup.exe
Microsoft Visual J#	2.0	vjredist64.exe
iTextSharp	5.0.5	itextsharp-5.0.5-dll.zip

Table 4-19. Democracy Suite 5.5-B EMS Software Build Environment Component Descriptions *(continued)*

Firmware/Software	Version	Filename
Ghostscript	9.0.4	gs904w32.exe, gs904w64.exe
Nlog	1.0.0.505	NLog-1.0-Refresh-bin.zip
OneWireAPI.NET	4.0	1-wiresdkver400_beta2.zip
Lame	3.99.4	lame3.99.4-20120130.zip
Sox	14.3.1	sox-14.3.1-win32.zip
Avalon Framework	20020806	avalon-framework-cvs-20020806.jar.zip
Fop	0.20-5	fop-0.20.5.jar
Batik	0.20-5	batik-1.5-fop-0.20-5.jar
SQLite	1.0.103.0	sqlite-netFx46-setup-bundle-x64-2015-1.0.103.0.exe
OpenSSL 1.0.2k	1.0.2k	openssl-1.0.2k.tar.gz
OpenSSL FIPS 2.0.10	2.0.10	openssl-fips-2.0.10.tar.gz
Strawberry Perl	5.24.1.1	strawberry-perl-5.24.1.1-64bit.msi
Patch	2.5.9-7	patch-2.5.9-7-bin.zip
ISOnewspaper	30.4	ISOnewspaper30v4_gr.icc.zip
Ogg Vorbis Encoder	2.88	oggenc2.88-1.3.5-generic.zip
Ogg Vorbis Encoder	1.10.1	oggdecV1.10.1.zip
Prism Mvvm	1.1.1	prism.mvvm.1.1.1.nupkg
Bitmiracle.libtiff.net	2.4.560	Bitmiracle.libtiff.net.2.4.560.nupkg
Prism	4.0.0	prism.4.0.0.nupkg
Prism.UnityExtensions	4.0.0	prism.unityextensions.4.0.0.nupkg
PDF Printing	2.9.5.2	PDFPrinting.zip
Entity Framework	6.1.3.net45	entityframework.6.1.3.nupkg
WiX	3.10	Wix310.exe
Spreadsheet Light	3.4.3	spreadsheetlight.3.4.3.nupkg
Open XML SDK 2.0 for Microsoft Office	2.0	OpenXMLSDKv2.msi
Adobe Reader DC	AcrobatDC	AcroRdrDC1501020060_en_US.exe
Arial Narrow Fonts	2.37a	ArialNarrowFonts.zip
SSH.NET	2016.1.0	SSH.NET-2016.1.0-bin.zip
SSMS	14.0.17119.0	SSMS-Setup-ENU.exe
TwainDSM	2.3.0	Twaindsm-2.3.0.win.bin

Table 4-20. Democracy Suite 5.5-B ICC Software Build Environment Component Descriptions

Firmware/Software	Version	Filename
NASM Assembler	2.12.02	nasm-2.12.02-win32.zip
OpenSSL 1.0.2k	1.0.2k	openssl-1.0.2k.tar.gz
OpenSSL FIPS 2.0.10	2.0.10	openssl-fips-2.0.10.tar.gz
CSC3-2010	N/A	CSC3-2010.crl
tss-ca-g2	N/A	tss-ca-g2.crl

Table 4-21. Democracy Suite 5.5-B Adjudication Software Build Environment Component Descriptions

Firmware/Software	Version	Filename
Microsoft Enterprise Library	5.0	Enterprise Library 5.0.msi
Microsoft Prism	4.0.0	Prism.4.0.0.nupkg
Microsoft Identity Foundation SDK	4.0	WindowsIdentityFoundation-SDK-4.0.msi
Toggle Switch Control Library	1.1.1	ToggleSwitch 1.1.1.zip
Infragistics NetAdvantage Ultimate 2013.1	2013.1	NetAdvantage_20131_PlatformInstaller.zip
iTextSharp	5.5.1	itextsharp-all-5.5.1.zip
CLR Security	June 2010	clrsecurity_june10.zip
OpenSSL 1.0.2k	1.0.2k	openssl-1.0.2k.tar.gz
OpenSSL FIPS 2.0.10	2.0.10	openssl-fips-2.0.10.tar.gz
Community MSI Extensions	1.4	msiext-1.4.zip
TreeViewEx	3.0.0.0	TreeViewEx.dll

Table 4-22. Democracy Suite 5.5-B ImageCast Precinct Election Firmware Compiler Descriptions

Firmware/Software	Version	Filename
g++ (GNU C++ compiler)	gcc3.4.0-20040603	m68k-uclinux-tools-c++-gcc3.4.0-20040603.sh

Table 4-23. Democracy Suite 5.5-B ImageCast Precinct Firmware Build Environment Component Descriptions

Firmware/Software	Version	Filename
Ubuntu 16.04.1	16.04.1	ubuntu-16.04.1-desktop-i386.iso
Toolchain Installation Script	N/A	Toolchain.sh

Table 4-23. Democracy Suite 5.5-B ImageCast Precinct Firmware Build Environment Component Descriptions *(continued)*

Firmware/Software	Version	Filename
m68k uClinux tools base gcc	3.4.0-20040603	m68k-uclinux-tools-base-gcc3.4.0-20040603.sh
m68k uClinux tools c++ gcc	3.4.0-20040603	m68k-uclinux-tools-c++-gcc3.4.0-20040603.sh
m68k uClinux tools gdb	20040603	m68k-uclinux-tools-gdb-20040603.sh
OpenSSL 1.0.2k	1.0.2k	openssl-1.0.2k.tar.gz
OpenSSL FIPS 2.0.10	2.0.10	openssl-fips-2.0.10.tar.gz

Table 4-24. Democracy Suite 5.5-B ImageCast Precinct 2 Firmware Build Environment Component Descriptions

Firmware/Software	Version	Filename
Ubuntu	16.04 LTS	ubuntu-16.04.5-desktop-amd64.iso
Yocto	imx-morty	morty.tar.gz
asciidoc	8.6.9	asciidoc_8.6.9-3_all.deb
autoconf	2.69	autoconf_2.69-9_all.deb
automake	1.15	automake_1%3a1.15-4ubuntu1_all.deb
p7zip- full	9.20.1~dfsg.1	p7zip-full_9.20.1~dfsg.1-4.2_amd64.deb
avr-libc	1.8.0+Atmel3.5.0	avr-libc_1%3a1.8.0+Atmel3.5.0-1_all.deb
binutils-avr_	2.25+Atmel3.5.0	binutils-avr_2.25+Atmel3.5.0-2_amd64.deb
python-dev	2.7.12	python-dev_2.7.12-1~16.04_amd64.deb
python3	3.5.1	python3-dev_3.5.1-3_amd64.deb
python3-pip	8.1.1	python3-pip_8.1.1-2ubuntu0.4_all.deb
python-pysqlite2	2.7.0	python-pysqlite2_2.7.0-1_amd64.deb
chrpath	0.16	chrpath_0.16-1_amd64.deb
socat	1.7.3.1	socat_1.7.3.1-1_amd64.deb
cvs	1.12.13	cvs_2%3a1.12.13+real-15ubuntu0.1_amd64.deb
desktop-file-utils	0.22	desktop-file-utils_0.22-1ubuntu5.2_amd64.deb
psutils	1.17.dfsg	psutils_1.17.dfsg-2_amd64.deb
docbook-utils	0.6.14	docbook-utils_0.6.14-3ubuntu1_all.deb
libsdl1.2-dev	1.2.15+dfsg1	libsdl1.2-dev_1.2.15+dfsg1-3_amd64.deb
help2man	1.47.3	help2man_1.47.3_amd64.deb

Table 4-24. Democracy Suite 5.5-B ImageCast Precinct 2 Firmware Build Environment Component Descriptions *(continued)*

Firmware/Software	Version	Filename
texi2html	1.82+dfsg1	texi2html_1.82+dfsg1-5_all.deb
libgl1-mesa-dev	18.0.5	libgl1-mesa-dev_18.0.5-0ubuntu0~16.04.1_amd64.deb
libglu1-mesa-dev	9.0.0	libglu1-mesa-dev_9.0.0-2.1_amd64.deb
mercurial	3.7.3	mercurial_3.7.3-1ubuntu1_amd64.deb
g++-5	5.4.0	g++-5_5.4.0-6ubuntu1~16.04.10_amd64.deb
gawk	4.1.3	gawk_1%3a4.1.3+dfsg-0.1_amd64.deb
lzop	1.03	lzop_1.03-3.2_amd64.deb
gcc	5.4.0	gcc-5_5.4.0-6ubuntu1~16.04.10_amd64.deb
gcc-5-multilib	5.4.0	gcc-5-multilib_5.4.0-6ubuntu1~16.04.10_amd64.deb
gcc-avr	4.9.2+Atmel3.5.3	gcc-avr_1%3a4.9.2+Atmel3.5.0-1_amd64.deb
git	2.7.4	git_1%3a2.7.4-0ubuntu1.4_amd64.deb
zlib	1.2.8	zlib1g-dev_1%3a1.2.8.dfsg-2ubuntu4.1_amd64.deb
texinfo	6.1.0.dfsg.1	texinfo_6.1.0.dfsg.1-5_amd64.deb
groff	1.22.3	groff_1.22.3-7_amd64.deb

Table 4-25. Democracy Suite 5.5-B ImageCast Evolution Firmware Build Environment Component Descriptions

Firmware/Software	Version	Filename
Ubuntu	10.04 LTS	ubuntu-10.04.4-desktop-i386.iso
LTIB	10.1.1a	ltib-10-1-1a-sv.tar.gz
g++ (GNU C++ compiler)	gcc-4.5.38-eglibc-2.11.38	freescale-powerpc-linux-gnu-2011.03-38.i686.rpm
autoconf	2.57	autoconf-2.57.tar.bz2
bison	2.3	bison-2.3.tar.bz2
ccache	2.4	ccache-2.4.tar.gz
cksum	19990607	cksum-19990607.tar.gz
cramfs	20081121	cramfs-20081121.tar.gz
distcc	2.18.3	distcc-2.18.3.tar.bz2
dtc	1.2.0	dtc-1.2.0.tar.gz
flex	2.5.33	flex-2.5.33.tar.gz
genext2fs	1.4.1	genext2fs-1.4.1.tar.gz

Table 4-25. Democracy Suite 5.5-B ImageCast Evolution Firmware Build Environment Component Descriptions *(continued)*

Firmware/Software	Version	Filename
gen_init_cpio	2.6.25-rc7	gen_init_cpio-2.6.25-rc7.tar.gz
genromfs	0.5.1	genromfs-0.5.1.tar.gz
git	1.5.6.5	git-1.5.6.5.tar.gz
libtool	1.5	libtool-1.5.tar.gz
lkc	1.4	lkc-1.4.tar.gz
mkspooflinks	3.4	mkspooflinks-3.4.tar.gz
mtd-utils	20060302	mtd-utils-20060302.tar.bz2
mux_server	1.0	mux_server.c
pkg-config	0.21	pkg-config-0.21.tar.gz
sparse	0.4	sparse-0.4.tar.gz
texinfo	4.8	texinfo-4.8.tar.bz2
tunctl	1.5	tunctl-1.5.tar.gz
u-boot-tools	1.1.6	u-boot-tools-1.1.6.tar.bz2
unifdef	1.0	unifdef-1.0.tar.gz
wget	1.9.1	wget-1.9.1.tar.gz
yaffs_utils	20060418	yaffs_utils-20060418.tar.gz
rpm	4.0.4	rpm-4.0.4.tar.gz

Table 4-26. Democracy Suite 5.5-B ImageCast X Firmware Build Environment Component Descriptions

Firmware/Software	Version	Filename
Ubuntu 14.04.4	14.04.4	ubuntu-14.04.4-desktop-amd64.iso

Table 4-27. D-Suite 5.5-B Configuration Files

Configuration File	Version	Filename
ICX Machine Configuration File (MCF)	5.5.12.1_20190510	MCF_5.5.12.1_20190510.mcf
ICP/ICC Device Configuration File (DCF)	5.5.31_20190423	DCF_5.5.31_20190423.dcf
ICE Machine Behavior Settings	5.5.6.3 20190512	behaviorsettings_ICE_5.5.6.3_EAC_20190512.mbs
ICP2 Machine Behavior Settings	5.5.1.4 20190510	behaviorsettings_ICP2_5.5.1.4_EAC_20190510.mbs

Table 4-28. D-Suite 5.5-B Voting System Equipment

Component	Serial Number
Proprietary Hardware	
ImageCast Precinct Optical Scanner PCOS-320C	AAFAJFM0061, AAFAJFN0030, AAFAJGI6764, AAFAJEL0352
ImageCast Precinct Optical Scanner PCOS-320A	AANAGCP0347, AANAGCP0002
ImageCast Precinct 2 Optical Scanner PCOS-330A	FAL18480494, FAL18480510
ImageCast Evolution Optical Scanner PCOS-410A	AAFEBIK1847, AAFEBCN0012
ICP Ballot Box BOX-330A	AAUCCFX0083, AAUCCGI0011
ICE Ballot Box	---
ICX Inline EMI Filter	[DVS-EMIFILTER-001] thru [DVS-EMIFILTER-003]
ICP2 Ballot Box BOX-350A	---
COTS Hardware	
ICX aValue 15” Tablet (SID-15V)	0E14AF00014, B03G005400006, B033G00540008, 9E274118, 1D274118, Baytrail98D750C0, Baytrail12034DCC, Baytrail9A6550C8
ICX aValue 21” Tablet (SID-21V)	0E14AF00027, B03G005500019, 03G005500009, 0039BZ2D, 0039B209, Baytrail0039B22D, BaytrailF1B2587F, BaytrailF1B25983
A Value 21" ICX DRE (Prime)	1707101522, 1707101789, 1707101730, 1707101887, 1707101710, 1707101725, 1707101731, 1708100916, 1708100876, 1708100915, 1707101845, 1707101778, 1717101720, 1707101845, 1707101722, 1707202552, 1711300282, 1707100089, 1707101795, 1707101793, 17101793
SII Thermal Printer	1115271A, 1115273A, 115270A, 1115275A
KFI VRP3 Thermal Printer (VVPAT)	KPR000000715, KPR0000078339, KPR0000078377, KRP000000711, KPR000000712, KPR170900010119, KPR0000078337, KPR0000078364, KPR170900008115, KPR0000078339, KPR170900008116, KPR170900010347, KPR170900009733, KPR170900010120, KPR170900010119, KPR170900010337, KPR170900010338, KPR170900010348
Dell OptiPlex 7440 All In One	HVNRFB2, HVNQFB2, HVNPFB2
Dell PowerEdge R630	4Z07T52
Dell PowerEdge R640	JMP9CM2
Canon imageFormula DR-G1130 Scanner	GF301092, GF304418
Canon DR-M160II Scanner	GX333569, GX333573, GX324846, GX326272, GX319353
Canon DR-M260 Scanner	HG306013, HG306012

Table 4-28. D-Suite 5.5-B Voting System Equipment *(continued)*

Component	Serial Number
InoTec HiPro 821 Scanner	0078K28, 0080K28
Dell Precision T3420 PC	HS0VFB2, HS0TFB2, HS0RFB2, HS0SFB2, 4TB3MN2, F575HH2
HP LaserJet Pro Printer M402dn	PHBQF20342, PHBQF20345, PHBQC12619, PHBQC19613, PHBQC12519, PHBQD18790, PHBQC12616, PHBQG09329
HP LaserJet Pro Printer M402dne	PHB5D00782, PHB5D04714, PHB5F04770, PHB5B18304, PHB5D04713
Dell OptiPlex 9030 All-In-One	CF73S52
Dell Ultrasharp 24” Monitor U2414H	1PVZ152, 62VZ152
Dell OptiPlex 3050 All-In-One	19YWWK2
Smart Card Reader ACR39	RR374-010362

Table 4-29. D-Suite 5.5-B Voting System Support Equipment

Component	Serial Number
Dell Monitor KM632	FYNTY12, CKX6Y12, CN-0524N3-72461-59H-6U5U
Dell Monitor P2414Hb	CN-0524N3-74261-5AH-2DNU, CN-0524N3-74261-5AH-2DAU
Dell DVD Multi Recorder GP60NB60	[DVS-Dell-001]
Dell Latitude E7450 Laptop	30GFH72, 369FH72
Dell Latitude e3480 Laptop	1VD3NJ2
Maxim iButton Programmer DS9490R# with DS1402	[DVS-Maxim-001] thru [DVS-Maxim-006]
APC Smart-UPS SMT1500	3S1536X06436, 3S1536X06475, 3S1536X06461, 3S1536X06485, 3S1536X06484, 3S1536X06322, 3S1536X07467, 3S1536X06485, 3S1536X06272, 3S1536X06201, 3S1536X07305, 3S1504X00395, 3S1504X00396, 351716X02289, W51530180004, 3S171X06059
Dell X1008 Network Switch	4R8XX42, 26SXX42
Dell X1018 Network Switch	6TN7Y42, 63SXX42
Enabling Devices Sip and Puff	[DVS-enabling devices-001] - [DVS-enabling devices-002]
Cyber Acoustics Headphones ACM-70	[DVS-cyber acoustics-001] - [DVS-cyber acoustics-005]
4-Way Joystick Controller S26	PME QC 1550 12, [DVS-JOY-001], [DVS-JOY-002]
Enablemart # 88906 Rocker (Paddle) Switch	[DVS-paddle-001]
Dell PowerConnect 2808 Network Switch	3S2P0Z1

Table 4-29. D-Suite 5.5-B Voting System Support Equipment *(continued)*

Component	Serial Number
IOGEAR SDHC/microSDHC 0U51USC410 Card Reader	8632, 8633
Lexar USB 3.0 Dual-Slot Reader	24020845007435
Hoodman Steel USB 3.0 UDMA Reader 102015	[DVS-hoodman-001]
ATI Handset	98862010101-035, 98862010103-075, 00659010100-046, 98862010100-232, 093015-1-1, 00659010100-035
ATI-USB Handset	02440010100-011, [DVS-ATIUSB-001], [DVS-ATIUSB-002], B104326-1-4-040, B104326-1-4-035
ACS PC-Linked Smart Card Reader ACR39U	RR374-006272, RR374-010356, RR374-010365
Lexar Professional CF Card Reader Workflow CFR1	24050361400108, 24050361401994, 24050361401991, 24050361401990
CORCOM Filter P/N#: 15EMC1	[DVS-CorcomEMIFilter-001]
Delta Filter P/N#: 16PDCG5C	[DVS-DeltaEMIFILTER-001]
Kingston Card Reader FCR-HS4	08738174208132

ATTACHMENT A

Attachment A-1: Report File # 7169005633E-00

Attachment A-2: Report File # 7169006118E-00

Attachment A-3: Test Report No. PR094223

Attachment A-4: Test Report No. PR097523

EMC / EMI Test Report

As per

2015 VVSG Volume I; Version 1.1

Sub-paragraphs 4.1.2.5 to 4.1.2.12

2015 VVSG Volume II; Version 1.1

Sub-paragraph 4.8

Emissions & Immunity

on the

Image Cast Evolution

Issued by:

TÜV SÜD Canada Inc.
11 Gordon Collins Dr,
Gormley, ON, L0H 1G0
Canada
Ph: (905) 883-7255

Testing produced for

PRO V&V

See Appendix A for full client & EUT details.

Marty McLear,
Project Engineer

Reviewed by:

Sanjiv Vyas,
Project Engineer

Industry Canada
Registration # 6844A-3

CE

ACCREDITED
Testing Laboratory
Certificate #2955.02

VCI
R-4023, G-506
C-4498, T-1246

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Table of Contents

Table of Contents 2

Report Scope 3

Summary 4

- Test Results Summary 5
- Notes, Justifications, or Deviations 6
- Sample Calculation(s) 6

Applicable Standards, Specifications and Methods 7

Document Revision Status 8

Definitions and Acronyms 9

Testing Facility 11

- Calibrations and Accreditations 11
- Testing Environmental Conditions and Dates 12

Detailed Test Result Section 13

- Power Line Conducted Emissions – 4.1.2.9 14
- Radiated Emissions – 4.1.2.9 20
- Electrical Power Disturbance – 4.1.2.5 28
- Electrical Fast Transients / Bursts – 4.1.2.6 31
- Lightning Surge – 4.1.2.7 34
- Electrostatic Disruption – 4.1.2.8 37
- Electromagnetic Susceptibility – 4.1.2.10 41
- Conducted RF Immunity – 4.1.2.11 44
- Magnetic Fields Immunity – 4.1.2.12 47

Appendix A – EUT & Client Provided Details 49

Appendix B – EUT, Peripherals, and Test Setup Photos 53

Appendix C – Product Marking 70

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Report Scope

This report addresses the EMC verification testing and test results of the **Image Cast Evolution**, Model: **PCOS-410A** herein referred to as EUT (Equipment Under Test). The EUT was tested for emissions and immunity compliance against the following standards:

2015 VVSG Volume I; Version 1.1

2015 VVSG Volume II; Version 1.1

Power line conducted emissions, radiated emissions, harmonics emissions, flicker emissions, and immunity testing was evaluated on the EUT. Test procedures, results, justifications, and engineering considerations, if any, follow later in this report.

For a more detailed list of the standards and the revision used, see the "Applicable Standards, Specifications and Methods" section of this report.

This report does not imply product endorsement by any government, accreditation agency, or TÜV SÜD Canada Inc.

Opinions or interpretations expressed in this report, if any, are outside the scope of TÜV SÜD Canada Inc. accreditations. Any opinions expressed do not necessarily reflect the opinions of TÜV SÜD Canada Inc., unless otherwise stated.

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Summary

The results contained in this report relate only to the item(s) tested.

Equipment Under Test (EUT)	**Image Cast Evolution** Model: **PCOS-410A**
EUT passed all tests performed	Yes
Testing conducted by	Marty McLear

For testing dates, see 'Testing Environmental Conditions and Dates'.

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Test Results Summary

Standard/ Method	Description	Criteria	Class / Level	Result
2015 VVSG Vol. I, Ver. 1.1	Power Line Conducted Emissions	N/A	Class B	Pass
2015 VVSG Vol. I, Ver. 1.1	Radiated Emissions	N/A	Class B	Pass
2015 VVSG Vol. I, Ver. 1.1	Electrical Power Disturbance	Normal Operation & No Data Loss	Various	Pass
2015 VVSG Vol. I, Ver. 1.1	Electrical Fast Transient	Normal Operation & No Data Loss	±2kV - Mains	Pass
2015 VVSG Vol. I, Ver. 1.1	Lightning Surge	Normal Operation & No Data Loss	±2kV Line - Line ±2kV Line - Ground	Pass
2015 VVSG Vol. I, Ver. 1.1	Electrostatic Disruption	Normal Operation & No Data Loss	±8kV Contact ±15kV Air	Pass
2015 VVSG Vol. I, Ver. 1.1	Electromagnetic Susceptibility	Normal Operation & No Data Loss	10 V/m, 80 MHz – 1 GHz	Pass
2015 VVSG Vol. I, Ver. 1.1	Conducted RF Immunity	Normal Operation & No Data Loss	10 Vrms, 150 kHz – 80 MHz	Pass
2015 VVSG Vol. I, Ver. 1.1	Magnetic Fields Immunity	Normal Operation & No Data Loss	30 A/m	Pass
Overall Result				**Pass**

If the product as tested complies with the specification or requirement, the EUT is deemed to comply and is issued a 'PASS' grade. If not, 'FAIL' grade is issued.

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Notes, Justifications, or Deviations

The following justifications for tests not performed or deviations from the above listed specifications apply:

No Electrical Fast Transients or Conducted RF Immunity tests were performed on any of the I/O cables of the EUTs. All cables are less than 3m.

The manufacturer presented the EUT representative of the main function(s) performed in the application for which it is intended. During measurement, the EUT is operational with a reprehensive working load and program to demonstrate typical operating conditions.

Modifications to the EUT were implemented during immunity testing to pass Electrical Fast Transients / Bursts, 2015 VVSG Volume I; Version 1.0 limits. Refer to Appendix A - Modifications for Compliance.

The EUT includes an external power supply converter.
Manufacturer: FranMar
Model: STD-19063

A later revision of the standard may have been substituted in place of the previous dated referenced revision. The year of the specification used is listed under applicable standards. Using the later revision accomplishes the goal of ensuring compliance to the intent of the previous specification, while allowing the laboratory to incorporate the extensions and clarifications made available by a later revision.

Sample Calculation(s)

Radiated Emission Test

Margin = Limit – (Received Signal + Antenna Factor + Cable Loss – Pre-Amp Gain)
Margin = 50dBµV/m – (50dBµV + 10dB + 2.5dB – 20dB)
Margin = 7.5 dB (pass)

Power Line Conducted Emission Test

Margin = Limit – (Received Signal + Attenuation Factor + Cable Loss + LISN Factor)
Margin = 73.0dBµV – (50dBµV + 10dB + 2.5dB + 0.5dB)
Margin = 10.0 dB (pass)

Milligauss to A/m Conversion (Magnetic Immunity)

1A/m = 12.57 mG
3A/m = 3*12.57 = 37.7 mG

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Applicable Standards, Specifications and Methods

ANSI C63.4:2014	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
2015 VVSG Volume I; Version 1.1	
2015 VVSG Volume II; Version 1.1	United States Election Assistance Commission – Voluntary Voting System Guidelines – Version 1.1 Volume I
CISPR 16-2-3:2010/A2:2014	Specification for Radio Disturbance and Immunity Measuring Apparatus and Methods - Part 2-3: Methods of Measurement of Disturbances and Immunity - Radiated Disturbance Measurements
IEC 61000-4-2:2008 EN 61000-4-2:2009	Testing and Measurement Techniques - Electrostatic Discharge Immunity Test
IEC/EN 61000-4-3:2006/ A2:2010	Testing and Measurement Techniques - Radiated, Radio-Frequency, Electromagnetic Field Immunity Test
IEC/EN 61000-4-4:2004	Testing and Measurement Techniques - Electrical Fast Transient/Burst Immunity Test
IEC 61000-4-5:2005 EN 61000-4-5:2006	Testing and Measurement Techniques - Surge Immunity Test
IEC 61000-4-6:2008 EN 61000-4-6:2009	Testing and Measurement Techniques - Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields
IEC 61000-4-8:2009 EN 61000-4-8:2010	Testing and Measurement Techniques - Power Frequency Magnetic Field Immunity Test
IEC/EN 61000-4-11:2004	Testing and Measurement Techniques - Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests
ISO 17025:2005	General Requirements for the Competence of Testing and Calibration Laboratories

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Document Revision Status

Revision 0	March 13, 2019 Initial Release

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Definitions and Acronyms

The following definitions and acronyms are applicable in this report.
See also ANSI C63.14.

AM – Amplitude Modulation
CDN – Coupling Decoupling Network
EFT – Electrical Fast Transients
ESD – Electro-Static Discharge
HCP – Horizontal Coupling Plane
VCP – Vertical Coupling Plane
LISN – Line Impedance Stabilization Network
NCR – No Calibration Required
NSA – Normalized Site Attenuation
N/A – Not Applicable
RF – Radio Frequency

AE – Associated Equipment. Equipment needed to exercise and/or monitor the operation of the EUT.

Class A Device – A device that is marketed for use in a commercial, industrial or business environment. A 'Class A' device should not be marketed for use by the general public. A 'Class A' device should contain a warning notice in the user manual stating that it could cause radio interference. For example: "**Warning**: Operation of this equipment in a residential environment could cause radio interference."

Class B Device – A device that is marketed for use in a residential environment and may also be used in a commercial, business or industrial environments. NOTE: A residential environment is an environment where the use of broadcast radio and television receivers may be expected within a distance of 10m of the device concerned.

EMC – Electro-Magnetic Compatibility. The ability of an equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.

EMI – Electro-Magnetic Immunity. The ability to maintain a specified performance when the equipment is subjected to disturbance (unwanted) signals of specified levels.

EUT – Equipment Under Test. A device or system being evaluated for compliance that is representative of a product to be marketed.

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ITE – Information Technology Equipment. Has a primary function of entry, storage, display, retrieval, transmission, processing, switching, or control of data and/or telecommunication messages and which may be equipped with one or more ports typically for information transfer.

Antenna Port – Port, other than a broadcast receiver tuner port, for connection of an antenna used for intentional transmission and/or reception of radiated RF energy.

Broadcast Receiver Tuner Port – Port intended for the reception of a modulated RF signal carrying terrestrial, satellite and/or cable transmissions of audio and/or video broadcast and similar services.

Optical Fiber Port – Port at which an optical fiber is connected to an equipment.

Signal/Control Port – Port intended for the interconnection of components of a EUT, or between a EUT and local AE and used in accordance with relevant functional specifications (for example for the maximum length of cable connected to it).
(Examples include: RS-232, USB, HDMI, Fire Wire)

Wired Network Port – Point of connection for voice, data and signaling transfers intended to interconnect widely dispersed systems by direct connection to a single-user or multi-user communication network.
(Examples include: CATV, PSTN, ISDN, xDSL, LAN and similar networks)

EMC Test Plan – An EMC test plan established prior to testing. See 'Appendix A – EUT & Client Provided Details'.

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Testing Facility

Testing for EMC on the EUT was carried out at TÜV SÜD Canada testing lab near Toronto, Ontario. The testing lab has a calibrated 3m semi-anechoic chamber which allows measurements on a EUT that has a maximum width or length of up to 2m and a height of up to 3m. The chamber is equipped with a turntable that is capable of testing devices up to 3300lb in weight. This facility is capable of testing products that are rated for 120Vac and 240Vac single phase, or devices that are rated for a 208Vac 3 phase input. DC capability is also available for testing. The chamber is equipped with a mast that controls the polarization and height of the antenna. Control of the mast occurs in the control room adjoining the shielded chamber. Radiated emission measurements are performed using a BiLog antenna and a Horn antenna where applicable. Conducted emissions, unless otherwise stated, are performed using a LISN and using the Vertical Ground plane if applicable.

Calibrations and Accreditations

The 3m semi-anechoic chamber is registered with Federal Communications Commission (FCC, CA6844), Industry Canada (IC, 6844A-3) and Voluntary Control Council for Interference (VCCI, R-4023, G-506, C-4498, and T-1246). This chamber was calibrated for Normalized Site Attenuation (NSA) using test procedures outlined in ANSI C63.4 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The chamber is lined with ferrite tiles and absorption cones to minimize any undesired reflections. The NSA data is kept on file at TÜV SÜD Canada. For radiated susceptibility testing, a 16 point field calibration has been performed on the chamber. The field uniformity data is kept on file at TÜV SÜD Canada. TÜV SÜD Canada Inc. is accredited to ISO 17025 by A2LA with Testing Certificate #2955.02. The laboratory's current scope of accreditation listing can be found as listed on the A2LA website. All measuring equipment is calibrated on an annual or bi-annual basis as listed for each respective test.

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Testing Environmental Conditions and Dates

Following environmental conditions were recorded in the facility during time of testing:

Date	Test	Initials	Temperature (ºC)	Humidity (%)	Pressure (kPa)
February 15, 2019	Power Line Conducted Emissions	MM	20.8	24.3	99.5
February 14, 2019	Radiated Emissions	MM	20.1	17.6	101.4
February 20, 2019	Electrostatic Disruption	MM	21.3	53.1	103.1
February 15, 2019	Electromagnetic Susceptibility	MM	20.8	24.3	99.5
February 19, 2019	Electrical Fast Transient	MM	18.7	20.2	103.5
February 19, 2019	Lightning Surge	MM	18.7	20.2	103.5
February 19, 2019	Conducted RF Immunity	MM	18.7	20.2	103.5
February 20, 2019	Magnetic Fields Immunity	MM	20.3	19.7	103.1
February 15, 2019	Electrical Power Disturbance 4.1.2.5 a, b, c	MM	20.8	24.3	99.5
February 20, 2019	Electrical Power Disturbance 4.1.2.5 e	MM	20.3	19.7	103.1

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Detailed Test Result Section

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Power Line Conducted Emissions – 4.1.2.9

Purpose

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT's power line does not exceed the limits listed below as defined in the applicable test standard and measured from a LISN. This helps protect lower frequency radio services such as AM radio, shortwave radio, amateur radio, maritime radio, CB radio, and so on, from unwanted interference.

Limits & Method

The method is as defined in ANSI C63.4. The limits are as defined in FCC Part 15 Section 15.107:

CLASS B

Average Limits		Quasi-Peak Limits	
150 kHz – 500 kHz	56 to 46* dBµV	150 kHz – 500 kHz	66 to 56* dBµV
500 kHz – 5 MHz	46 dBµV	500 kHz – 5 MHz	56 dBµV
5 MHz – 30 MHz	50 dBµV	5 MHz – 30 MHz	60 dBµV

* Decreases linearly with the logarithm of the frequency

Both Quasi-Peak and Average limits are applicable, and each is specified as being measured with a resolution bandwidth of 9 kHz. For Quasi-Peak, a video bandwidth at least three times greater than the resolution bandwidth is used.

Based on ANSI C63.4 Section 4.2, if the Peak or Quasi-Peak detector measurements do not exceed the Average limits, then the EUT is deemed to have passed the requirements.

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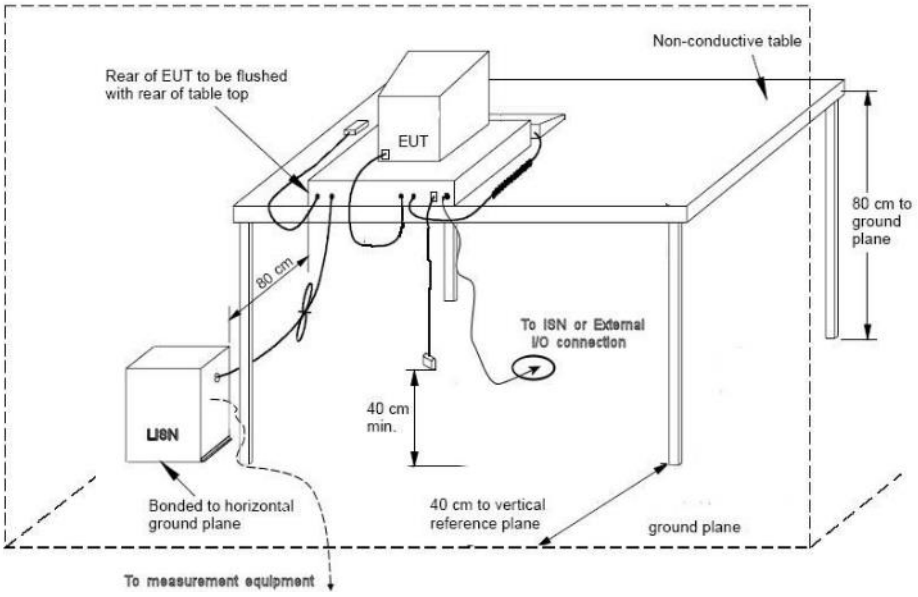
Typical Setup Diagram



Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is ±2.73dB with a 'k=2' coverage factor and a 95% confidence level.

Preliminary Graphs

The graphs shown below are maximized peak measurement graphs measured with a resolution bandwidth greater than or equal to the final required detector. This peaking process is done as a worst case measurement and enables the detection of frequencies of concern for final measurement. For final measurements with the appropriate detector, where applicable, please refer to the tables under Final Measurements.

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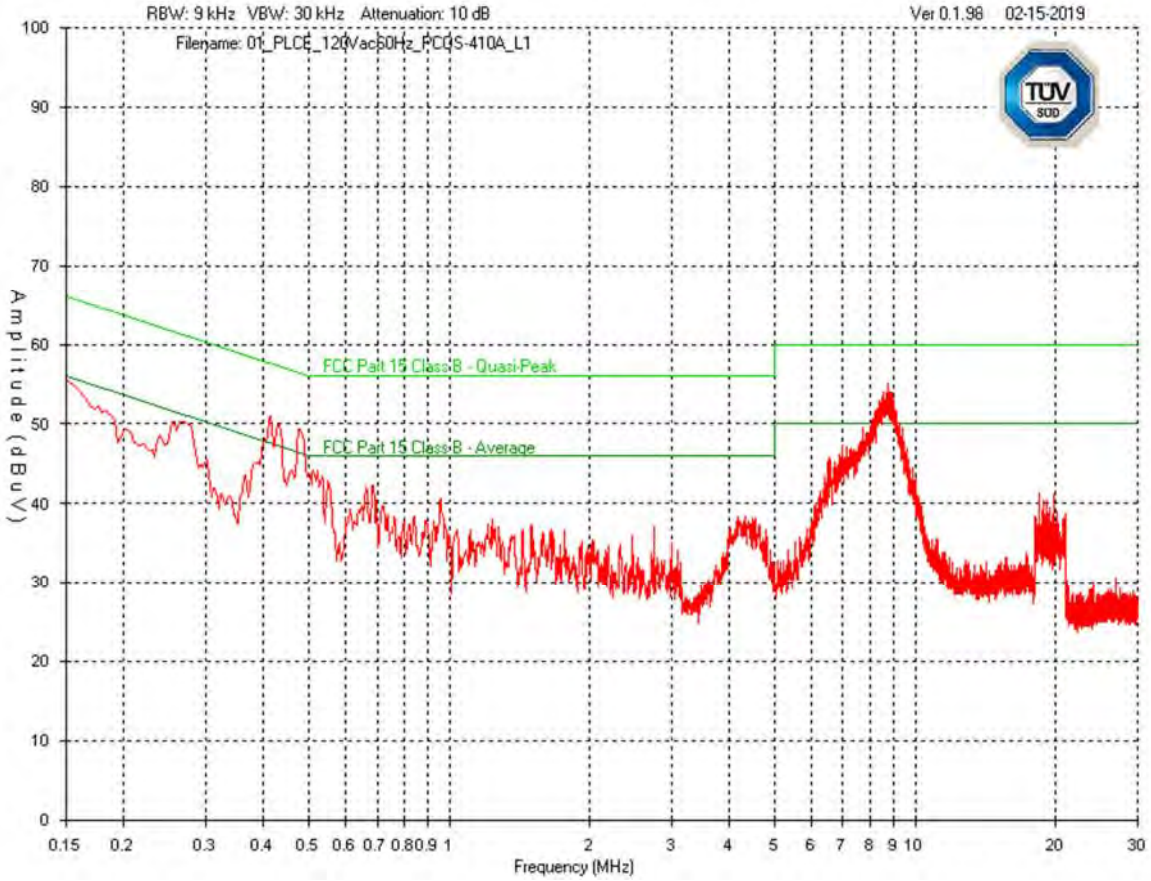

Line (L1) – 120Vac 60Hz

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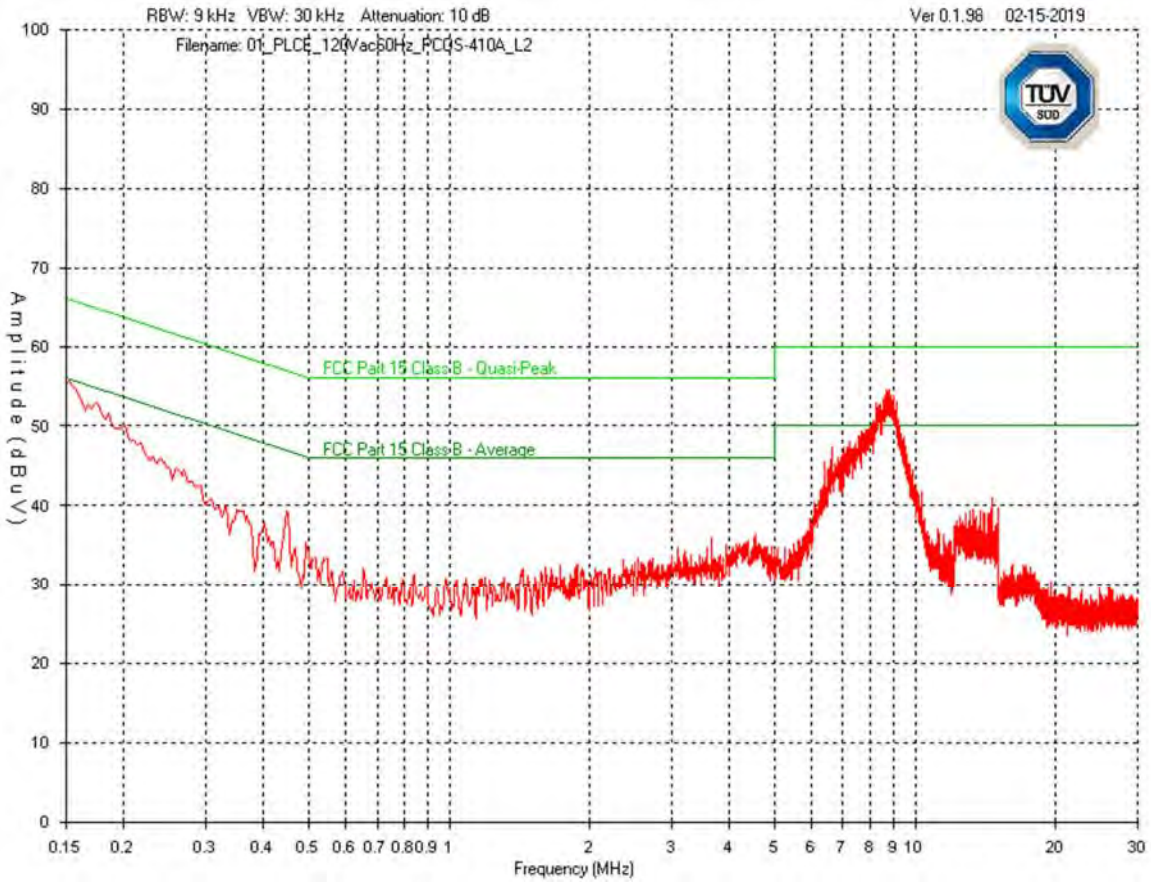

Neutral (L2) – 120Vac 60Hz

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Final Measurements

Product Category			Class B								
EUT			Image Cast Evolution								
Supply			**120Vac 60Hz**								
Frequency (MHz)	**Detector**	**Received Signal (dBµV)**	**Atten Factor (dB)**	**Cable Factor (dB)**	**LISN Factor (dB)**	**Level (dBµV)**	**QP Limit (dBµV)**	**AVG Limit (dBµV)**	**QP Margin (dB)**	**AVG Margin (dB)**	**Pass/ Fail**
Line											
8.744	QP	41.4	10	0.1	0.0	51.5	60.0	--	8.5	--	Pass
8.744	AVG	34.7	10	0.1	0.0	44.8	--	50.0	--	5.2	Pass
0.413	AVG	29.1	10	0.1	0.0	39.2	--	47.6	--	8.4	Pass
0.478	AVG	28.7	10	0.1	0.0	38.8	--	46.4	--	7.6	Pass
0.153	AVG	17.1	10	0.0	0.1	27.2	--	55.8	--	28.6	Pass
0.684	AVG	18.8	10	0.1	0.0	28.9	--	46.0	--	17.1	Pass
0.959	AVG	16.2	10	0.1	0.0	26.3	--	46.0	--	19.7	Pass
Neutral											
8.786	QP	39.3	10	0.1	0.0	49.4	60.0	--	10.6	--	Pass
8.786	AVG	31.8	10	0.1	0.0	41.9	--	50.0	--	8.1	Pass
0.153	AVG	16.4	10	0.0	0.1	26.5	--	55.8	--	29.3	Pass
0.449	PEAK	29.3	10	0.1	0.0	39.4	56.9	46.9	17.5	7.5	Pass
14.591	PEAK	30.8	10	0.1	0.1	41.0	60.0	50.0	19.0	9.0	Pass
3.663	PEAK	25.9	10	0.1	0.0	36.0	56.0	46.0	20.0	10.0	Pass

Average and Quasi-Peak Emissions Table

Note:
Peak = Peak measurement
AVG = Average measurement
QP = Quasi-Peak measurement

See 'Appendix B – EUT, Peripherals and Test Setup Photos' for photos showing the test set-up for the highest line conducted emission

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Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Spectrum Analyzer	ESL 6	Rohde & Schwarz	Dec. 27, 2017	Dec. 27, 2019	GEMC 160
LISN	FCC-LISN-50/250-16-2-01	FCC	Jan. 10, 2018	Jan. 10, 2020	GEMC 302
RF Cable 3m	LMR-400-3M-50Ω-MN-MN	LexTec	NCR	NCR	GEMC 276
Attenuator 10 dB	612-10-1	Meca Electronics, Inc	NCR	NCR	GEMC 223
Emissions Software	0.1.98	TUV SUD Canada, Inc.	NCR	NCR	GEMC 58

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Radiated Emissions – 4.1.2.9

Purpose

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT does not exceed the limits listed below as defined in the applicable test standard and measured from a receiving antenna. This helps protect broadcast radio services such as television, FM radio, pagers, cellular telephones, emergency services, and so on, from unwanted interference.

Limit(s)

The method is as defined in ANSI C63.4:2014. The limits are as defined in FCC Part 15 Section 15.109:

CLASS B

FCC Part 15, Subpart B Limits - 30MHz – 1GHz

Frequency Range[a]	Quasi-Peak Limits - 3m[b]
30 MHz – 88 MHz	40 dBµV/m
88 MHz – 216 MHz	43.5 dBµV/m
216 MHz – 960 GHz	46 dBµV/m
960 MHz – 1 GHz	54 dBµV/m

Frequency Range[a]	Average Limit - 3m[c]	Peak Limit - 3m[d]
1 GHz and Up	54 dBµV/m	74 dBµV/m

[a]The frequency range scanned is in accordance to FCC Part 15 Section 15.33(b).
[b]Limit is with a resolution bandwidth of 120 kHz, a video bandwidth at least three times greater than the resolution bandwidth, and using a Quasi-Peak detector.
[c]Limit is with a resolution bandwidth of 1 MHz and using an Average detector.
[d]Limit is with a resolution bandwidth of 1 MHz, a video bandwidth at least three times greater than the resolution bandwidth, and using a Peak detector.

Based on ANSI C63.4 Section 4.2, if the Peak detector measurements do not exceed the Quasi-Peak limits, where defined, then the EUT is deemed to have passed the requirements.

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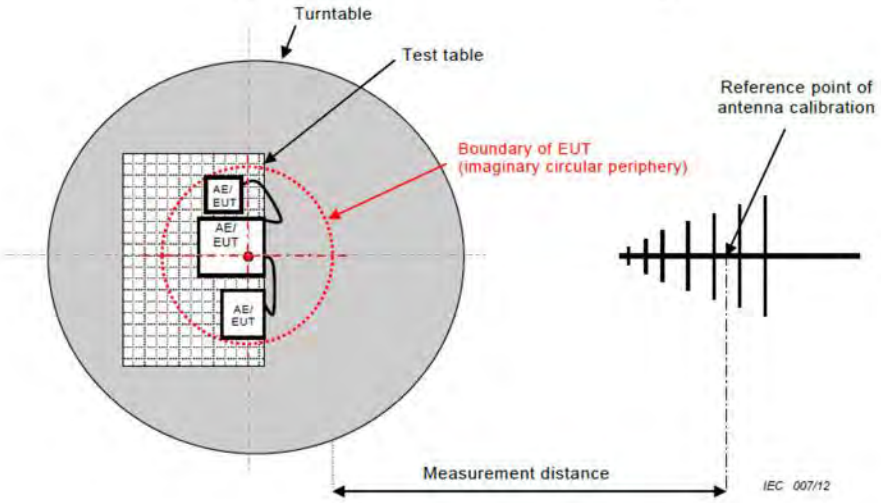
Typical Radiated Emissions Setup



Note: In accordance with FCC Part 15, section 15.31(f)(1), testing was performed at a 3 meter test distance and an extrapolation factor, if applicable, of 20 dB/decade was applied. For example, an extrapolation of 10m to 3m is 20log(10/3) = 10.5 dB.

Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is ±5.04dB for 30MHz – 1GHz and ±4.93dB for 1GHz – 18GHz with a 'k=2' coverage factor and a 95% confidence level.

Preliminary Graphs

The graphs shown below are maximized peak measurement graphs measured with a resolution bandwidth greater than or equal to the final required detector over a full 0-360°. This peaking process is done as a worst case measurement and enables the detection of frequencies of concern for final measurement. For final measurements with the appropriate detector, where applicable, please refer to the tables under Final Measurements.

In accordance with FCC Part 15, Subpart B, Section 15.33, the device was scanned to a minimum of a 1 GHz. For devices containing clocks higher than 108 MHz, they were scanned above 1 GHz to meet the requirements of FCC Part 15, Section 15.33.

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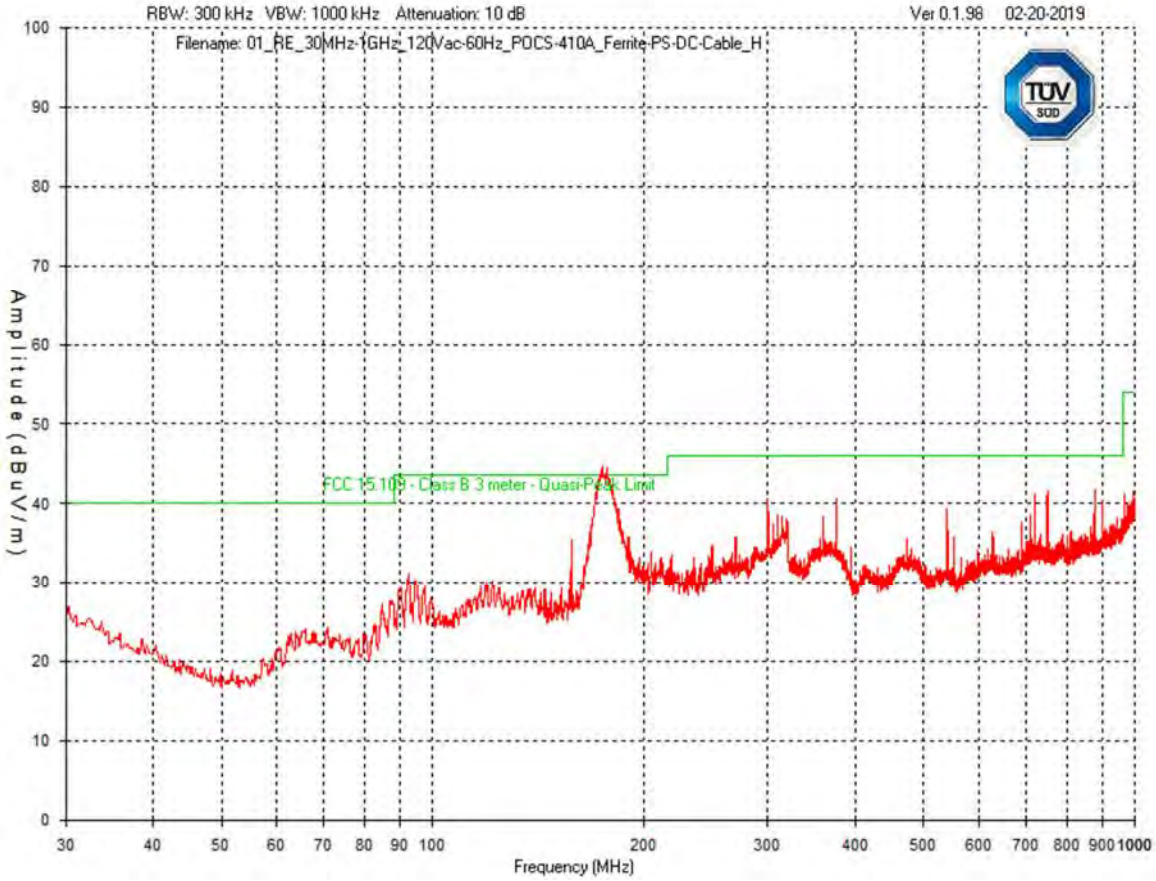

Horizontal – 120Vac 60Hz – 30MHz - 1GHz

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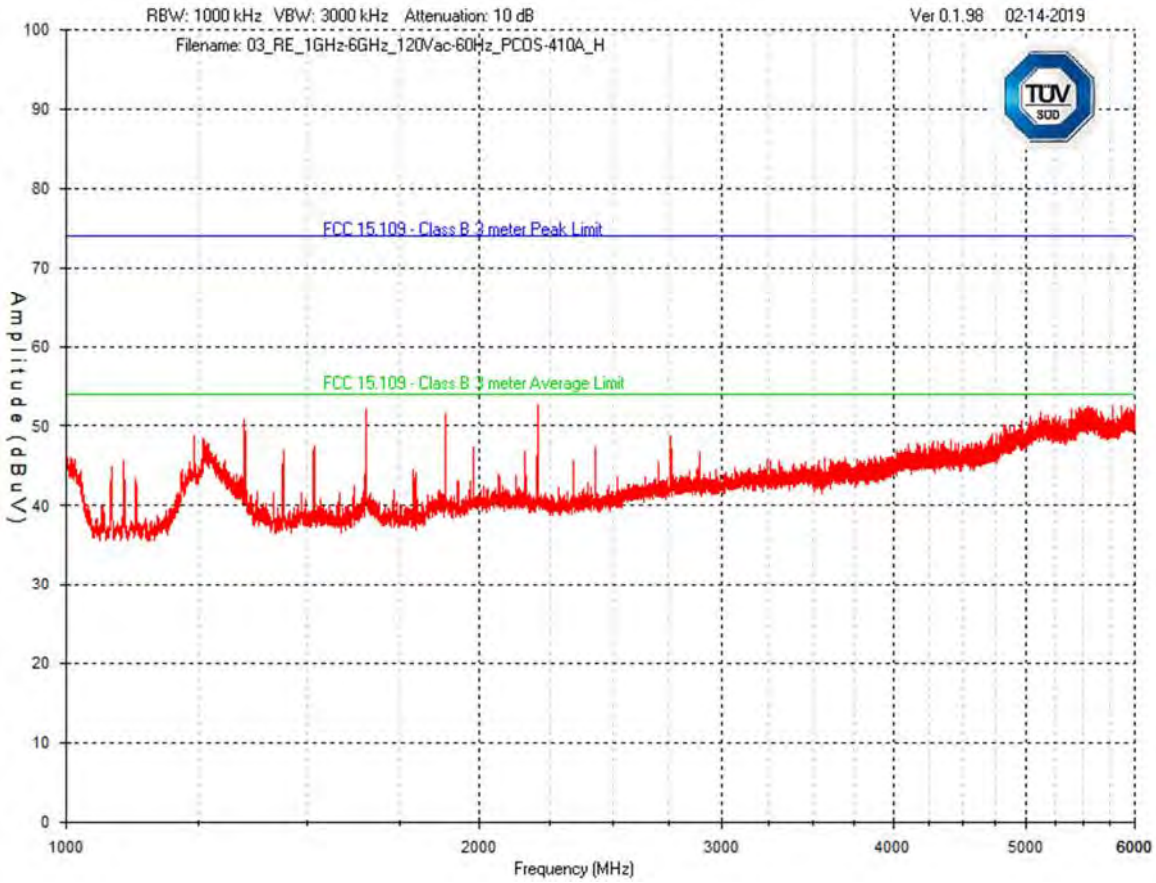

Horizontal – 120Vac 60Hz – 1GHz - 6GHz

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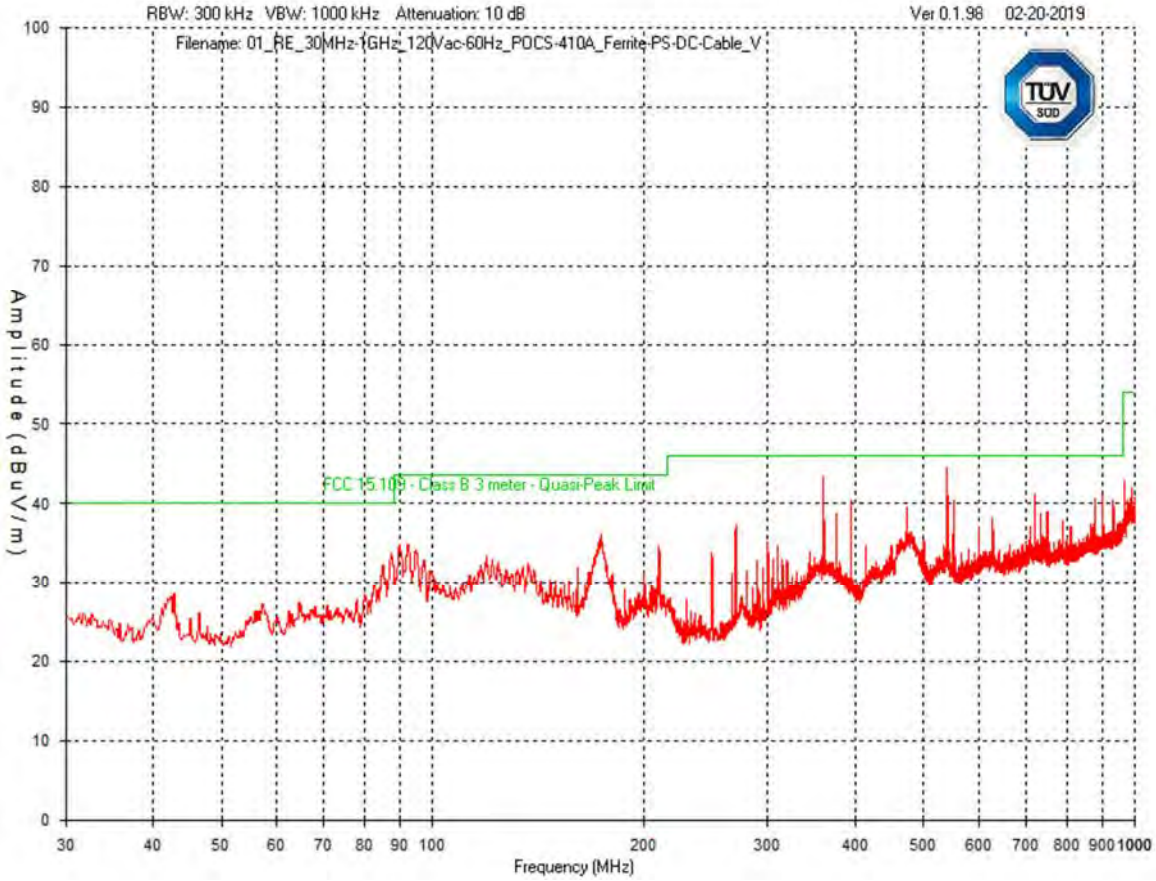

Vertical – 120Vac 60Hz – 30MHz - 1GHz

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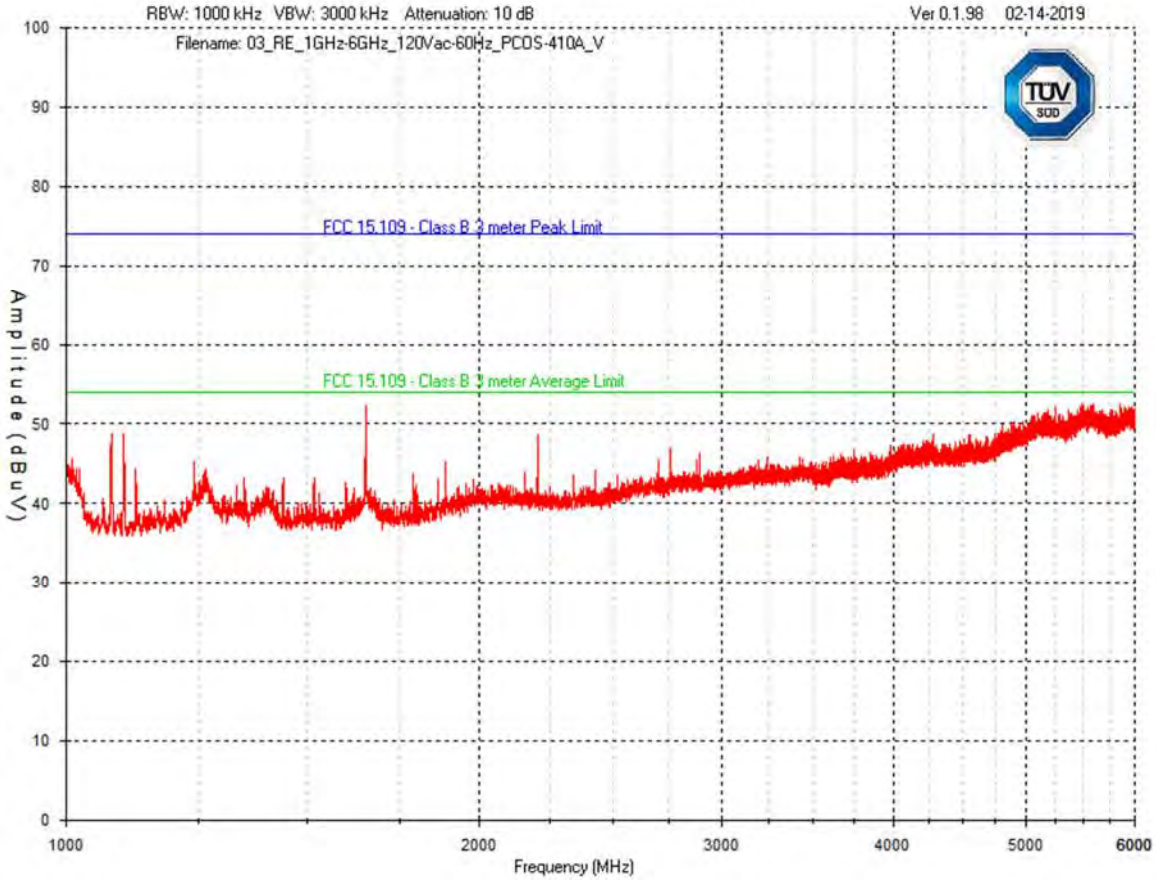

Vertical – 120Vac 60Hz – 1GHz - 6GHz

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Final Measurements

The worst case measurement as listed in the table below appeared at a horizontal antenna height of 115 cm and a table azimuth of 210 degrees, as pictured in Appendix B.

Product Category			Class B							
Supply			**120Vac 60Hz**							
Frequency (MHz)	**Detector**	**Received Signal (dBµV)**	**Antenna Factor (dB/m)**	**Atten Factor (dB)**	**Cable Factor (dB)**	**Pre-Amp (dB)**	**Level (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dB)**	**Pass/ Fail**
Horizontal Antenna Polarization										
174.43	QP	51.1	9.6	6	0.8	-33.7	33.8	43.5	9.7	Pass
875.26	QP	42.7	23.0	6	2.2	-32.5	41.4	46.0	4.6	Pass
750.03	QP	42.9	22.0	6	2.1	-33.0	40.0	46.0	6.0	Pass
720.16	QP	41.8	22.1	6	2.0	-33.1	38.8	46.0	7.2	Pass
375.13	QP	49.9	16.3	6	1.3	-33.5	40.0	46.0	6.0	Pass
300.05	QP	47.3	12.8	6	1.2	-33.6	33.7	46.0	12.3	Pass
2205.58	AVG	47.4	28.4	0	3.4	-34.2	45.0	54.0	9.0	Pass
1653.78	AVG	56.5	25.8	0	2.9	-34.8	50.4	54.0	3.6	Pass
1890.27	AVG	50.6	27.2	0	3.0	-34.4	46.4	54.0	7.6	Pass
1350.04	AVG	51.9	25.5	0	2.6	-35.1	44.9	54.0	9.1	Pass
1241.18	AVG	42.0	25.2	0	2.5	-35.6	34.1	54.0	19.9	Pass
2756.76	AVG	43.0	29.6	0	3.8	-33.4	43.0	54.0	11.0	Pass
Vertical										
540.03	QP	45.8	19.7	6	1.6	-33.3	39.8	46.0	6.2	Pass
360.09	QP	47.6	15.9	6	1.2	-33.5	37.2	46.0	8.8	Pass
719.86	QP	28.2	22.1	6	2.0	-33.1	25.2	46.0	20.8	Pass
900.38	QP	32.5	23.7	6	2.2	-32.4	32.0	46.0	14.0	Pass
875.36	QP	38.7	23.0	6	2.2	-32.5	37.4	46.0	8.6	Pass
393.85	QP	49.2	16.3	6	1.4	-33.5	39.4	46.0	6.6	Pass
551.18	QP	44.1	19.4	6	1.6	-33.3	37.8	46.0	8.2	Pass
1653.47	AVG	51.7	25.8	0	2.9	-34.8	45.6	54.0	8.4	Pass
1079.77	AVG	49.9	24.6	0	2.7	-36.2	41.0	54.0	13.0	Pass
1102.92	AVG	48.8	24.7	0	2.7	-36.1	40.1	54.0	13.9	Pass
2205.89	AVG	37.1	28.4	0	3.4	-34.2	34.7	54.0	19.3	Pass

Quasi-Peak and Average Emissions Table

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Note:
Peak = Peak measurement
QP = Quasi-Peak measurement
AVG = Average measurement

See 'Appendix B – EUT, Peripherals, and Test Setup Photos' for photos showing the test set-up for the highest radiated emission.

Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Spectrum Analyzer	ESU 40	Rohde & Schwarz	Jan. 12, 2018	Jan. 12, 2020	GEMC 233
BiLog Antenna	3142-C	ETS	Feb. 22, 2017	Feb. 22, 2019	GEMC 137
Horn Antenna 1 – 18 GHz	AH-118	Com-Power Corporation	July 12, 2017	July 12, 2019	GEMC 214
Attenuator 6 dB	612-6-1	Meca Electronics, Inc	NCR	NCR	GEMC 286
Pre-Amp	LNA-1450	RF Bay Inc.	Oct. 18, 2018	Oct. 11, 2020	GEMC 221
Pre-Amp 1 – 26.5 GHz	HP 8449B	HP	Nov. 15, 2017	Nov. 15, 2019	GEMC 189
RF Cable 10m	LMR-400-10M-50Ω-MN-MN	LexTec	NCR	NCR	GEMC 274
RF Cable 2m	Sucoflex 104A	Huber+Suhner	NCR	NCR	GEMC 271
Emissions Software	0.1.98	TUV SUD Canada, Inc.	NCR	NCR	GEMC 58

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Electrical Power Disturbance – 4.1.2.5

Purpose

An AC powered device may be subjected to voltage dips, short interruptions or other voltage variations in the power line. Such conditions are mainly caused by faults or changes in the network due to sudden large changes in load, or when a brown out or a black out condition occurs. These voltage dips can also occur with power supplies that are not well regulated such as emergency diesel AC generators. This test simulates the occurrence of these conditions and subjects the EUT to this phenomenon.

Application Level Requirements

This test is performed in accordance with the methodology defined in IEC 61000-4-11. As per VVSG 1.0 (2005) Vol. 1, the following dip and interruption levels apply:

Voltage Dip Level	Duration	Duration @ 60Hz [Cycles]
30% (36 Vac)	0.01s	0.6
60% (72 Vac)	0.1s / 1.0s	6 / 60
100% (120 Vac)	0.5	300

Voltage Surge Level	Duration	Duration @ 60Hz [Cycles]
85% (102 Vac)	4 hours	14400
115% (138 Vac)	4 hours	14400

Surges of +15% line variations of nominal line voltage and electrical power increases of 7.5% and reductions of 12.5% of nominal specified power supply for a period of up to four hours at each level.

The voltage level in brackets is the residual voltage of the voltage dip applied and presumes a normal operating voltage of 120 Vac and a frequency of 60Hz.

The test is carried out at phase angles of 0º, 90º, and 270º of the AC with 5 repetitions applied at each of the dips and interrupts listed in the table above.

No disruption of normal operation or loss of data is applied to this test.

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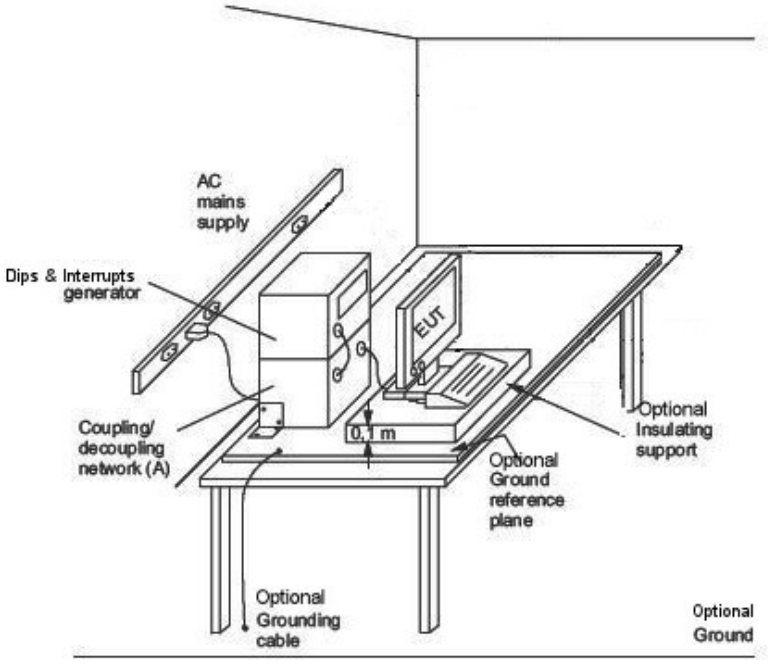
Typical Test Setup



Application Level Accuracy

As per IEC 61000-4-11, the voltage must be ±5% of the voltage stated to be applied. The frequency must be kept within ±2% of the stated frequency.

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Test Results

The EUTs passed the requirements. The EUTs met the criteria's listed above in the application level requirements.

No anomalies were observed for the surges and no disruption to operation or data loss occurred.

Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Immunity Generator	EMC Pro Plus	Keytek Thermo Corp.	Feb. 6, 2019	Feb. 6, 2021	GEMC 188
Immunity Software	CEWare 32 V4.1	Thermo Fisher Scientific	NCR	NCR	GEMC 182
Variac	PWRSTA 3PN126	Powerstat	NCR	NCR	GEMC 6032

IEC61000-4-11_DipsImmunity-C24_Rev3

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Electrical Fast Transients / Bursts – 4.1.2.6

Purpose

Electrical Fast Transients is a series of bursts consisting of a number of fast transients, which in a typical application environment, can be coupled into the supply and onto the I/O lines of the EUT. These transient signals usually arise from nearby switching circuitry such as a light switch, relay bounces, electric motor noise, interruption of inductive loads, etc. This test is to verify that the EUT is immune to such transient disturbances based on the applicable test levels. This test, however, does not guarantee that the EUT will not experience higher level burst impulses during its operation, which may cause the EUT to fail.

Application Level Requirement

This test is performed in accordance with the methodology defined in IEC 61000-4-4. The voltage waveform applied has the following characteristics:

- Pulse rise time: 5ns ± 30%
- Pulse duration (to 50% value): 50ns ± 30%
- Pulse repetition frequency 100kHz
- Burst duration should be 15ms ± 20%
- Burst period should be 300ms ± 20%

Bursts are applied for 1 minute each at the positive and the negative polarity to the mains power input (common mode) and to each applicable I/O line.

A test level of ±2kV is applied to the power supply port(s) via a coupling and decoupling network and ±1kV to each applicable I/O line via a Capacitive Coupling Clamp. No disruption of normal operation or loss of data is to occur during the performance of this test.

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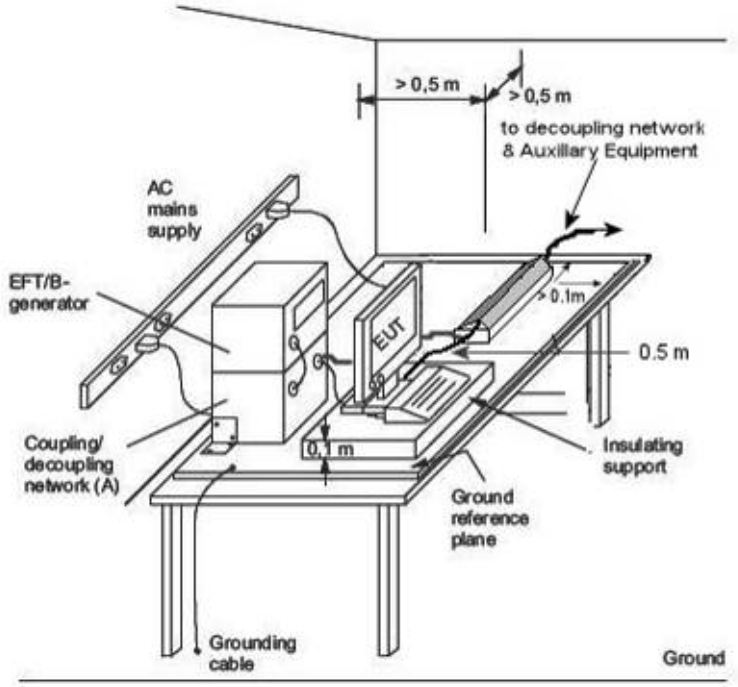
Typical Test Setup



Application Level Accuracy

As per IEC 61000-4-4, the test level is specified as being within ±10% into a 50Ω load and ±20% into a 1000Ω load.

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Test Results

The EUT's second USB monitor experienced a shutdown during the test and did not self-recover. The manufacturer installed a ferrite on the USB to pass the test. Refer to Appendix A - Modifications for Compliance. No additional anomalies were observed.

After the ferrite install on the USB cable, the EUT passed the requirements. The EUT met Criteria B as defined in "Appendix A – EUT & Client Provided Details".

Test Voltage	Repetition Rate	Coupling Lines	Result
±2kV	100kHz	L – N – PE	Pass

Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Immunity Generator	EMC Pro Plus	Keytek Thermo Corp.	Feb. 6, 2019	Feb. 6, 2021	GEMC 188
Immunity Software	CEWare 32 V4.1	Thermo Fisher Scientific	NCR	NCR	GEMC 182

IEC61000-4-4_EFTB_Rev4

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Lightning Surge – 4.1.2.7

Purpose

Surge occurs when a high energy disturbance takes place on the power lines, or less frequently, I/O lines and can cause significant temporary increase in current and/or voltage. These disturbances can arise during a nearby lightning strike, circuit trips, short-circuits on the same power line that the equipment is connected to, etc. The sudden rise in voltage over a very short period of time could cause damage to the components of the EUT and this test assesses the immunity of the EUT to such transient waves. This test differs from Electrical Fast Transients / Bursts in that this waveform, characterized by the rapid increase of current and/or voltage followed by a slower decrease, has a longer wave duration that could allow damage to the EUT. This test does not guarantee that the EUT will not be exposed to a higher level of surge energy during its operation, which may cause the EUT to fail. This test also does not ensure operation of the EUT in the presence of direct lightning effects.

Application Level Requirement

This test is performed in accordance with the methodology defined in IEC 61000-4-5. Surges are simulated using a waveform generator and the characteristics of the waveform generated are as follows:

- Rise time of 1.2µs and wave duration of 50µs (to 50% value) into an open circuit.
- Rise time of 8µs and wave duration of 20µs (to 50% value) into a short circuit.
- Dwell time of 60 seconds between each surge.
- 5 surges in the positive and 5 surges in the negative polarity.
- For AC systems, the surge pulses are applied at 0º, 90º, 180º and 270º.
- For AC systems, Line to Ground is performed at the same amount as the Line to Line voltage.

For AC mains supply, a test level of ±2kV Line to Line and ±2kV Line to Ground is applied to the power supply port(s) via a coupling and decoupling network. Lower test levels are evaluated first before applying the required test level. No disruption of normal operation or data loss is allowed as applied to this test.

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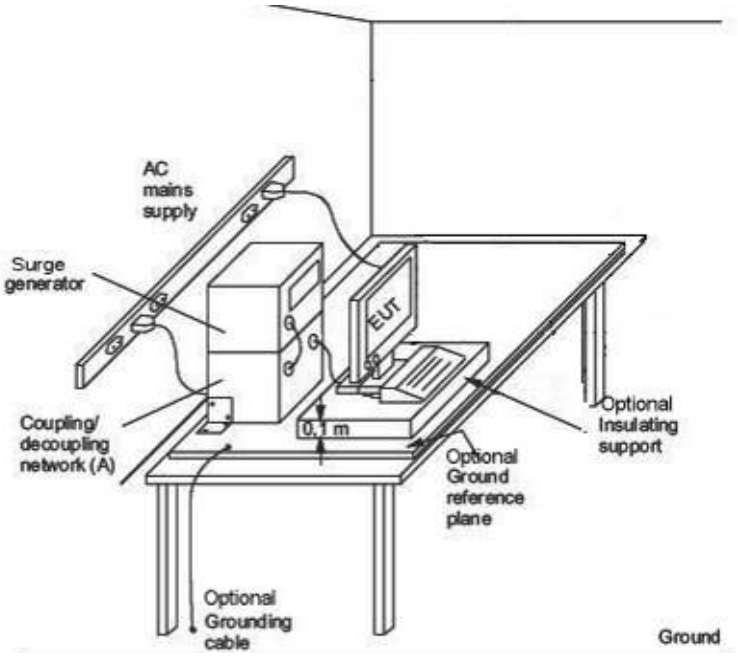
Typical Test Setup



Application Level Accuracy

As per IEC 61000-4-5, the level is specified as being within ±10% for open circuit voltage calibration or ±10% for short circuit current calibration. The EUTs input impedance, or whether Line – PE or Line – Line is being performed, combined with the calibrated generators output impedance, will affect the timing and voltage/current of the waveform applied to the EUT.

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Test Results

The EUT passed the requirements. The EUT did not encounter any deviation from normal operation or data loss.

Test Voltages	Phase Angles	Number of Surges	Coupling Lines	Result
±0.5kV, ±1kV, ±2kV	0°, 90°, 180°, 270°	5 per polarity	L – PE	Pass
±0.5kV, ±1kV, ±2kV	0°, 90°, 180°, 270	5 per polarity	N – PE	Pass
±0.5kV, ±1kV, ±2kV	0°, 90°, 180°, 270°	5 per polarity	L – N	Pass

Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Immunity Generator	EMC Pro Plus	Keytek Thermo Corp.	Feb. 6, 2019	Feb. 6, 2021	GEMC 188
Immunity Software	CEWare 32 V4.1	Thermo Fisher Scientific	NCR	NCR	GEMC 182

IEC61000-4-5_Surge_Rev4

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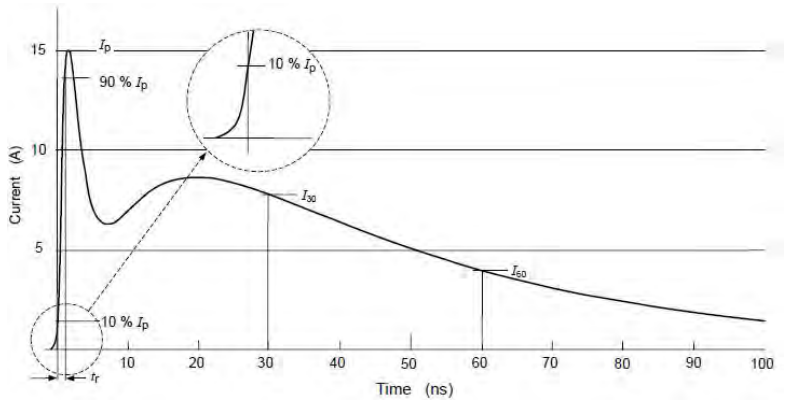
Electrostatic Disruption – 4.1.2.8

Purpose

The purpose of this immunity test is to apply a static electricity discharge from the operator to the EUT or create a nearby discharge field. An example of this discharge can be seen in low humidity conditions when a person touches an object and creates a small spark. This spark could potentially be harmful to the operation of the EUT. The contact method, with related reduced voltages, has been shown to be roughly equivalent to air discharges in severity and due to its reproducibility, contact is the preferred test method. Air discharge is used where contact discharge cannot be applied since the discharge point is significantly insulated and the insulation cannot be easily broken through. This test ensures a minimum level of immunity which is likely to occur in a normal usage environment. This test does not guarantee that the EUT will not be exposed to higher discharge levels which could cause it to fail.

Application Level Requirement

This test is performed in accordance with the methodology defined in IEC 61000-4-2. Ten hits in the positive and negative polarity are applied at each defined discharge point on the EUT. These are called direct discharges, regardless of contact or air being applied. Horizontal Coupling Plane (HCP) and Vertical Coupling Plane (VCP) discharges are also applied and these are called indirect discharges. A typical test setup representation is shown on the following page. A photograph of the actual test setup is shown in Appendix B. See the results table under Test Results for the actual EUT discharge points.



A level of ±8kV contact or ±15kV air, where applicable, is applied to each defined discharge point. For air discharge testing, the test is applied at the lower test levels first. No disruption to normal operation or loss of data is applied to this test. However, all anomalies, if any, are noted.

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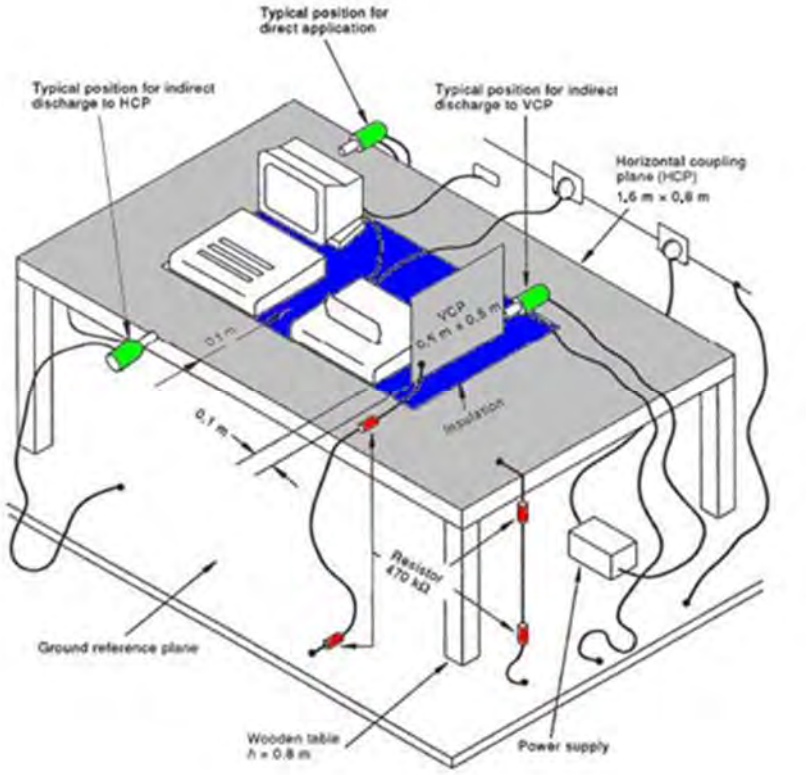
Typical ESD Setup



Application Level Accuracy

Contact discharge: ±15% for the first peak current, ±5% for the output voltage and ±25% for the rise time as measured at the discharge electrode tip of ESD generator.

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Test Results

The EUTs passed the requirements. The EUTs encountered no disruption of normal operation and no loss of data. No anomalies were observed.

Location	Test Voltage	Discharge Type	Pass / Fail
1. HCP	±2kV, ±4kV, ±8kV	Contact	Pass
2. VCP	±2kV, ±4kV, ±8kV	Contact	Pass
3. Front enclosure screw – left	±2kV, ±4kV, ±8kV	Contact	Pass
4. Front enclosure screw – right	±2kV, ±4kV, ±8kV	Contact	Pass
5. Front security tab – left	±2kV, ±4kV, ±8kV	Contact	Pass
6. Front security tab – right	±2kV, ±4kV, ±8kV	Contact	Pass
7. Security FOB outer shell	±2kV, ±4kV, ±8kV	Contact	Pass
8. LCD Touch Screen – center	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass (No Discharge)
9. AUX LCD Touch Screen – center	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass (No Discharge)
10. AUX LCD Touch Screen – stand	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass (No Discharge)
11. AUX LCD Touch Screen – rear	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass (No Discharge)
12. Enclosure – ballot entry seam	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass (No Discharge)
13. Enclosure button – Cast	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass (No Discharge)
14. Enclosure button – Return	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass (No Discharge)
15. Enclosure – top upper left	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass (No Discharge)
16. Enclosure – top upper right	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass (No Discharge)
17. Enclosure – top upper center	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass (No Discharge)
18. Controller – buttons	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass (No Discharge)
19. Headphone jack	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass (No Discharge)

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20. AC Power supply enclosure – top	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass (No Discharge)
21. AC Power supply enclosure – back	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass (No Discharge)
22. AC Power supply – cable	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass (No Discharge)
23. DC power cable – entry	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass
24. RJ-45 cable	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass (No Discharge)
25. USB cable	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass (No Discharge)

Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
ESD Simulator	NSG 437	Teseq	Jun. 28, 2017	Jun. 28, 2019	GEMC 130
ESD HCP	80CM x 160CM	TUV SUD Canada, Inc	NCR	NCR	GEMC 50
ESD VCP	50CM x 50CM	TUV SUD Canada, Inc	NCR	NCR	GEMC 51
ESD 470K A	2x470kΩ 100CM	TUV SUD Canada, Inc	NCR	NCR	GEMC 52
ESD 470K B	2x470kΩ 100CM	TUV SUD Canada, Inc	NCR	NCR	GEMC 53

IEC61000-4-2_ESD_Rev4

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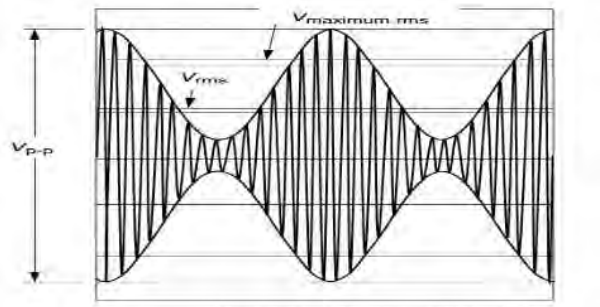
Electromagnetic Susceptibility – 4.1.2.10

Purpose

The EUT will likely be exposed to intentional sources of electromagnetic radiation during its regular application. Sources of such radiation can be cellular phones, FM radio, television, remote car alarms, garage door openers, and other broadcast transmissions. These sources of radiation are licensed or certified for broadcast and therefore, the EUT should be immune to their RF energy. This test assesses the immunity of the EUT to the applicable field strength test level. This test, however, does not guarantee that the EUT will not be exposed to higher level fields during its operation, which may cause it to fail.

Application Level Requirement

This test is performed in accordance with the methodology defined in IEC 61000-4-3. The immunity test is performed over the frequency range of 80MHz to 1.0GHz. As the frequency range is swept incrementally, the step size used is calculated at 1% of the preceding frequency value, rounded down to the nearest kHz. Known clock frequencies, local oscillators, etc. are analyzed separately, where applicable, and these are defined in "Appendix A – EUT & Client Provided Details". The field uniformity is calibrated at 10V/m and a modulation of 80% AM 1kHz sine wave is applied during the application of the RF energy at each frequency.



Modulated RF-signal 80 % AM

The RF field is applied in both horizontal and vertical antenna polarization and four sides of the EUT are subjected to this RF field. The dwell time used for each frequency is 3 seconds. Forward power is monitored and records are kept on file at TUV SUD Canada Inc. An isotropic field probe is also placed in near proximity of the EUT to verify the application of the RF field. Performance Criteria level A as defined in "Appendix A – EUT & Client Provided Details" is applied to this test.

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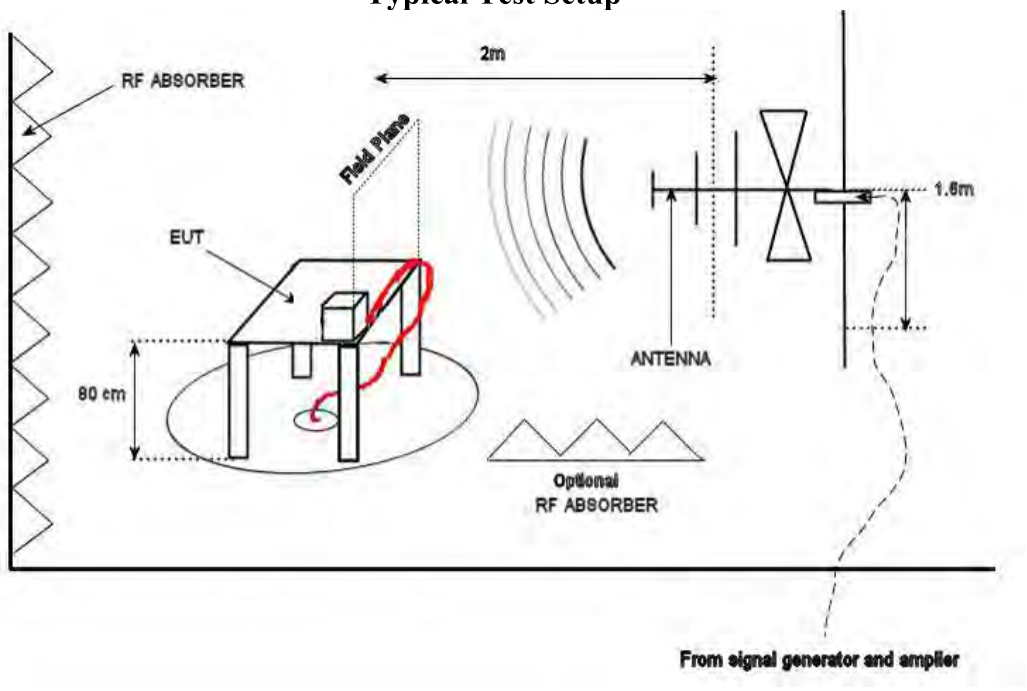
Typical Test Setup



Application Level Accuracy

As per IEC 61000-4-3, the RF field is specified as 0dB to +6dB for at least 12 of the 16 calibration points. For a 10 V/m field, this allows for the EUT to be subjected to a field of 10 V/m to 20 V/m with at least 75% coverage at this level.

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Test Results

The EUTs encountered no disruption of normal operation or data loss. No other anomalies were observed.

Input Voltage and Frequency	120Vac, 60Hz
Frequency Range and Field Strength	80MHz – 1GHz 10V/m (80% AM)
Sweep Step	1% of Fundamental
Dwell Time	3 sec.
Result	**Pass**

Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Signal Generator	SMU 200A	Rohde & Schwarz	Dec. 22, 2017	Dec. 22, 2019	GEMC 236
BiLog Antenna	3142-C	ETS	Oct. 19, 2018	Oct. 19, 2020	GEMC 8
Power Amplifier	5225FE	Ophir RF	NCR	NCR	GEMC 298
Field Probe	FL 7018	AR	Oct. 10, 2018	Oct. 10, 2020	GEMC 164
Field Monitor	FM 7004	AR	NCR	NCR	GEMC 13
Power Head	PH 2000	AR	Feb. 1, 2017	Feb. 1, 2019	GEMC 15
Power Meter	PM 2002	AR	Feb. 1, 2017	Feb. 1, 2019	GEMC 16
Immunity Software	V224	TUV SUD Canada, Inc.	NCR	NCR	GEMC 57

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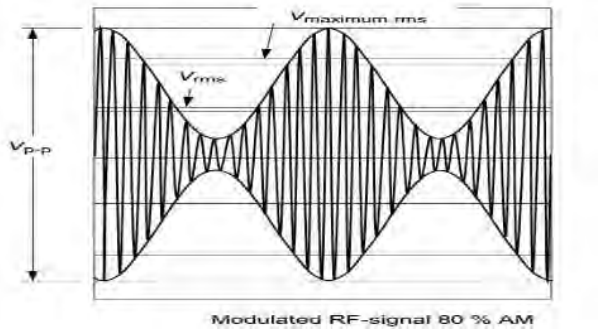
Conducted RF Immunity – 4.1.2.11

Purpose

The EUT will likely be exposed, in some way, to low frequency intentional sources of RF energy during its regular application. Sources of such radiations can be AM radio, shortwave radio, CB transmissions, and other low frequency broadcast transmissions. These sources of radiations are licensed or certified for broadcast and therefore, the EUT should be immune to their RF energy. Due to the properties of radio, the power or I/O lines on the EUT would likely be the passive receiving antenna that induces the disturbance to the EUT. Since this is the main method of coupling at this frequency range, the direct application of the RF energy to the line being tested is used. At this frequency range and level, this method is easier to produce and reproduce in a laboratory environment than subjecting the EUT to an equivalent RF field.

Application Level Requirement

This test is performed in accordance with the methodology defined in IEC 61000-4-6. I/O cables are tested using a bulk current injection probe and power lines are tested using a coupling and decoupling network. The immunity test is performed over the frequency range of 150kHz to 80MHz. As the frequency range is swept incrementally, the step size used is calculated at 1% of the preceding frequency value, rounded down to the nearest kHz. Known clock frequencies, local oscillators, etc. are analyzed separately, where applicable, and these are defined in "Appendix A – EUT & Client Provided Details". The test level is calibrated at 10Vrms and a modulation of 80% AM 1kHz sine wave is applied during the application of the RF energy at each frequency.



The dwell time used for each frequency is 3 seconds. A current probe is placed between the coupling device and the EUT to verify the application of the RF energy. No disruption to normal operation or data loss allowed is applied to this test.

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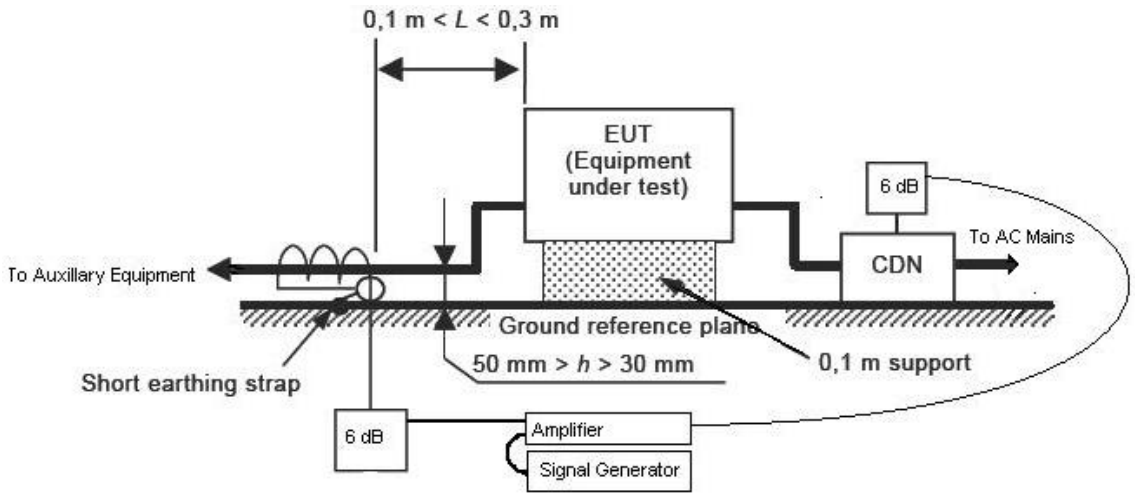
Typical Test Setup



Application Level Accuracy

As per IEC 61000-4-6, the CDN must meet a common mode impedance $|Z_{CE}| = 150\Omega \pm 20\Omega$ for 150kHz to 26MHz and $|Z_{CE}| = 150\Omega + 60\Omega$ or $150\Omega - 45\Omega$ for 26MHz to 80MHz. During tests using the bulk current injection probe, the impedance of each cable will affect the current injected and therefore, current was monitored. The calibration is performed according to IEC 61000-4-6 which allows for ±2dB.

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Test Results

The EUTs passed the requirements. The EUTs met Criteria A as defined in "Appendix A – EUT & Client Provided Details". No anomalies were observed.

Input Voltage and Frequency	120Vac 60Hz
Frequency Range and Signal Strength	150kHz - 80MHz 10Vrms (80% AM)
Sweep Step	1% of Fundamental
Dwell Time	3 sec.
AC Mains	Pass
Result	**Pass**

Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Power Line CDN	FCC-801-M3-16A	FCC	Feb. 23, 2018	Feb. 23, 2020	GEMC 138
Power Amplifier	75A250A	AR	NCR	NCR	GEMC 14
Signal Generator	SMY01	Rohde & Schwarz	Feb. 21, 2018	Feb. 21, 2020	GEMC 6330
Power Attenuator 6dB	100-A-FFN-06	Bird	NCR	NCR	GEMC 48
Immunity Software	V223	TUV SUD Canada, Inc	NCR	NCR	GEMC 57

IEC61000-4-6_ConductedImmunity_Rev4

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Magnetic Fields Immunity – 4.1.2.12

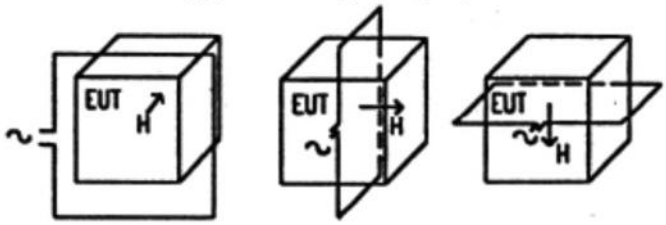
Purpose

A magnetic field with the frequency of the power line is generated around the EUT. In practice, the EUT will be subjected to power frequency magnetic fields from nearby power lines, transformers, or devices such as televisions or monitors. Since the EUT is usually used in conjunction with other electrical equipment, it is subjected to the steady state magnetic fields. These are magnetic fields that the device is exposed to under normal operating conditions. These fields have lower field strengths compared to typical transient magnetic fields.

Application Level Requirement

This test is performed in accordance with the methodology defined in IEC 61000-4-8. Three orthogonal axis of the EUT are subjected to the field within the magnetic loop. The transient magnetic field, if applicable, is tested for 1 minute while the steady state magnetic field is tested for 15 minutes. The frequency applied is 60 Hz. A magnetic field strength of 30 A/m is applied to the EUT in each orthogonal axis. No disruption to normal operation or loss of data is applied to this test.

Typical Setup Diagram



Application Level Accuracy

As per IEC 61000-4-8, the field over the area that the EUT occupies within the loop must be calibrated to be within ±3dB. For a field strength of 3 A/m, this means that the empty calibrated field strength can be between 2.1 A/m and 4.2 A/m over the area that the EUT occupies.

Test Results

The EUT passed the requirements. The EUT did not encounter any disruption of normal operation or loss of data. No anomalies were observed.

When a 60 Hz field was applied, the EUTs were powered at 120 Vac 60 Hz, battery mode and the field strength at 30 A/m.

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Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Magnetic Loop	F-1000-4-8/9/10-L-1M	FCC	NCR	NCR	GEMC 22
Variac	PWRSTA 3PN126	Powerstat	NCR	NCR	GEMC 6032
Clamp Meter	365	Fluke	Nov. 19, 2018	Nov. 19, 2019	GEMC 260

IEC61000-4-8_MagneticImmunity_Rev3

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Appendix A – EUT & Client Provided Details

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General EUT Description

Client Details	
Organization / Address	Pro V&V 700 Boulevard South Huntsville, Al. 35803
Contact	Michael L. Walker
Phone	256-713-1111
Email	michael.walker@provandv.com
Manufacturer Details (if not same as above)	
Organization / Address	Dominion Voting Systems/215 Spadina Ave, Toronto, ON M5T 2C7
Contact	Aamer Chaudhry
Phone	416.762.8683 x 227
Email	aamer.chaudhry@dominionvoting.com
EUT (Equipment Under Test) Details	
EUT Name	Image Cast Evolution
EUT Model / SN	PCOS-410A
EUT revision	51
Software version	5.5.6.1
Equipment category	Voting Machines
EUT is powered using	AC/DC
Input voltage range(s) (V)	100-240
Frequency range(s) (Hz)	50-60
Rated input current (A)	1.8A
Nominal power consumption (W)	60W
Number of power supplies in EUT	1
Basic EUT functionality description	Voting Ballot Tabulator
Modes of operation	Voting Mode, Tech Mode
EUT setup time (min)	5
Frequency of all clocks present in EUT	CPU Core 533MHz, DDR 266MHz, Video 90MHz, Local Bus 66MHz, PCI 33MHz
I/O cable description Specify length and type	AVS ATI RJ45 3m; AVS Headphones Audio 1/8" 2.5m; AVS Sip&Puff Audio 1/8" 1.5m;

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	Power Input Docking Connector extension cable 15cm; Ballot Box Intrusion Switch docking connector extension cable 110cm;
Available connectors on EUT	Serial; 2xCF; USB; Ethernet RJ45, ATI RJ45, Bottom Ballot Box Docking Connector, Aux Power, BMD Lights RJ11
Dimensions of product	L 570mm W 490mm H 180mm
Method of monitoring EUT and description of failure for immunity.	Run voting test, without disruption of normal operation or loss of data.

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EUT Functional Description

Voting Ballot Tabulator.

EUT Configuration

Please see Appendix B for a picture of the unit running in normal conditions.

- Cables and earthing were connected as per manufacturer's specification.
- All cables are less than 3m

Operational Setup

Peripheral devices were attached to the EUT for its test operation. However, this report does not represent compliance of these peripheral device(s) in any way.

- Turn on device, enter test mode using voter and admin cards

Modifications for Compliance

The following modifications were made during testing for the sample to achieve compliance with the testing requirements:

A ferrite bead installed on the USB cable which connects to the second USB monitor signal cable. See Appendix B - EUT, Peripherals, and Test Setup Photos.
Wurth Electronik ferrite P/N: 742 712 22

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Appendix B – EUT, Peripherals, and Test Setup Photos

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Figure 1 – EUT Front Close Up

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Figure 2 – EUT Rear Close Up

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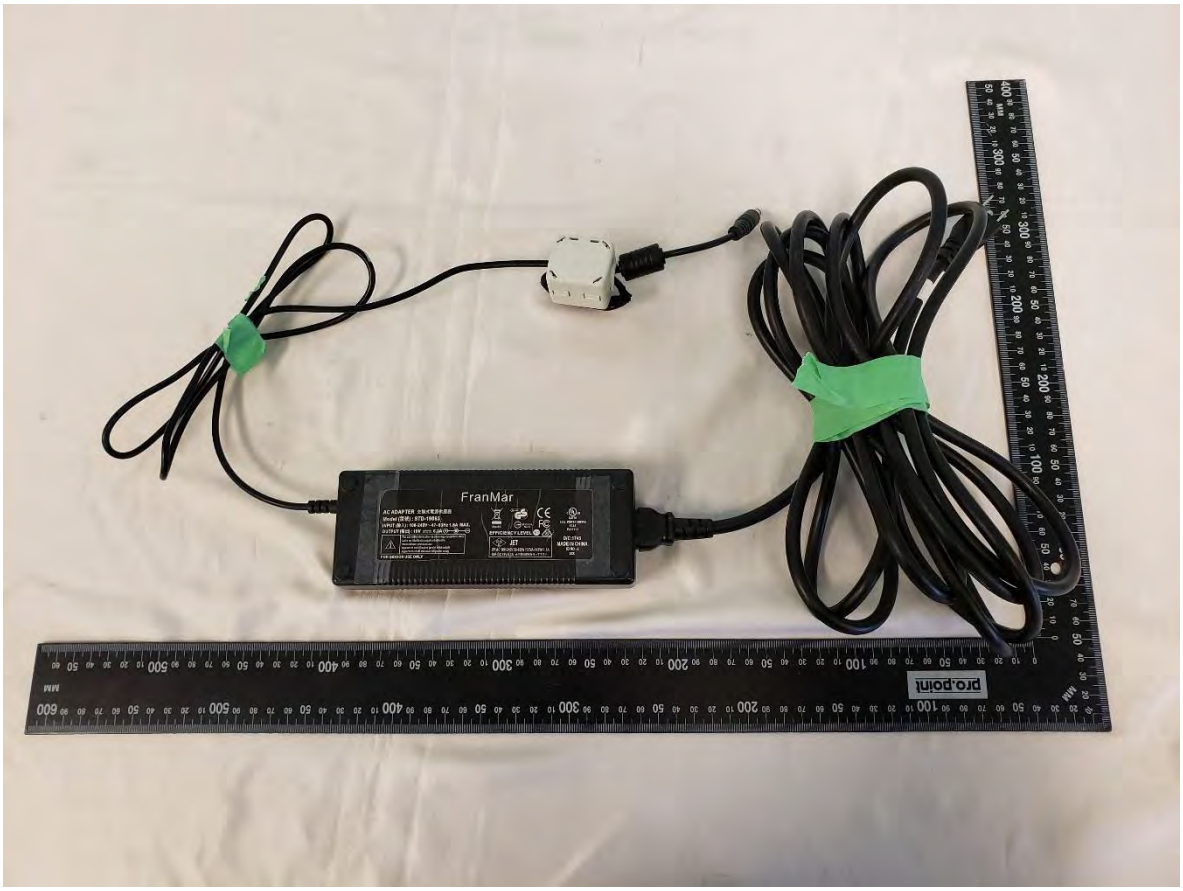

Figure 3 – EUT Power Supply

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Figure 4 – EUT Accessory – ATI control panel & Headphones

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Figure 5 – EUT Accessory – Second USB monitor

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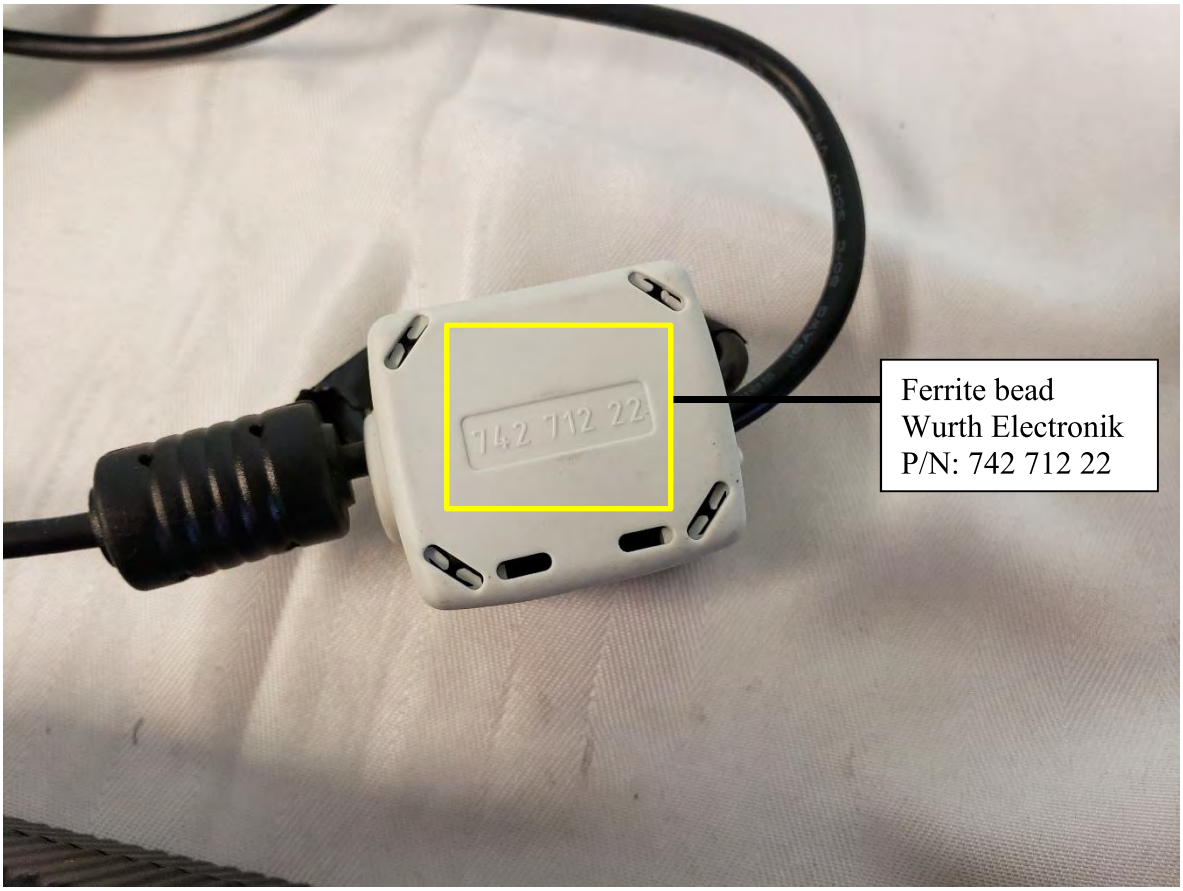

Figure 6 – Ferrite bead installed on second USB monitor cable

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Figure 7 – Power Line Conducted Emissions Setup – Photo 1

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Figure 8 – Power Line Conducted Emissions Setup – Photo 2

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Figure 9 – Radiated Emissions Setup – Photo 1
30MHz – 1GHz

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Figure 10 – Radiated Emissions Setup – Photo 2
1GHz – 6GHz

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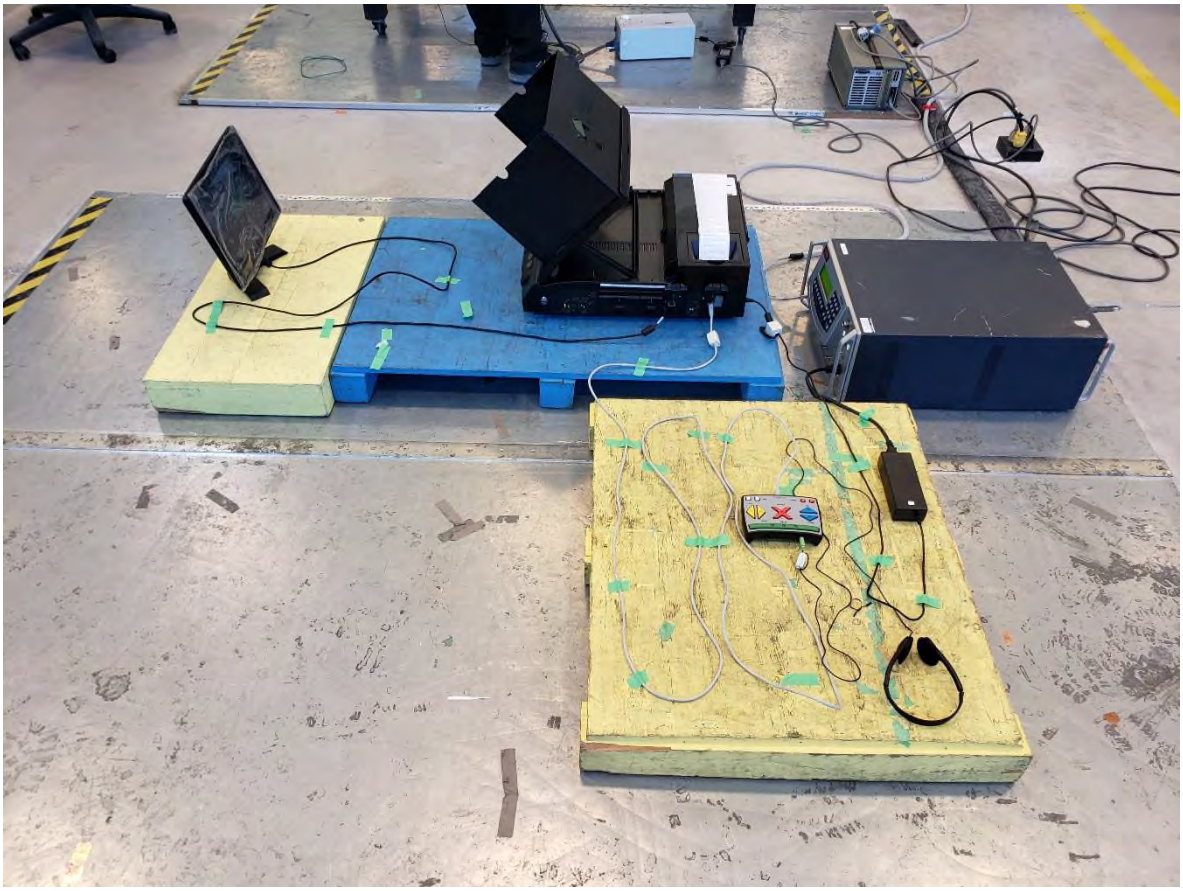

Figure 11 – Electrical Power Disturbance - Dips / Electrical Fast Transient / Lightning Surge

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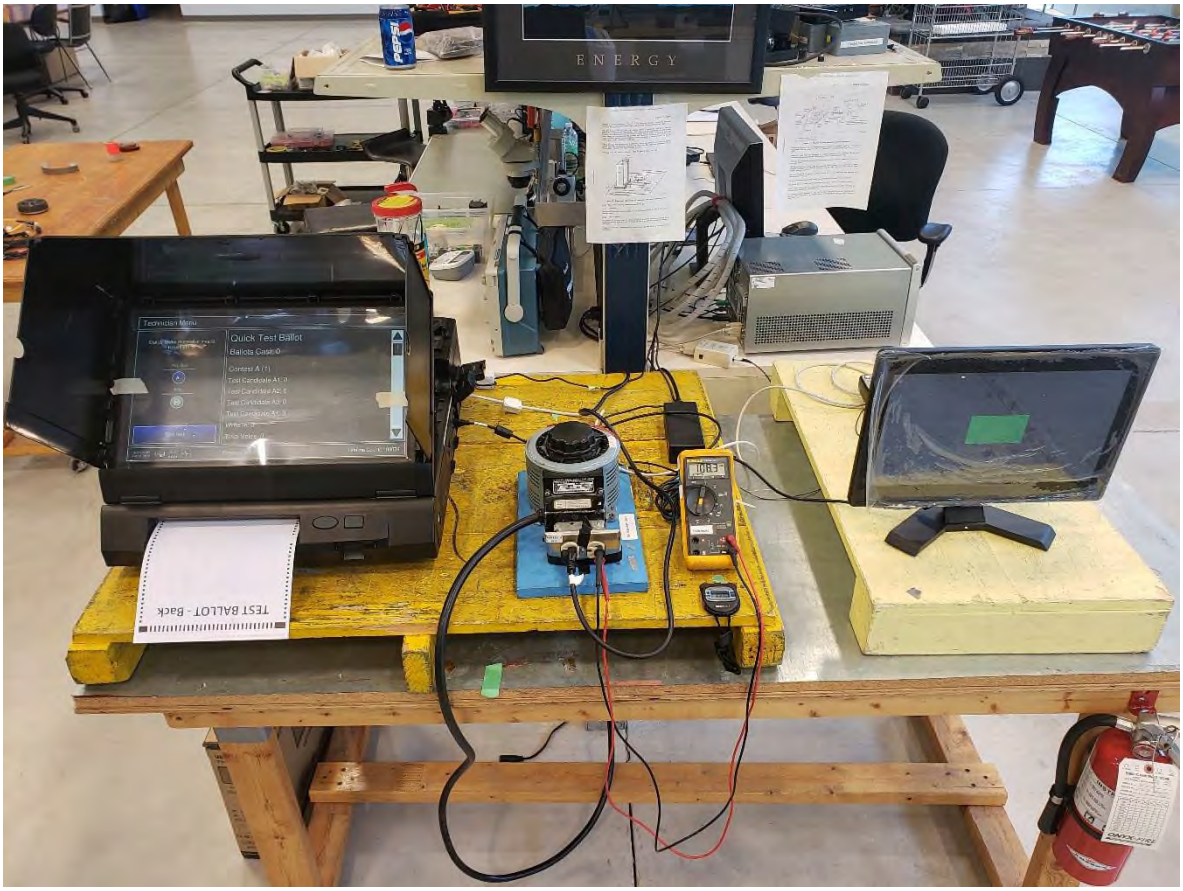

Figure 12 – Electrical Power Disturbance – power increase & reduction

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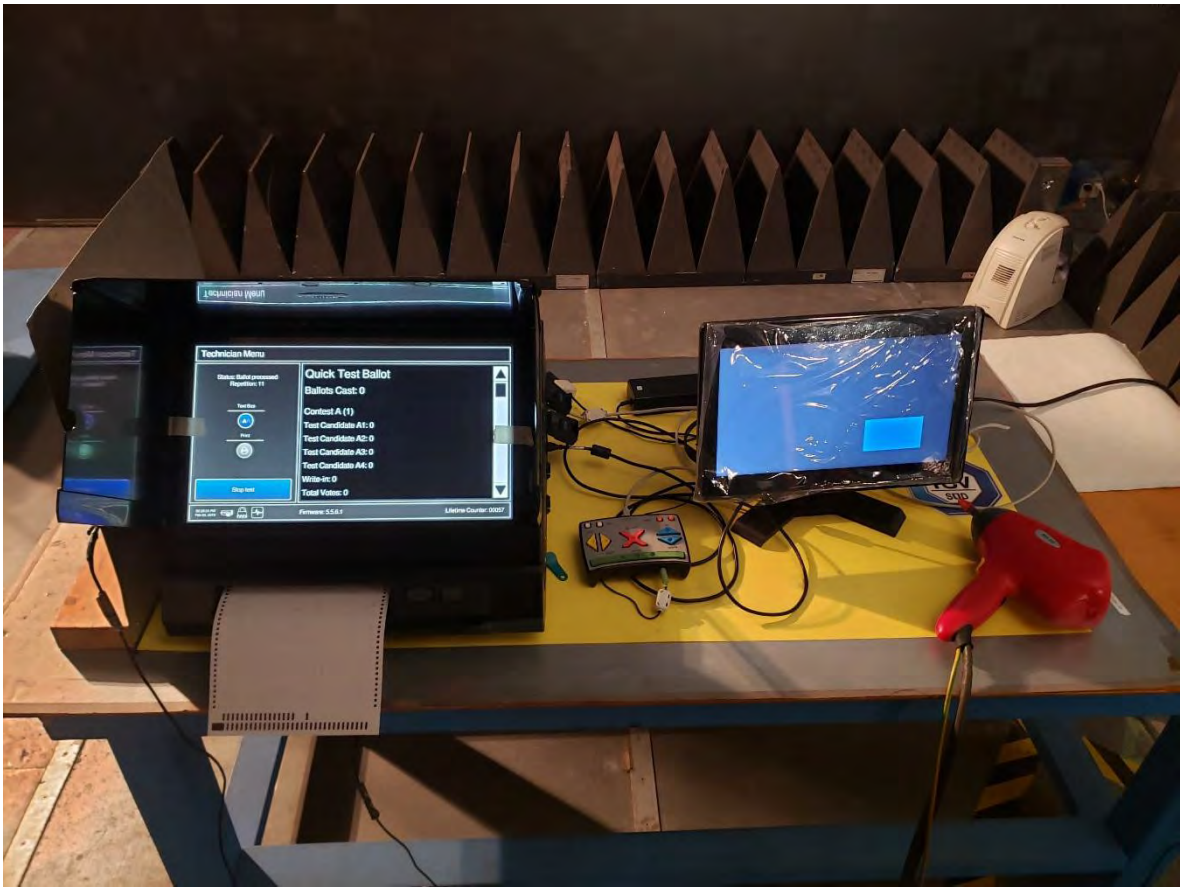

Figure 13 – Electrostatic Disruption Setup

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Figure 14 – Electromagnetic Susceptibility Setup

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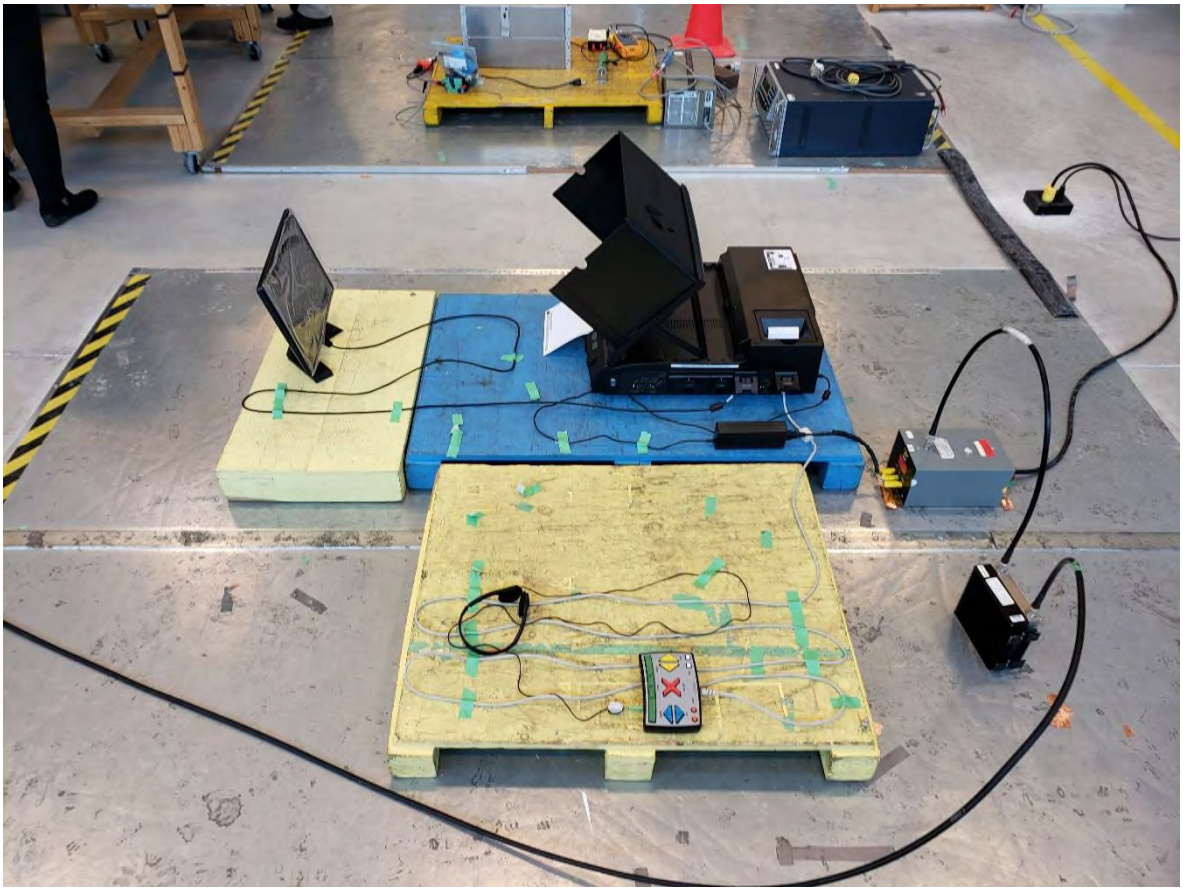

Figure 15 – Conducted RF Immunity Setup

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Figure 16 – Magnetic Fields Immunity

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Appendix C – Product Marking

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Product Marking

Products marketed in the US:
For products that are not intentional radiators and are subject to the 'verification' procedure in the US, according to the FCC, the product shall bear the following statement in a conspicuous location on the device:

> *This device complies with Part 15 of the FCC Rules.*
> *Operation is subject to the following two conditions:*
> *(1) this device may not cause harmful interference, and*
> *(2) this device must accept any interference received, including interference that may cause undesired operation.*

Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified is required to be affixed only to the main control unit.

When the device is so small or for such use that it is not practicable to place the statement specified on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed.

In this case, the following statement may accompany the product:

> *"This device complies with Part 15 of the FCC Rules. See manual for details*"

Also, the FCC identifier or other unique identifier such as a model number and serial number, as appropriate, must be displayed on the device.

Products marketed within Canada:
According to Industry Canada, the following statement shall be permanently affixed to the ITE or displayed electronically and its text must be clearly legible. If the dimensions of the device are too small or if it is not practical to place the label on the device and electronic labeling has not been implemented, the label shall be, upon agreement with Industry Canada, placed in a prominent location in the user manual supplied with the ITE.

> *CAN ICES-3 (*)/NMB-3(*)*

* Insert either "A" or "B" but not both to identify the applicable Class of ITE.

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EMC / EMI Test Report

As per

2015 VVSG Volume I; Version 1.1
Sub-paragraphs 4.1.2.5 to 4.1.2.12

2015 VVSG Volume II; Version 1.1
Sub-paragraph 4.8

Emissions & Immunity

on the

ICP2 V1

Issued by:

TÜV SÜD Canada Inc.
11 Gordon Collins Dr,
Gormley, ON, L0H 1G0
Canada
Ph: (905) 883-7255

Testing produced for

PRO V&V

See Appendix A for full client & EUT details.

Marty McLear,
Project Engineer

Reviewed by:

Min Xie,
Sr. Project Engineer

Industry Canada
Registration # 6844A-3

Testing Laboratory
Certificate #2955.02

R-4023, G-506
C-4498, T-1246

Registration # CA6844

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Table of Contents

Table of Contents 2

Report Scope 3

Summary 4

- Test Results Summary 5
- Notes, Justifications, or Deviations 6
- Sample Calculation(s) 6

Applicable Standards, Specifications and Methods 7

Document Revision Status 8

Definitions and Acronyms 9

Testing Facility 11

- Calibrations and Accreditations 11
- Testing Environmental Conditions and Dates 12

Detailed Test Result Section 13

- Power Line Conducted Emissions – 4.1.2.9 14
- Radiated Emissions – 4.1.2.9 20
- Electrical Power Disturbance – 4.1.2.5 28
- Electrical Fast Transients / Bursts – 4.1.2.6 31
- Lightning Surge – 4.1.2.7 34
- Electrostatic Disruption – 4.1.2.8 37
- Electromagnetic Susceptibility – 4.1.2.10 41
- Conducted RF Immunity – 4.1.2.11 44
- Magnetic Fields Immunity – 4.1.2.12 47

Appendix A – EUT & Client Provided Details 49

Appendix B – EUT, Peripherals, and Test Setup Photos 53

Appendix C – Product Marking 71

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Report Scope

This report addresses the EMC verification testing and test results of the **ICP2 V1**, Model: **PCOS-330A** herein referred to as EUT (Equipment Under Test). The EUT was tested for emissions and immunity compliance against the following standards:

2015 VVSG Volume I; Version 1.1

2015 VVSG Volume II; Version 1.1

Power line conducted emissions, radiated emissions and immunity testing was evaluated on the EUT. Test procedures, results, justifications, and engineering considerations, if any, follow later in this report.

For a more detailed list of the standards and the revision used, see the "Applicable Standards, Specifications and Methods" section of this report.

This report does not imply product endorsement by any government, accreditation agency, or TÜV SÜD Canada Inc.

Opinions or interpretations expressed in this report, if any, are outside the scope of TÜV SÜD Canada Inc. accreditations. Any opinions expressed do not necessarily reflect the opinions of TÜV SÜD Canada Inc., unless otherwise stated.

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Summary

The results contained in this report relate only to the item(s) tested.

Equipment Under Test (EUT)	**ICP V1** Model: **PCOS-330A**
EUT passed all tests performed	Yes
Testing conducted by	Marty McLear

For testing dates, see 'Testing Environmental Conditions and Dates'.

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Test Results Summary

Standard/ Method	Description	Criteria	Class / Level	Result
2015 VVSG Vol. I, Ver. 1.1 Sec. 4.1.2.9	Power Line Conducted Emissions	N/A	Class B	Pass
2015 VVSG Vol. I, Ver. 1.1 Sec. 4.1.2.9	Radiated Emissions	N/A	Class B	Pass
2015 VVSG Vol. I, Ver. 1.1 Sec. 4.1.2.5(a. b. c. d. e)	Electrical Power Disturbance	Normal Operation & No Data Loss	Various	Pass
2015 VVSG Vol. I, Ver. 1.1 Sec. 4.1.2.6(a. b. c.)	Electrical Fast Transient	Normal Operation & No Data Loss	±2kV - Mains	Pass
2015 VVSG Vol. I, Ver. 1.1 Sec. 4.1.2.7(a. b. c. d. e)	Lightning Surge	Normal Operation & No Data Loss	±2kV Line - Line ±2kV Line - Ground	Pass
2015 VVSG Vol. I, Ver. 1.1 Sec. 4.1.2.8	Electrostatic Disruption	Normal Operation & No Data Loss	±8kV Contact ±15kV Air	Pass
2015 VVSG Vol. I, Ver. 1.1 Sec. 4.1.2.9	Electromagnetic Susceptibility	Normal Operation & No Data Loss	10 V/m, 80 MHz – 1 GHz	Pass
2015 VVSG Vol. I, Ver. 1.1 Sec. 4.1.2.11	Conducted RF Immunity	Normal Operation & No Data Loss	10 Vrms, 150 kHz – 80 MHz	Pass
2015 VVSG Vol. I, Ver. 1.1 Sec. 4.1.2.12	Magnetic Fields Immunity	Normal Operation & No Data Loss	30 A/m	Pass
Overall Result				**Pass**

If the product as tested complies with the specification or requirement, the EUT is deemed to comply and is issued a 'PASS' grade. If not, 'FAIL' grade is issued.

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Notes, Justifications, or Deviations

The following justifications for tests not performed or deviations from the above listed specifications apply:

All Ethernet and USB ports are service ports and is not used in normal operation. Therefore, these ports are not loaded during testing.

The manufacturer presented the EUT representative of the main function(s) performed in the application for which it is intended. During measurement, the EUT is operational with a reprehensive working load and program to demonstrate typical operating conditions.

The EUT includes an external power supply converter.
Manufacturer: FranMar
Model: ATS090-P190

The two documents referenced in the scope of work are custom test plans (or standard test procedures) which is not part of TUV SUD Canada's Scope of Accreditation; however, all individual EMC tests are in TUV SUD Canada's Scope of Accreditation.

A later revision of the standard may have been substituted in place of the previous dated referenced revision. The year of the specification used is listed under applicable standards. Using the later revision accomplishes the goal of ensuring compliance to the intent of the previous specification, while allowing the laboratory to incorporate the extensions and clarifications made available by a later revision.

Sample Calculation(s)

Radiated Emission Test

Margin = Limit – (Received Signal + Antenna Factor + Cable Loss – Pre-Amp Gain)
Margin = 50dBµV/m – (50dBµV + 10dB + 2.5dB – 20dB)
Margin = 7.5 dB (pass)

Power Line Conducted Emission Test

Margin = Limit – (Received Signal + Attenuation Factor + Cable Loss + LISN Factor)
Margin = 73.0dBµV – (50dBµV + 10dB + 2.5dB + 0.5dB)
Margin = 10.0 dB (pass)

Milligauss to A/m Conversion (Magnetic Immunity)

1A/m = 12.57 mG
3A/m = 3*12.57 = 37.7 mG

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Applicable Standards, Specifications and Methods

ANSI C63.4:2014	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
2015 VVSG Volume I; Version 1.1	United States Election Assistance Commission – Voluntary Voting System Guidelines – Version 1.1 Volume I
2015 VVSG Volume II; Version 1.1	United States Election Assistance Commission – Voluntary Voting System Guidelines – Version 1.1 Volume II
CISPR 16-2-3:2010/A2:2014	Specification for Radio Disturbance and Immunity Measuring Apparatus and Methods - Part 2-3: Methods of Measurement of Disturbances and Immunity - Radiated Disturbance Measurements
IEC 61000-4-2:2008 EN 61000-4-2:2009	Testing and Measurement Techniques - Electrostatic Discharge Immunity Test
IEC/EN 61000-4-3:2006/ A2:2010	Testing and Measurement Techniques - Radiated, Radio-Frequency, Electromagnetic Field Immunity Test
IEC/EN 61000-4-4:2004	Testing and Measurement Techniques - Electrical Fast Transient/Burst Immunity Test
IEC 61000-4-5:2005 EN 61000-4-5:2006	Testing and Measurement Techniques - Surge Immunity Test
IEC 61000-4-6:2008 EN 61000-4-6:2009	Testing and Measurement Techniques - Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields
IEC 61000-4-8:2009 EN 61000-4-8:2010	Testing and Measurement Techniques - Power Frequency Magnetic Field Immunity Test
IEC/EN 61000-4-11:2004	Testing and Measurement Techniques - Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests
ISO 17025:2005	General Requirements for the Competence of Testing and Calibration Laboratories

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Document Revision Status

Revision	Date	Description
0	June 17, 2019	Initial release
-	-	-

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Definitions and Acronyms

The following definitions and acronyms are applicable in this report.
See also ANSI C63.14.

AM – Amplitude Modulation
CDN – Coupling Decoupling Network
EFT – Electrical Fast Transients
ESD – Electro-Static Discharge
HCP – Horizontal Coupling Plane
VCP – Vertical Coupling Plane
LISN – Line Impedance Stabilization Network
NCR – No Calibration Required
NSA – Normalized Site Attenuation
N/A – Not Applicable
RF – Radio Frequency

AE – Associated Equipment. Equipment needed to exercise and/or monitor the operation of the EUT.

Class A Device – A device that is marketed for use in a commercial, industrial or business environment. A 'Class A' device should not be marketed for use by the general public. A 'Class A' device should contain a warning notice in the user manual stating that it could cause radio interference. For example: "**Warning**: Operation of this equipment in a residential environment could cause radio interference."

Class B Device – A device that is marketed for use in a residential environment and may also be used in a commercial, business or industrial environments. NOTE: A residential environment is an environment where the use of broadcast radio and television receivers may be expected within a distance of 10m of the device concerned.

EMC – Electro-Magnetic Compatibility. The ability of an equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.

EMI – Electro-Magnetic Immunity. The ability to maintain a specified performance when the equipment is subjected to disturbance (unwanted) signals of specified levels.

EUT – Equipment Under Test. A device or system being evaluated for compliance that is representative of a product to be marketed.

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ITE – Information Technology Equipment. Has a primary function of entry, storage, display, retrieval, transmission, processing, switching, or control of data and/or telecommunication messages and which may be equipped with one or more ports typically for information transfer.

Antenna Port – Port, other than a broadcast receiver tuner port, for connection of an antenna used for intentional transmission and/or reception of radiated RF energy.

Broadcast Receiver Tuner Port – Port intended for the reception of a modulated RF signal carrying terrestrial, satellite and/or cable transmissions of audio and/or video broadcast and similar services.

Optical Fiber Port – Port at which an optical fiber is connected to an equipment.

Signal/Control Port – Port intended for the interconnection of components of a EUT, or between a EUT and local AE and used in accordance with relevant functional specifications (for example for the maximum length of cable connected to it).
(Examples include: RS-232, USB, HDMI, Fire Wire)

Wired Network Port – Point of connection for voice, data and signaling transfers intended to interconnect widely dispersed systems by direct connection to a single-user or multi-user communication network.
(Examples include: CATV, PSTN, ISDN, xDSL, LAN and similar networks)

EMC Test Plan – An EMC test plan established prior to testing. See 'Appendix A – EUT & Client Provided Details'.

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Testing Facility

Testing for EMC on the EUT was carried out at TÜV SÜD Canada testing lab near Toronto, Ontario. The testing lab has a calibrated 3m semi-anechoic chamber which allows measurements on a EUT that has a maximum width or length of up to 2m and a height of up to 3m. The chamber is equipped with a turntable that is capable of testing devices up to 3300lb in weight. This facility is capable of testing products that are rated for 120Vac and 240Vac single phase, or devices that are rated for a 208Vac 3 phase input. DC capability is also available for testing. The chamber is equipped with a mast that controls the polarization and height of the antenna. Control of the mast occurs in the control room adjoining the shielded chamber. Radiated emission measurements are performed using a BiLog antenna and a Horn antenna where applicable. Conducted emissions, unless otherwise stated, are performed using a LISN and using the Vertical Ground plane if applicable.

Calibrations and Accreditations

The 3m semi-anechoic chamber is registered with Federal Communications Commission (FCC, CA6844), Industry Canada (IC, 6844A-3) and Voluntary Control Council for Interference (VCCI, R-4023, G-506, C-4498, and T-1246). This chamber was calibrated for Normalized Site Attenuation (NSA) using test procedures outlined in ANSI C63.4 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The chamber is lined with ferrite tiles and absorption cones to minimize any undesired reflections. The NSA data is kept on file at TÜV SÜD Canada. For radiated susceptibility testing, a 16 point field calibration has been performed on the chamber. The field uniformity data is kept on file at TÜV SÜD Canada. TÜV SÜD Canada Inc. is accredited to ISO 17025 by A2LA with Testing Certificate #2955.02. The laboratory's current scope of accreditation listing can be found as listed on the A2LA website. All measuring equipment is calibrated on an annual or bi-annual basis as listed for each respective test.

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Testing Environmental Conditions and Dates

Following environmental conditions were recorded in the facility during time of testing:

Date	Test	Initials	Temperature (ºC)	Humidity (%)	Pressure (kPa)
June 3, 2019	Power Line Conducted Emissions	MM	21.9	33.4	101.8
June 3, 2019	Radiated Emissions	MM	21.9	33.4	101.8
June 5, 2019	Electrostatic Disruption	MM	23.9	40.8	101.6
June 3, 2019	Electromagnetic Susceptibility	MM	21.9	33.4	101.8
June 4, 2019	Electrical Fast Transient	MM	22.2	30.4	101.7
June 4, 2019	Lightning Surge	MM	22.2	30.4	101.7
June 3, 2019	Conducted RF Immunity	MM	21.9	33.4	101.8
June 4, 2019	Magnetic Fields Immunity	MM	22.2	30.4	101.7
June 4, 2019	Electrical Power Disturbance 4.1.2.5 a, b, c	MM	22.2	30.4	101.7
June 4, 2019	Electrical Power Disturbance 4.1.2.5 d	MM	22.2	30.4	101.7
June 5, 2019	Electrical Power Disturbance 4.1.2.5 e	MM	23.9	40.8	101.6

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Detailed Test Result Section

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Power Line Conducted Emissions – 4.1.2.9

Purpose

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT's power line does not exceed the limits listed below as defined in the applicable test standard and measured from a LISN. This helps protect lower frequency radio services such as AM radio, shortwave radio, amateur radio, maritime radio, CB radio, and so on, from unwanted interference.

Limits & Method

The method is as defined in ANSI C63.4. The limits are as defined in FCC Part 15 Section 15.107:

CLASS B

Average Limits		Quasi-Peak Limits	
150 kHz – 500 kHz	56 to 46* dBµV	150 kHz – 500 kHz	66 to 56* dBµV
500 kHz – 5 MHz	46 dBµV	500 kHz – 5 MHz	56 dBµV
5 MHz – 30 MHz	50 dBµV	5 MHz – 30 MHz	60 dBµV

* Decreases linearly with the logarithm of the frequency

Both Quasi-Peak and Average limits are applicable, and each is specified as being measured with a resolution bandwidth of 9 kHz. For Quasi-Peak, a video bandwidth at least three times greater than the resolution bandwidth is used.

Based on ANSI C63.4 Section 4.2, if the Peak or Quasi-Peak detector measurements do not exceed the Average limits, then the EUT is deemed to have passed the requirements.

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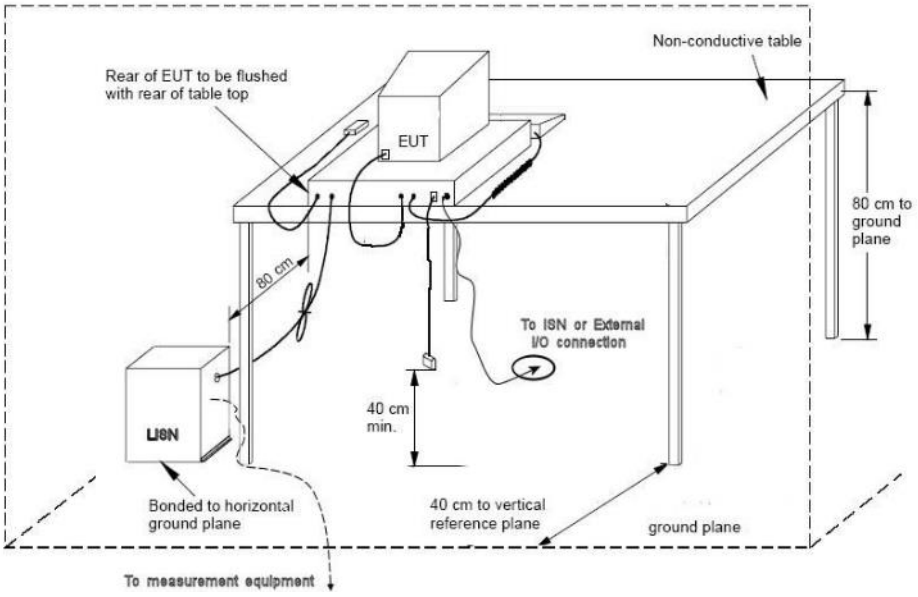
Typical Setup Diagram



Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is ±2.73dB with a 'k=2' coverage factor and a 95% confidence level.

Preliminary Graphs

The graphs shown below are maximized peak measurement graphs measured with a resolution bandwidth greater than or equal to the final required detector. This peaking process is done as a worst case measurement and enables the detection of frequencies of concern for final measurement. For final measurements with the appropriate detector, where applicable, please refer to the tables under Final Measurements.

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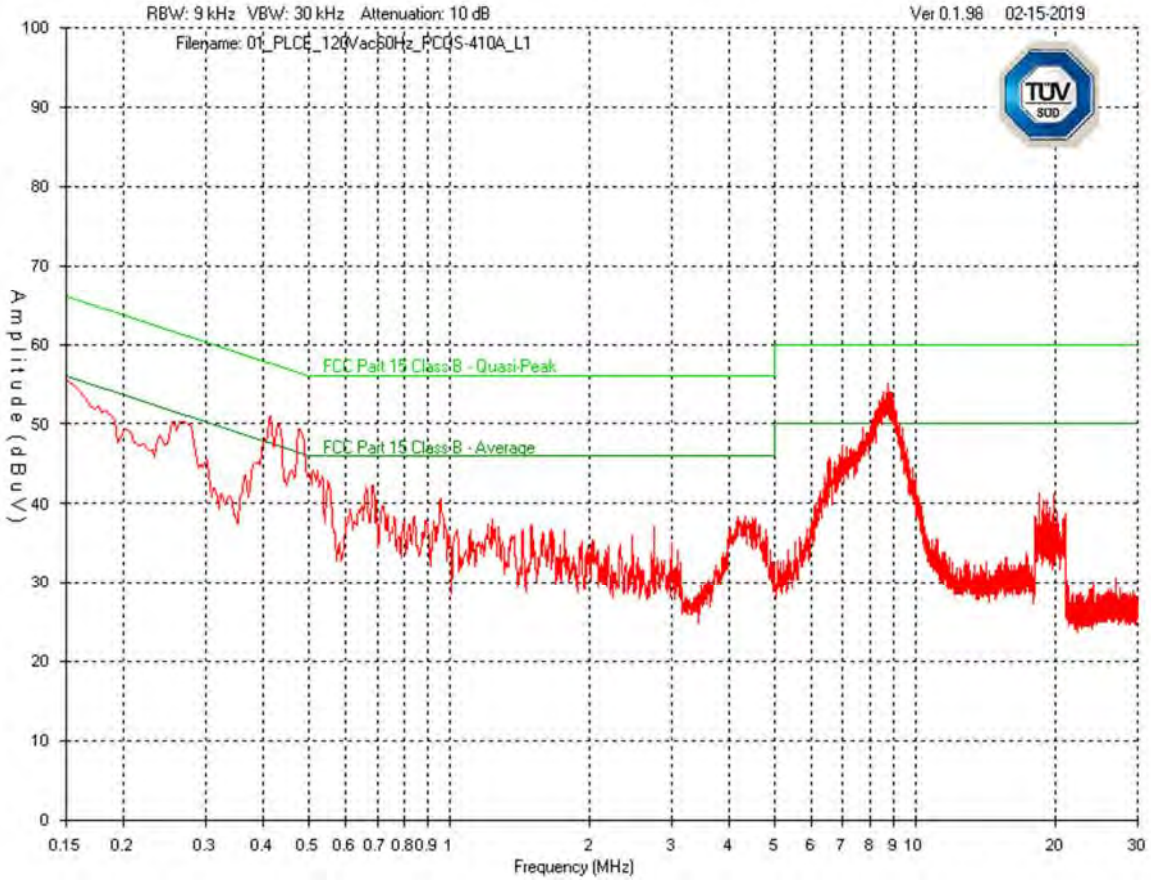

Line (L1) – 120Vac 60Hz

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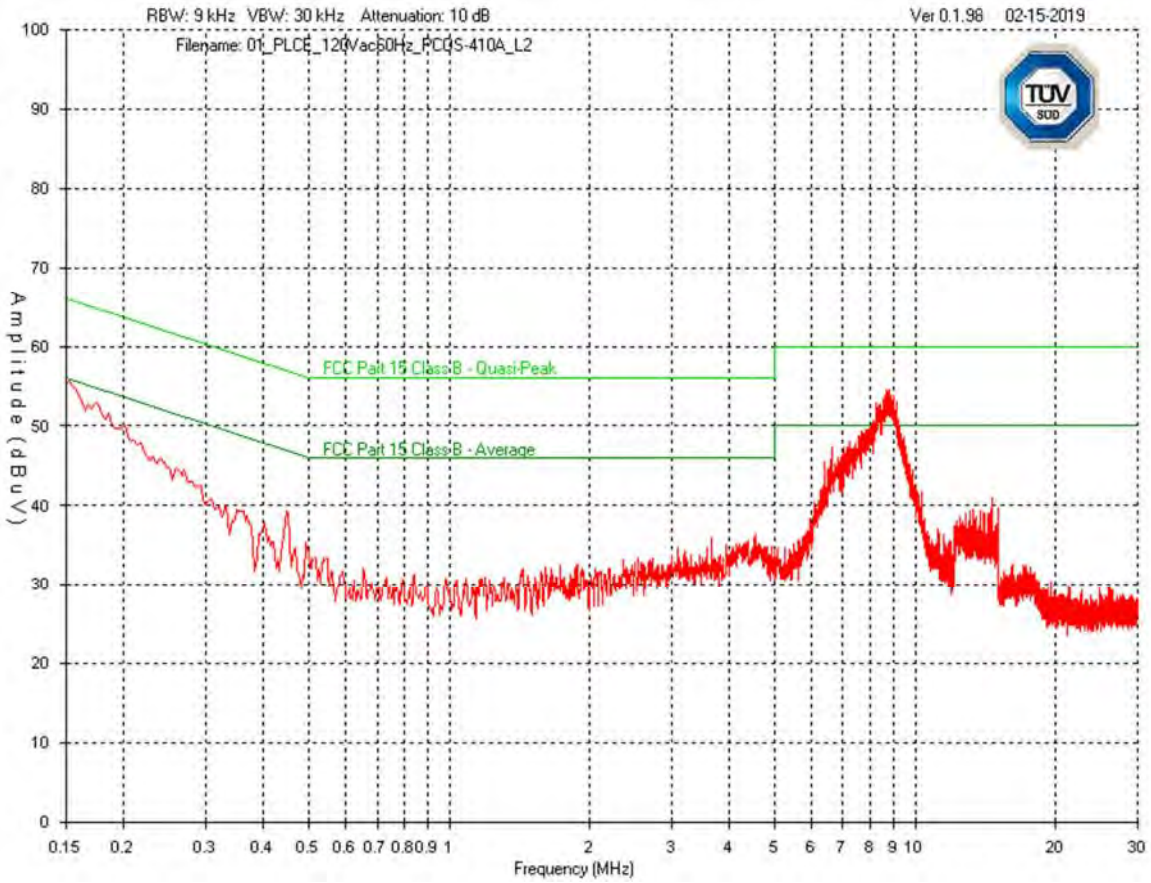

Neutral (L2) – 120Vac 60Hz

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Final Measurements

Product Category			Class B								
EUT			Image Cast Evolution								
Supply			**120Vac 60Hz**								
Frequency (MHz)	**Detector**	**Received Signal (dBµV)**	**Atten Factor (dB)**	**Cable Factor (dB)**	**LISN Factor (dB)**	**Level (dBµV)**	**QP Limit (dBµV)**	**AVG Limit (dBµV)**	**QP Margin (dB)**	**AVG Margin (dB)**	**Pass/ Fail**
Line											
8.744	QP	41.4	10	0.1	0.0	51.5	60.0	--	8.5	--	Pass
8.744	AVG	34.7	10	0.1	0.0	44.8	--	50.0	--	5.2	Pass
0.413	AVG	29.1	10	0.1	0.0	39.2	--	47.6	--	8.4	Pass
0.478	AVG	28.7	10	0.1	0.0	38.8	--	46.4	--	7.6	Pass
0.153	AVG	17.1	10	0.0	0.1	27.2	--	55.8	--	28.6	Pass
0.684	AVG	18.8	10	0.1	0.0	28.9	--	46.0	--	17.1	Pass
0.959	AVG	16.2	10	0.1	0.0	26.3	--	46.0	--	19.7	Pass
Neutral											
8.786	QP	39.3	10	0.1	0.0	49.4	60.0	--	10.6	--	Pass
8.786	AVG	31.8	10	0.1	0.0	41.9	--	50.0	--	8.1	Pass
0.153	AVG	16.4	10	0.0	0.1	26.5	--	55.8	--	29.3	Pass
0.449	PEAK	29.3	10	0.1	0.0	39.4	56.9	46.9	17.5	7.5	Pass
14.591	PEAK	30.8	10	0.1	0.1	41.0	60.0	50.0	19.0	9.0	Pass
3.663	PEAK	25.9	10	0.1	0.0	36.0	56.0	46.0	20.0	10.0	Pass

Average and Quasi-Peak Emissions Table

Note:
Peak = Peak measurement
AVG = Average measurement
QP = Quasi-Peak measurement

See 'Appendix B – EUT, Peripherals and Test Setup Photos' for photos showing the test set-up for the highest line conducted emission

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Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Spectrum Analyzer	ESL 6	Rohde & Schwarz	Dec. 27, 2017	Dec. 27, 2019	GEMC 160
LISN	FCC-LISN-50/250-16-2-01	FCC	Jan. 10, 2018	Jan. 10, 2020	GEMC 302
RF Cable 3m	LMR-400-3M-50Ω-MN-MN	LexTec	NCR	NCR	GEMC 276
Attenuator 10 dB	10-A-MFN-10	Bird/Hutton	NCR	NCR	GEMC 322
Emissions Software	0.1.98	TUV SUD Canada, Inc.	NCR	NCR	GEMC 58

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Radiated Emissions – 4.1.2.9

Purpose

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT does not exceed the limits listed below as defined in the applicable test standard and measured from a receiving antenna. This helps protect broadcast radio services such as television, FM radio, pagers, cellular telephones, emergency services, and so on, from unwanted interference.

Limit(s)

The method is as defined in ANSI C63.4:2014. The limits are as defined in FCC Part 15 Section 15.109:

CLASS B

FCC Part 15, Subpart B Limits - 30MHz – 1GHz

Frequency Range[a]	Quasi-Peak Limits - 3m[b]
30 MHz – 88 MHz	40 dBµV/m
88 MHz – 216 MHz	43.5 dBµV/m
216 MHz – 960 GHz	46 dBµV/m
960 MHz – 1 GHz	54 dBµV/m

Frequency Range[a]	Average Limit - 3m[c]	Peak Limit - 3m[d]
1 GHz and Up	54 dBµV/m	74 dBµV/m

[a]The frequency range scanned is in accordance to FCC Part 15 Section 15.33(b).
[b]Limit is with a resolution bandwidth of 120 kHz, a video bandwidth at least three times greater than the resolution bandwidth, and using a Quasi-Peak detector.
[c]Limit is with a resolution bandwidth of 1 MHz and using an Average detector.
[d]Limit is with a resolution bandwidth of 1 MHz, a video bandwidth at least three times greater than the resolution bandwidth, and using a Peak detector.

Based on ANSI C63.4 Section 4.2, if the Peak detector measurements do not exceed the Quasi-Peak limits, where defined, then the EUT is deemed to have passed the requirements.

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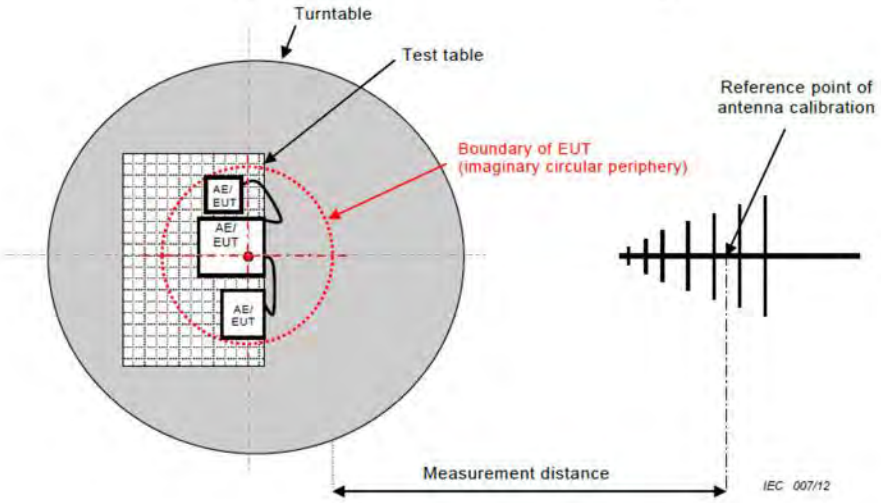
Typical Radiated Emissions Setup



Note: In accordance with FCC Part 15, section 15.31(f)(1), testing was performed at a 3 meter test distance and an extrapolation factor, if applicable, of 20 dB/decade was applied. For example, an extrapolation of 10m to 3m is 20log(10/3) = 10.5 dB.

Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is ±5.04dB for 30MHz – 1GHz and ±4.93dB for 1GHz – 18GHz with a 'k=2' coverage factor and a 95% confidence level.

Preliminary Graphs

The graphs shown below are maximized peak measurement graphs measured with a resolution bandwidth greater than or equal to the final required detector over a full 0-360°. This peaking process is done as a worst case measurement and enables the detection of frequencies of concern for final measurement. For final measurements with the appropriate detector, where applicable, please refer to the tables under Final Measurements.

In accordance with FCC Part 15, Subpart B, Section 15.33, the device was scanned to a minimum of a 1 GHz. For devices containing clocks higher than 108 MHz, they were scanned above 1 GHz to meet the requirements of FCC Part 15, Section 15.33.

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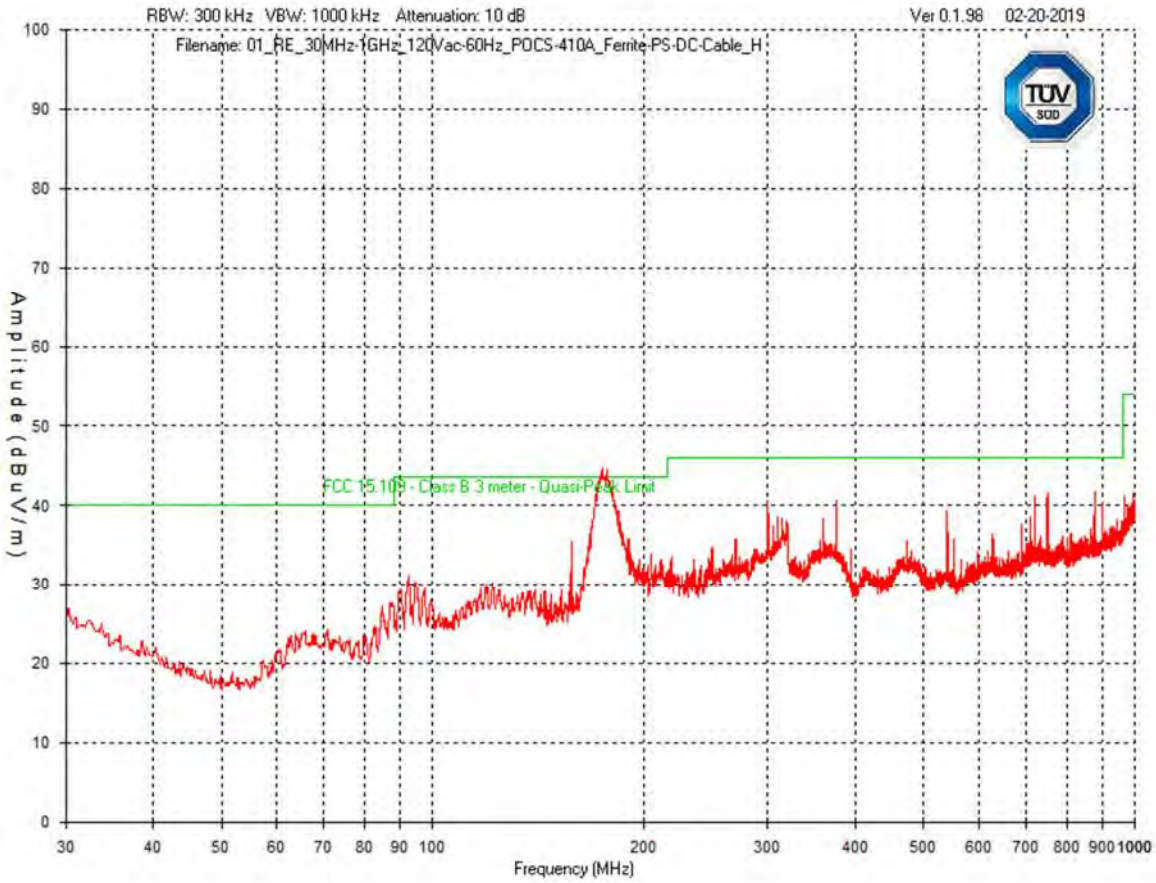

Horizontal – 120Vac 60Hz – 30MHz - 1GHz

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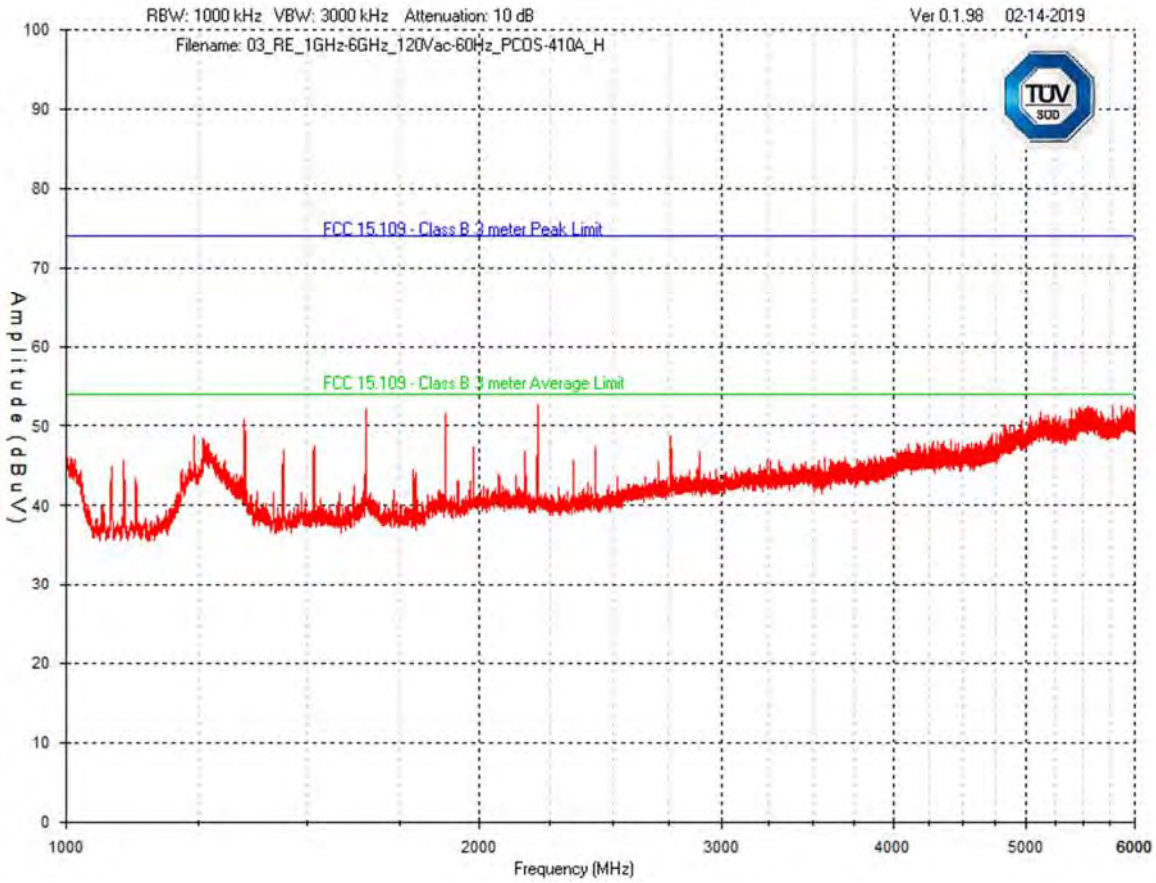

Horizontal – 120Vac 60Hz – 1GHz - 6GHz

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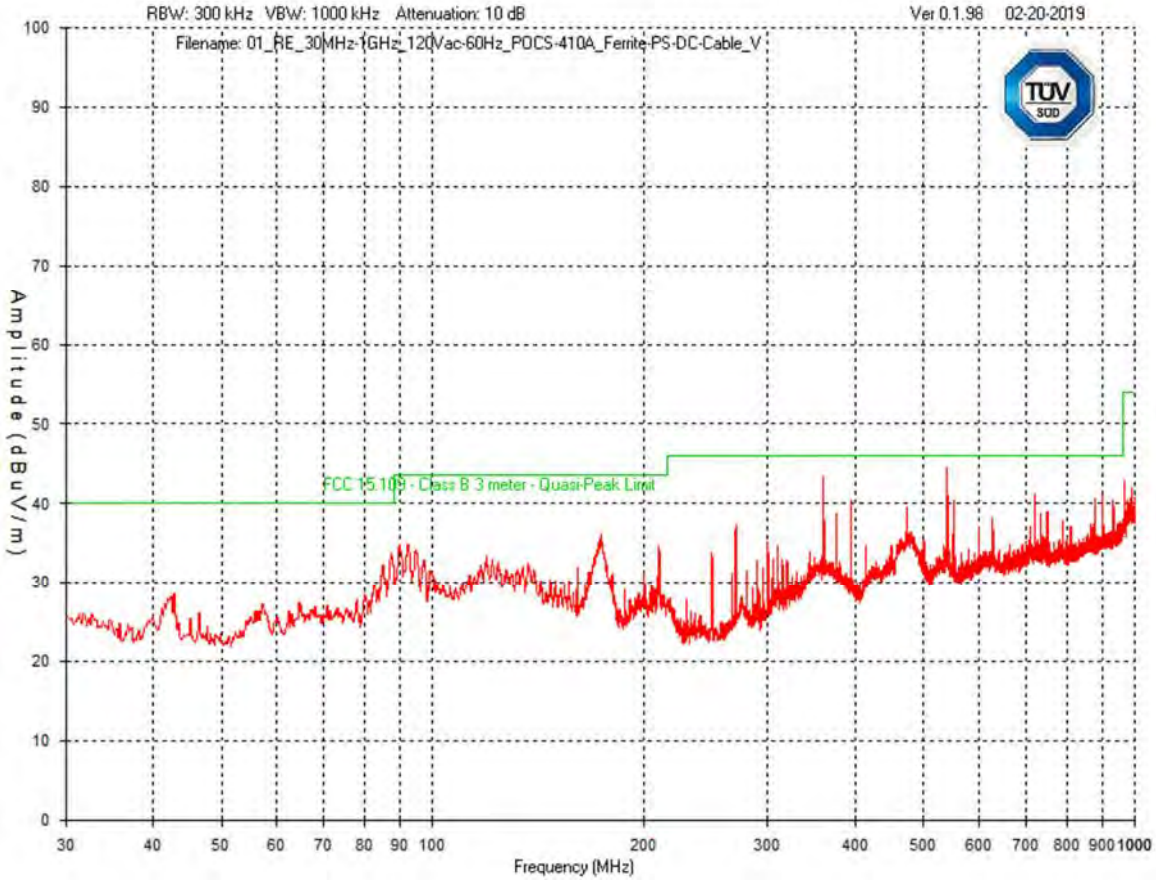

Vertical – 120Vac 60Hz – 30MHz - 1GHz

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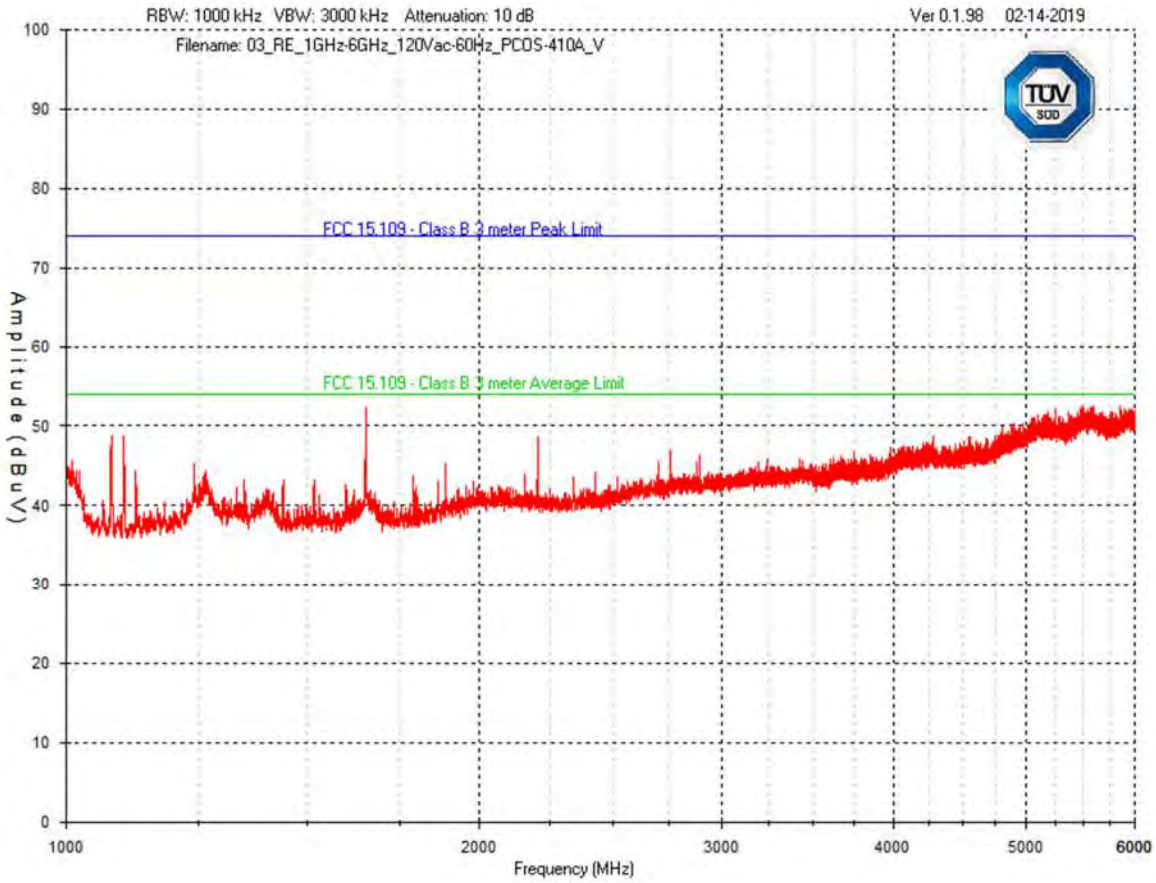

Vertical – 120Vac 60Hz – 1GHz - 6GHz

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Final Measurements

The worst case measurement as listed in the table below appeared at a horizontal antenna height of 115 cm and a table azimuth of 210 degrees, as pictured in Appendix B.

Product Category			Class B							
Supply			**120Vac 60Hz**							
Frequency (MHz)	**Detector**	**Received Signal (dBµV)**	**Antenna Factor (dB/m)**	**Atten Factor (dB)**	**Cable Factor (dB)**	**Pre-Amp (dB)**	**Level (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dB)**	**Pass/ Fail**
Horizontal Antenna Polarization										
174.43	QP	51.1	9.6	6	0.8	-33.7	33.8	43.5	9.7	Pass
875.26	QP	42.7	23.0	6	2.2	-32.5	41.4	46.0	4.6	Pass
750.03	QP	42.9	22.0	6	2.1	-33.0	40.0	46.0	6.0	Pass
720.16	QP	41.8	22.1	6	2.0	-33.1	38.8	46.0	7.2	Pass
375.13	QP	49.9	16.3	6	1.3	-33.5	40.0	46.0	6.0	Pass
300.05	QP	47.3	12.8	6	1.2	-33.6	33.7	46.0	12.3	Pass
2205.58	AVG	47.4	28.4	0	3.4	-34.2	45.0	54.0	9.0	Pass
1653.78	AVG	56.5	25.8	0	2.9	-34.8	50.4	54.0	3.6	Pass
1890.27	AVG	50.6	27.2	0	3.0	-34.4	46.4	54.0	7.6	Pass
1350.04	AVG	51.9	25.5	0	2.6	-35.1	44.9	54.0	9.1	Pass
1241.18	AVG	42.0	25.2	0	2.5	-35.6	34.1	54.0	19.9	Pass
2756.76	AVG	43.0	29.6	0	3.8	-33.4	43.0	54.0	11.0	Pass
Vertical										
540.03	QP	45.8	19.7	6	1.6	-33.3	39.8	46.0	6.2	Pass
360.09	QP	47.6	15.9	6	1.2	-33.5	37.2	46.0	8.8	Pass
719.86	QP	28.2	22.1	6	2.0	-33.1	25.2	46.0	20.8	Pass
900.38	QP	32.5	23.7	6	2.2	-32.4	32.0	46.0	14.0	Pass
875.36	QP	38.7	23.0	6	2.2	-32.5	37.4	46.0	8.6	Pass
393.85	QP	49.2	16.3	6	1.4	-33.5	39.4	46.0	6.6	Pass
551.18	QP	44.1	19.4	6	1.6	-33.3	37.8	46.0	8.2	Pass
1653.47	AVG	51.7	25.8	0	2.9	-34.8	45.6	54.0	8.4	Pass
1079.77	AVG	49.9	24.6	0	2.7	-36.2	41.0	54.0	13.0	Pass
1102.92	AVG	48.8	24.7	0	2.7	-36.1	40.1	54.0	13.9	Pass
2205.89	AVG	37.1	28.4	0	3.4	-34.2	34.7	54.0	19.3	Pass

Quasi-Peak and Average Emissions Table

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Note:
Peak = Peak measurement
QP = Quasi-Peak measurement
AVG = Average measurement

See 'Appendix B – EUT, Peripherals, and Test Setup Photos' for photos showing the test set-up for the highest radiated emission.

Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Spectrum Analyzer	ESU 40	Rohde & Schwarz	Jan. 12, 2018	Jan. 12, 2020	GEMC 233
BiLog Antenna	3142-C	ETS	Oct. 19, 2018	Oct. 19, 2020	GEMC 137
Horn Antenna 1 – 18 GHz	AH-118	Com-Power Corporation	July 12, 2017	July 12, 2019	GEMC 214
Attenuator 6 dB	612-6-1	Meca Electronics, Inc	NCR	NCR	GEMC 286
Pre-Amp	LNA-1450	RF Bay Inc.	Oct. 18, 2018	Oct. 11, 2020	GEMC 221
Pre-Amp 1 – 26.5 GHz	HP 8449B	HP	Nov. 15, 2017	Nov. 15, 2019	GEMC 189
RF Cable 10m	LMR-400-10M-50Ω-MN-MN	LexTec	NCR	NCR	GEMC 274
RF Cable 2m	Sucoflex 104A	Huber+Suhner	NCR	NCR	GEMC 271
Emissions Software	0.1.98	TUV SUD Canada, Inc.	NCR	NCR	GEMC 58

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Electrical Power Disturbance – 4.1.2.5

Purpose

An AC powered device may be subjected to voltage dips, short interruptions or other voltage variations in the power line. Such conditions are mainly caused by faults or changes in the network due to sudden large changes in load, or when a brown out or a black out condition occurs. These voltage dips can also occur with power supplies that are not well regulated such as emergency diesel AC generators. This test simulates the occurrence of these conditions and subjects the EUT to this phenomenon.

Application Level Requirements

This test is performed in accordance with the methodology defined in IEC 61000-4-11. As per VVSG 1.0 (2005) Vol. 1, the following dip and interruption levels apply:

Voltage Dip Level	Duration	Duration @ 60Hz [Cycles]
30% (36 Vac)	0.01s	0.6
60% (72 Vac)	0.1s / 1.0s	6 / 60
100% (120 Vac)	0.5	300

Voltage Surge Level	Duration	Duration @ 60Hz [Cycles]
85% (102 Vac)	4 hours	14400
115% (138 Vac)	4 hours	14400

Surges of +15% line variations of nominal line voltage and electrical power increases of 7.5% and reductions of 12.5% of nominal specified power supply for a period of up to four hours at each level.

The voltage level in brackets is the residual voltage of the voltage dip applied and presumes a normal operating voltage of 120 Vac and a frequency of 60Hz.

The test is carried out at phase angles of 0º, 90º, and 270º of the AC with 5 repetitions applied at each of the dips and interrupts listed in the table above.

No disruption of normal operation or loss of data is applied to this test.

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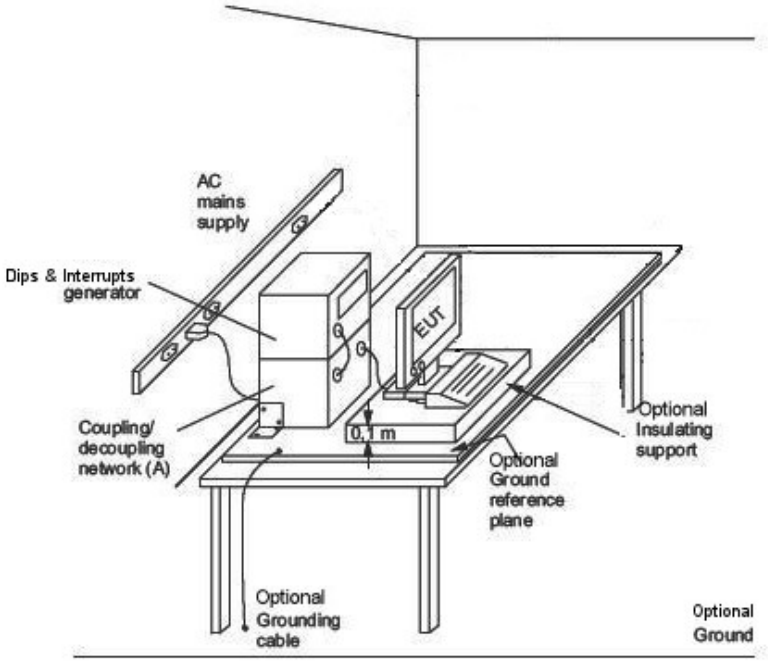
Typical Test Setup



Application Level Accuracy

As per IEC 61000-4-11, the voltage must be ±5% of the voltage stated to be applied. The frequency must be kept within ±2% of the stated frequency.

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Test Results

The EUTs passed the requirements. The EUTs met the criteria's listed above in the application level requirements.

No anomalies were observed for the surges and no disruption to operation or data loss occurred.

Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Immunity Generator	EMC Pro Plus	Keytek Thermo Corp.	Feb. 6, 2019	Feb. 6, 2021	GEMC 188
Immunity Software	CEWare 32 V4.1	Thermo Fisher Scientific	NCR	NCR	GEMC 182
Variac	PWRSTA 3PN126	Powerstat	NCR	NCR	GEMC 6032
Digital Multi-Meter	73 III	Fluke	Jul. 13, 2018	Jul. 13, 2019	CANE00016
Stopwatch	14-649-11	Fisherbrand	Jul. 6, 2019	Jul. 6, 2020	CANE00221

IEC61000-4-11_DipsImmunity-C24_Rev3

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Electrical Fast Transients / Bursts – 4.1.2.6

Purpose

Electrical Fast Transients is a series of bursts consisting of a number of fast transients, which in a typical application environment, can be coupled into the supply and onto the I/O lines of the EUT. These transient signals usually arise from nearby switching circuitry such as a light switch, relay bounces, electric motor noise, interruption of inductive loads, etc. This test is to verify that the EUT is immune to such transient disturbances based on the applicable test levels. This test, however, does not guarantee that the EUT will not experience higher level burst impulses during its operation, which may cause the EUT to fail.

Application Level Requirement

This test is performed in accordance with the methodology defined in IEC 61000-4-4. The voltage waveform applied has the following characteristics:

- Pulse rise time: 5ns ± 30%
- Pulse duration (to 50% value): 50ns ± 30%
- Pulse repetition frequency 100kHz
- Burst duration should be 15ms ± 20%
- Burst period should be 300ms ± 20%

Bursts are applied for 1 minute each at the positive and the negative polarity to the mains power input (common mode) and to each applicable I/O line.

A test level of ±2kV is applied to the power supply port(s) via a coupling and decoupling network and ±1kV to each applicable I/O line via a Capacitive Coupling Clamp. No disruption of normal operation or loss of data is to occur during the performance of this test.

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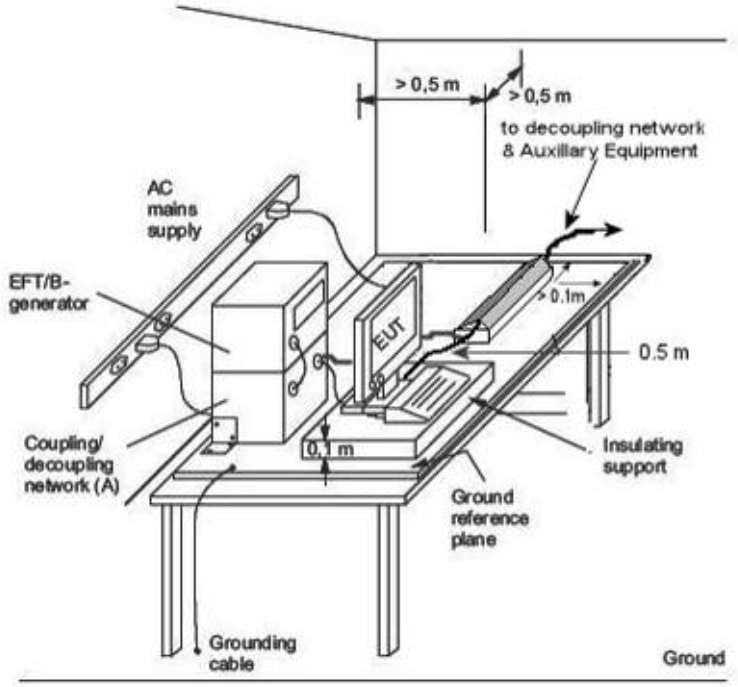
Typical Test Setup



Application Level Accuracy

As per IEC 61000-4-4, the test level is specified as being within ±10% into a 50Ω load and ±20% into a 1000Ω load.

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Test Results

The EUT passed the requirements. The EUT met Criteria B as defined in "Appendix A – EUT & Client Provided Details". No anomalies were observed.

Test Voltage	Repetition Rate	Coupling Lines	Result
±2kV	100kHz	L – N – PE	Pass

Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Immunity Generator	NSG 3060	Teseq	Aug 20, 2018	Aug 20, 2020	GEMC 317
Coupling/ Decoupling Network	CDN 3061	Teseq	Aug 20, 2018	Aug 20, 2020	GEMC 318
Immunity Software	WIN 3000 V1.5.1	Teseq	NCR	NCR	GEMC 320

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Lightning Surge – 4.1.2.7

Purpose

Surge occurs when a high energy disturbance takes place on the power lines, or less frequently, I/O lines and can cause significant temporary increase in current and/or voltage. These disturbances can arise during a nearby lightning strike, circuit trips, short-circuits on the same power line that the equipment is connected to, etc. The sudden rise in voltage over a very short period of time could cause damage to the components of the EUT and this test assesses the immunity of the EUT to such transient waves. This test differs from Electrical Fast Transients / Bursts in that this waveform, characterized by the rapid increase of current and/or voltage followed by a slower decrease, has a longer wave duration that could allow damage to the EUT. This test does not guarantee that the EUT will not be exposed to a higher level of surge energy during its operation, which may cause the EUT to fail. This test also does not ensure operation of the EUT in the presence of direct lightning effects.

Application Level Requirement

This test is performed in accordance with the methodology defined in IEC 61000-4-5. Surges are simulated using a waveform generator and the characteristics of the waveform generated are as follows:

- Rise time of 1.2µs and wave duration of 50µs (to 50% value) into an open circuit.
- Rise time of 8µs and wave duration of 20µs (to 50% value) into a short circuit.
- Dwell time of 60 seconds between each surge.
- 5 surges in the positive and 5 surges in the negative polarity.
- For AC systems, the surge pulses are applied at 0º, 90º, 180º and 270º.
- For AC systems, Line to Ground is performed at the same amount as the Line to Line voltage.

For AC mains supply, a test level of ±2kV Line to Line and ±2kV Line to Ground is applied to the power supply port(s) via a coupling and decoupling network. Lower test levels are evaluated first before applying the required test level. No disruption of normal operation or data loss is allowed as applied to this test.

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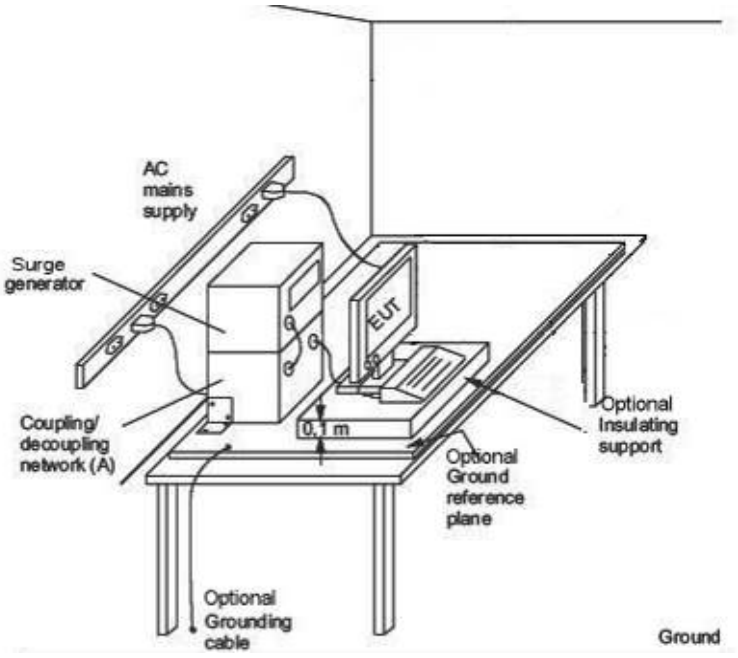
Typical Test Setup



Application Level Accuracy

As per IEC 61000-4-5, the level is specified as being within ±10% for open circuit voltage calibration or ±10% for short circuit current calibration. The EUTs input impedance, or whether Line – PE or Line – Line is being performed, combined with the calibrated generators output impedance, will affect the timing and voltage/current of the waveform applied to the EUT.

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Test Results

The EUT passed the requirements. The EUT did not encounter any deviation from normal operation or data loss.

Test Voltages	Phase Angles	Number of Surges	Coupling Lines	Result
±0.5kV, ±1kV, ±2kV	0°, 90°, 180°, 270°	5 per polarity	L – PE	Pass
±0.5kV, ±1kV, ±2kV	0°, 90°, 180°, 270	5 per polarity	N – PE	Pass
±0.5kV, ±1kV, ±2kV	0°, 90°, 180°, 270°	5 per polarity	L – N	Pass

Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Immunity Generator	NSG 3060	Teseq	Aug 20, 2018	Aug 20, 2020	GEMC 317
Coupling/ Decoupling Network	CDN 3061	Teseq	Aug 20, 2018	Aug 20, 2020	GEMC 318
Immunity Software	WIN 3000 V1.5.1	Teseq	NCR	NCR	GEMC 320

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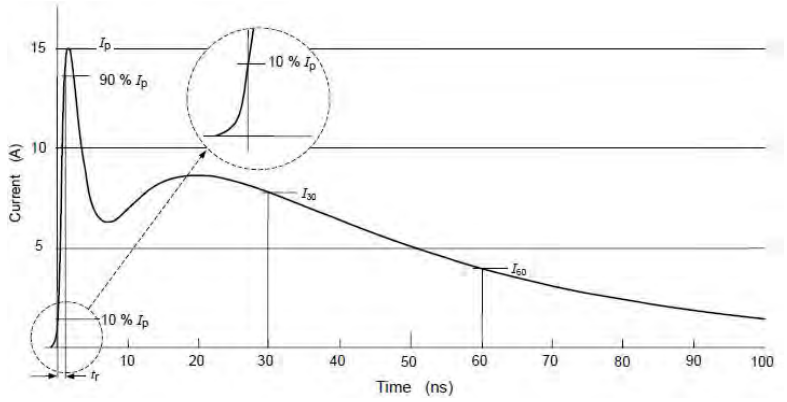
Electrostatic Disruption – 4.1.2.8

Purpose

The purpose of this immunity test is to apply a static electricity discharge from the operator to the EUT or create a nearby discharge field. An example of this discharge can be seen in low humidity conditions when a person touches an object and creates a small spark. This spark could potentially be harmful to the operation of the EUT. The contact method, with related reduced voltages, has been shown to be roughly equivalent to air discharges in severity and due to its reproducibility, contact is the preferred test method. Air discharge is used where contact discharge cannot be applied since the discharge point is significantly insulated and the insulation cannot be easily broken through. This test ensures a minimum level of immunity which is likely to occur in a normal usage environment. This test does not guarantee that the EUT will not be exposed to higher discharge levels which could cause it to fail.

Application Level Requirement

This test is performed in accordance with the methodology defined in IEC 61000-4-2. Ten hits in the positive and negative polarity are applied at each defined discharge point on the EUT. These are called direct discharges, regardless of contact or air being applied. Horizontal Coupling Plane (HCP) and Vertical Coupling Plane (VCP) discharges are also applied and these are called indirect discharges. A typical test setup representation is shown on the following page. A photograph of the actual test setup is shown in Appendix B. See the results table under Test Results for the actual EUT discharge points.



A level of ±8kV contact or ±15kV air, where applicable, is applied to each defined discharge point. For air discharge testing, the test is applied at the lower test levels first. No disruption to normal operation or loss of data is applied to this test. However, all anomalies, if any, are noted.

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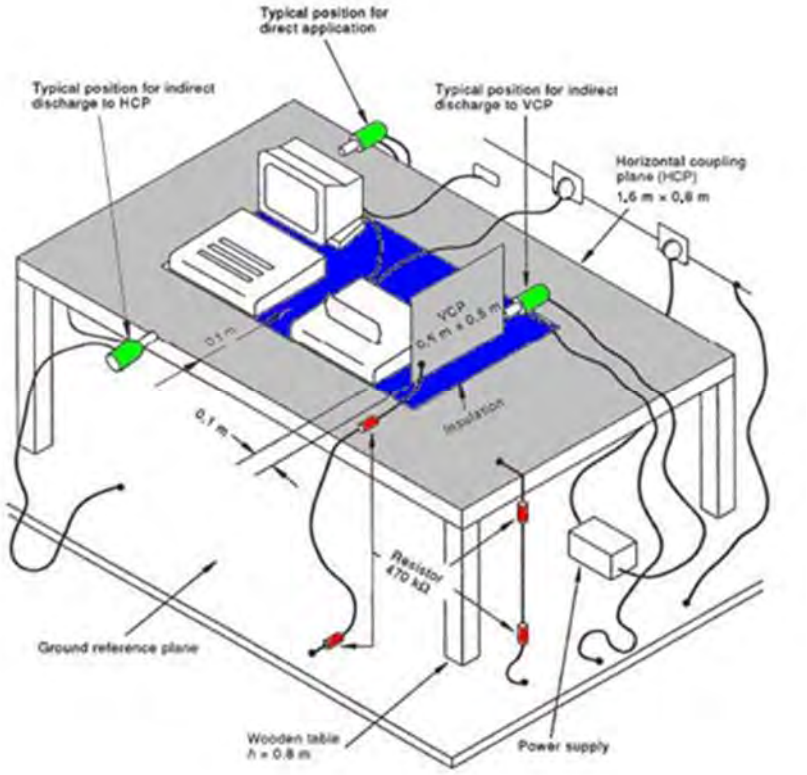
Typical ESD Setup



Application Level Accuracy

Contact discharge: ±15% for the first peak current, ±5% for the output voltage and ±25% for the rise time as measured at the discharge electrode tip of ESD generator.

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Test Results

The EUTs passed the requirements. The EUTs encountered no disruption of normal operation and no loss of data. No anomalies were observed.

Location	Test Voltage	Discharge Type	Pass / Fail
1. HCP	±2kV, ±4kV, ±8kV	Contact	Pass
2. VCP	±2kV, ±4kV, ±8kV	Contact	Pass
3. Front enclosure screw – left	±2kV, ±4kV, ±8kV	Contact	Pass
4. Front enclosure screw – right	±2kV, ±4kV, ±8kV	Contact	Pass
5. Front security tab – left	±2kV, ±4kV, ±8kV	Contact	Pass
6. Front security tab – right	±2kV, ±4kV, ±8kV	Contact	Pass
7. Security FOB outer shell	±2kV, ±4kV, ±8kV	Contact	Pass
8. Enclosure – ballot entry seam	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass (No Discharge)
9. Enclosure button – Cast	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass (No Discharge)
10. Enclosure button – Return	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass (No Discharge)
11. Enclosure – top upper left	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass (No Discharge)
12. Enclosure – top upper right	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass (No Discharge)
13. Enclosure – top upper center	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass (No Discharge)
14. AC Power supply enclosure – top	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass (No Discharge)
15. AC Power supply enclosure – back	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass (No Discharge)
16. AC Power supply enclosure – seam	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass
17. AC Power supply enclosure – LED	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass
18. AC Power supply – cable	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass (No Discharge)
19. DC power cable – entry	±2kV, ±4kV, ±8kV, ±15kV	Air	Pass

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Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
ESD Simulator	NSG 437	Teseq	Dec. 20, 2018	Dec. 20, 2020	GEMC 130
ESD HCP	80CM x 160CM	TUV SUD Canada, Inc	NCR	NCR	GEMC 50
ESD VCP	50CM x 50CM	TUV SUD Canada, Inc	NCR	NCR	GEMC 51
ESD 470K A	2x470kΩ 100CM	TUV SUD Canada, Inc	NCR	NCR	GEMC 52
ESD 470K B	2x470kΩ 100CM	TUV SUD Canada, Inc	NCR	NCR	GEMC 53

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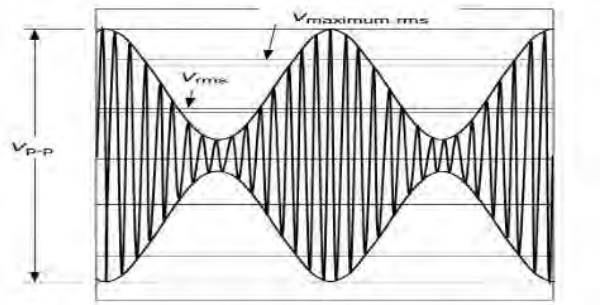
Electromagnetic Susceptibility – 4.1.2.10

Purpose

The EUT will likely be exposed to intentional sources of electromagnetic radiation during its regular application. Sources of such radiation can be cellular phones, FM radio, television, remote car alarms, garage door openers, and other broadcast transmissions. These sources of radiation are licensed or certified for broadcast and therefore, the EUT should be immune to their RF energy. This test assesses the immunity of the EUT to the applicable field strength test level. This test, however, does not guarantee that the EUT will not be exposed to higher level fields during its operation, which may cause it to fail.

Application Level Requirement

This test is performed in accordance with the methodology defined in IEC 61000-4-3. The immunity test is performed over the frequency range of 80MHz to 1.0GHz. As the frequency range is swept incrementally, the step size used is calculated at 1% of the preceding frequency value, rounded down to the nearest kHz. Known clock frequencies, local oscillators, etc. are analyzed separately, where applicable, and these are defined in "Appendix A – EUT & Client Provided Details". The field uniformity is calibrated at 10V/m and a modulation of 80% AM 1kHz sine wave is applied during the application of the RF energy at each frequency.



The RF field is applied in both horizontal and vertical antenna polarization and four sides of the EUT are subjected to this RF field. The dwell time used for each frequency is 3 seconds. Forward power is monitored and records are kept on file at TUV SUD Canada Inc. An isotropic field probe is also placed in near proximity of the EUT to verify the application of the RF field. Performance Criteria level A as defined in "Appendix A – EUT & Client Provided Details" is applied to this test.

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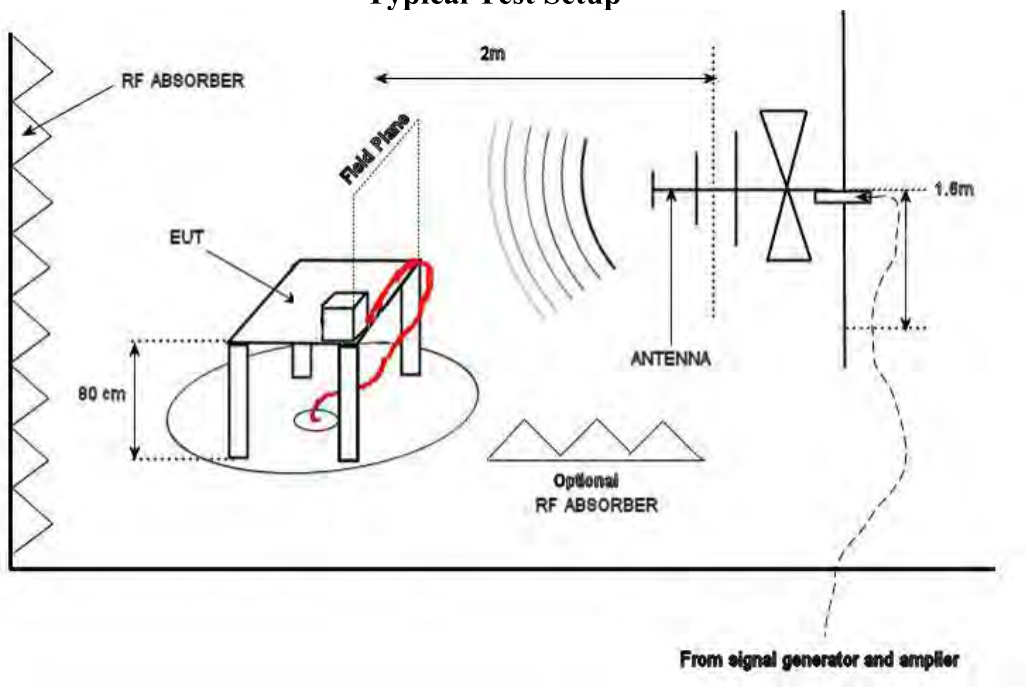
Typical Test Setup



Application Level Accuracy

As per IEC 61000-4-3, the RF field is specified as 0dB to +6dB for at least 12 of the 16 calibration points. For a 10 V/m field, this allows for the EUT to be subjected to a field of 10 V/m to 20 V/m with at least 75% coverage at this level.

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Test Results

The EUTs encountered no disruption of normal operation or data loss. No other anomalies were observed.

Input Voltage and Frequency	120Vac, 60Hz
Frequency Range and Field Strength	80MHz – 1GHz 10V/m (80% AM)
Sweep Step	1% of Fundamental
Dwell Time	3 sec.
Result	**Pass**

Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Signal Generator	SMHU	Rohde & Schwarz	Mar. 06, 2019	Mar. 06, 2021	GEMC 155
BiLog Antenna	3142-C	ETS	Oct. 19, 2018	Oct. 19, 2020	GEMC 8
Power Amplifier	150W1000	AR	NCR	NCR	GEMC 179
Electric Field Probe Kit	EP 601	Narda S.T.S	Oct. 10, 2018	Oct. 10, 2020	GEMC 304
Immunity Software	V224	TUV SUD Canada, Inc.	NCR	NCR	GEMC 57

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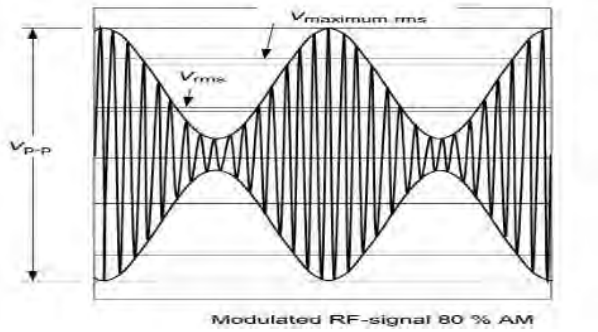
Conducted RF Immunity – 4.1.2.11

Purpose

The EUT will likely be exposed, in some way, to low frequency intentional sources of RF energy during its regular application. Sources of such radiations can be AM radio, shortwave radio, CB transmissions, and other low frequency broadcast transmissions. These sources of radiations are licensed or certified for broadcast and therefore, the EUT should be immune to their RF energy. Due to the properties of radio, the power or I/O lines on the EUT would likely be the passive receiving antenna that induces the disturbance to the EUT. Since this is the main method of coupling at this frequency range, the direct application of the RF energy to the line being tested is used. At this frequency range and level, this method is easier to produce and reproduce in a laboratory environment than subjecting the EUT to an equivalent RF field.

Application Level Requirement

This test is performed in accordance with the methodology defined in IEC 61000-4-6. I/O cables are tested using a bulk current injection probe and power lines are tested using a coupling and decoupling network. The immunity test is performed over the frequency range of 150kHz to 80MHz. As the frequency range is swept incrementally, the step size used is calculated at 1% of the preceding frequency value, rounded down to the nearest kHz. Known clock frequencies, local oscillators, etc. are analyzed separately, where applicable, and these are defined in "Appendix A – EUT & Client Provided Details". The test level is calibrated at 10Vrms and a modulation of 80% AM 1kHz sine wave is applied during the application of the RF energy at each frequency.



The dwell time used for each frequency is 3 seconds. A current probe is placed between the coupling device and the EUT to verify the application of the RF energy. No disruption to normal operation or data loss allowed is applied to this test.

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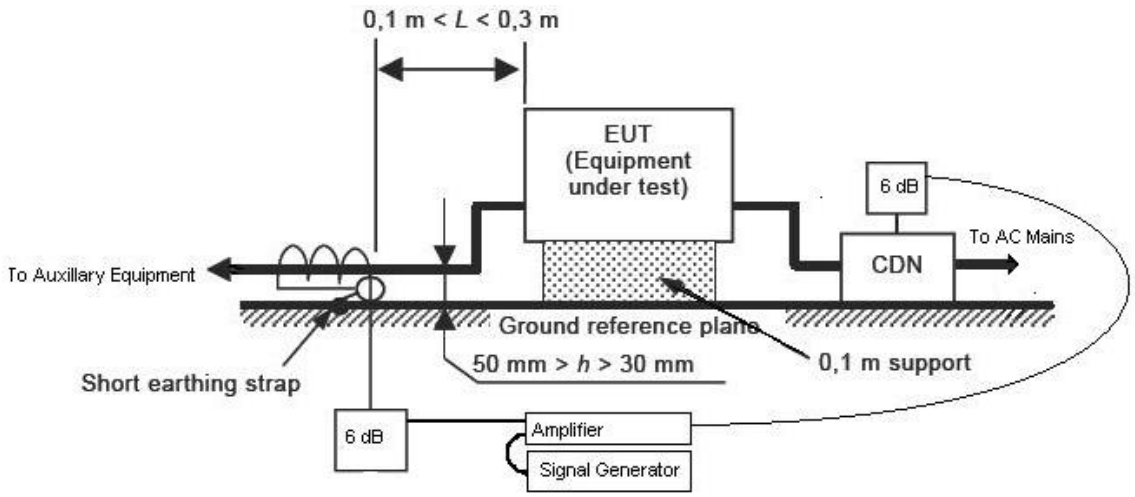
Typical Test Setup



Application Level Accuracy

As per IEC 61000-4-6, the CDN must meet a common mode impedance $|Z_{CE}| = 150\Omega \pm 20\Omega$ for 150kHz to 26MHz and $|Z_{CE}| = 150\Omega + 60\Omega$ or $150\Omega - 45\Omega$ for 26MHz to 80MHz. During tests using the bulk current injection probe, the impedance of each cable will affect the current injected and therefore, current was monitored. The calibration is performed according to IEC 61000-4-6 which allows for ±2dB.

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Test Results

The EUTs passed the requirements. The EUTs met Criteria A as defined in "Appendix A – EUT & Client Provided Details". No anomalies were observed.

Input Voltage and Frequency	120Vac 60Hz
Frequency Range and Signal Strength	150kHz - 80MHz 10Vrms (80% AM)
Sweep Step	1% of Fundamental
Dwell Time	3 sec.
AC Mains	Pass
Result	**Pass**

Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Power Line CDN	FCC-801-M3-16A	FCC	Feb. 23, 2018	Feb. 23, 2020	GEMC 138
Power Amplifier	75A250A	AR	NCR	NCR	GEMC 14
Signal Generator	SMY01	Rohde & Schwarz	Feb. 21, 2018	Feb. 21, 2020	GEMC 6330
Power Attenuator 6dB	100-A-FFN-06	Bird	NCR	NCR	GEMC 48
Immunity Software	V223	TUV SUD Canada, Inc	NCR	NCR	GEMC 57

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Magnetic Fields Immunity – 4.1.2.12

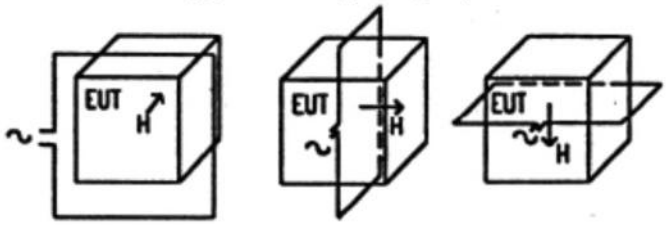
Purpose

A magnetic field with the frequency of the power line is generated around the EUT. In practice, the EUT will be subjected to power frequency magnetic fields from nearby power lines, transformers, or devices such as televisions or monitors. Since the EUT is usually used in conjunction with other electrical equipment, it is subjected to the steady state magnetic fields. These are magnetic fields that the device is exposed to under normal operating conditions. These fields have lower field strengths compared to typical transient magnetic fields.

Application Level Requirement

This test is performed in accordance with the methodology defined in IEC 61000-4-8. Three orthogonal axis of the EUT are subjected to the field within the magnetic loop. The transient magnetic field, if applicable, is tested for 1 minute while the steady state magnetic field is tested for 15 minutes. The frequency applied is 60 Hz. A magnetic field strength of 30 A/m is applied to the EUT in each orthogonal axis. No disruption to normal operation or loss of data is applied to this test.

Typical Setup Diagram



Application Level Accuracy

As per IEC 61000-4-8, the field over the area that the EUT occupies within the loop must be calibrated to be within ±3dB. For a field strength of 3 A/m, this means that the empty calibrated field strength can be between 2.1 A/m and 4.2 A/m over the area that the EUT occupies.

Test Results

The EUT passed the requirements. The EUT did not encounter any disruption of normal operation or loss of data. No anomalies were observed.

When a 60 Hz field was applied, the EUTs were powered at 120 Vac 60 Hz, battery mode and the field strength at 30 A/m.

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Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Magnetic Loop	F-1000-4-8/9/10-L-1M	FCC	NCR	NCR	GEMC 22
AC Current Source	AVU-5-30-AV-01	Criterian Instruments Ltd	Jan. 3, 2019	Jan. 3, 2020	CANE00003
Clamp Meter	365	Fluke	Nov. 19, 2018	Nov. 19, 2019	GEMC 260
Milligauss Meter	4180	F W Bell	Oct. 10, 2018	Oct. 10, 2020	GEMC 74

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Appendix A – EUT & Client Provided Details

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General EUT Description

Client Details	
Organization / Address	Pro V&V 700 Boulevard South Huntsville, Al. 35803
Contact	Michael L. Walker
Phone	256-713-1111
Email	michael.walker@provandv.com
Manufacturer Details (if not same as above)	
Organization / Address	Dominion Voting Systems/215 Spadina Ave, Toronto, ON M5T 2C7
Contact	Aamer Chaudhry
Phone	416.762.8683 x 227
Email	aamer.chaudhry@dominionvoting.com
EUT (Equipment Under Test) Details	
EUT Name	ICP2 V1
EUT Model / SN	PCOS-330A
Software version	5.5.1.8
Equipment category	Voting Machines
EUT is powered using	AC 120VAC and back-up battery
If mains powered, how many plugs?	1 No
Input voltage range(s) (V)	100 ~ 240VAC
Frequency range(s) (Hz)	50 ~ 60Hz
Rated input current (A)	1.5 A
Nominal power consumption (W)	70 W
Number of power supplies in EUT	1
Transmits RF energy? (describe)	No
Basic EUT functionality description	Voting Machine
Modes of operation	AC and battery mode
Step by step instructions for setup and operation	Customer setup
Customer to setup EUT on site?	Yes
EUT response time (ms)	N/A
EUT setup time (min)	5 min

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Frequency of all clocks present in EUT	Highest clock 536 MHz
I/O cable description Specify length and type	No I/O lines to be tested
Available connectors on EUT	Audio Output, USB 2.0, Serial port
Peripherals required to exercise EUT Ex. Signal generator	N/A
Dimensions of product	L 430mm W 330mm H 100mm
Method of monitoring EUT and description of failure for immunity.	Run voting test, without disruption of normal operation or loss of data.

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EUT Functional Description

Voting Ballot Tabulator.

EUT Configuration

Please see Appendix B for a picture of the unit running in normal conditions.

- Cables and earthing were connected as per manufacturer's specification.

Operational Setup

Peripheral devices were attached to the EUT for its test operation. However, this report does not represent compliance of these peripheral device(s) in any way.

- Turn on device, enter test mode using voter and admin cards

Modifications for Compliance

No modifications were made during testing for the sample to achieve compliance with the testing requirements.

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Appendix B – EUT, Peripherals, and Test Setup Photos

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Figure 1 – EUT Front Close Up

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Figure 2 – EUT Rear Close Up

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Figure 3 – EUT label

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Figure 4 – EUT Power Supply

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Figure 5 – Power Line Conducted Emissions Setup – Photo 1

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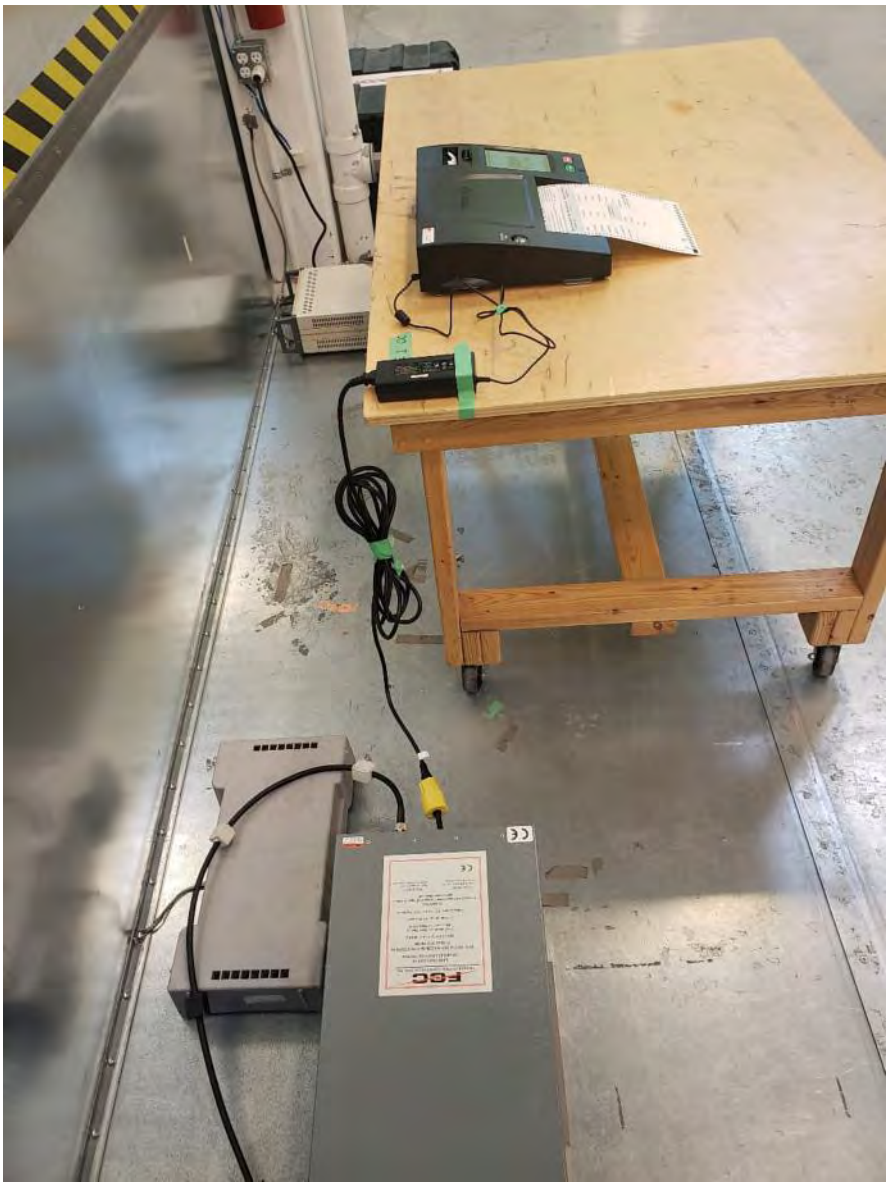

Figure 6 – Power Line Conducted Emissions Setup – Photo 2

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Figure 7 – Radiated Emissions Setup – Photo 1
30MHz – 1GHz

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Figure 8 – Radiated Emissions Setup – Photo 2
1GHz – 6GHz

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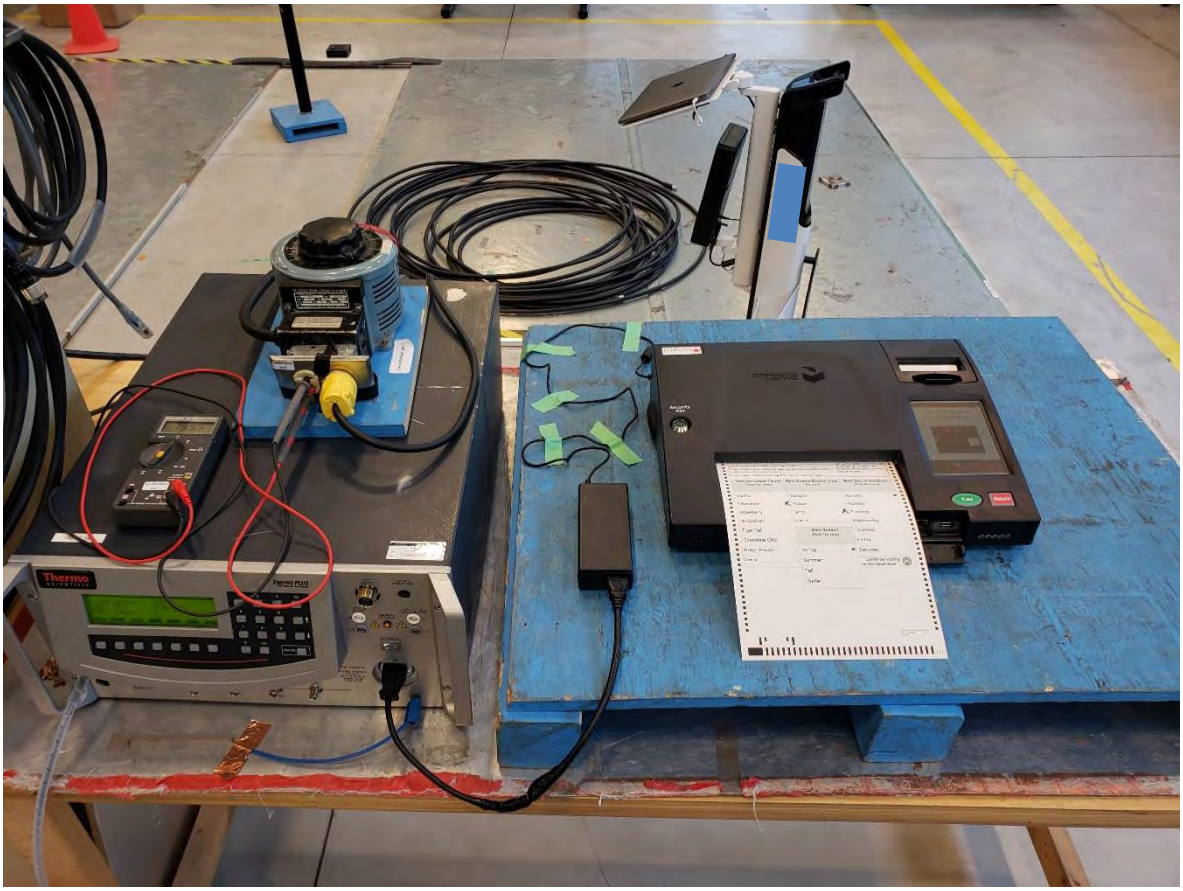

Figure 9 – Electrical Power Disturbance – Surges of ±15% Line Variations

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Figure 10 – Electrical Fast Transient / Lightning Surge

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Figure 11 – Voltage Dips

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Figure 12 – Electrical Power Disturbance – power increase & reduction

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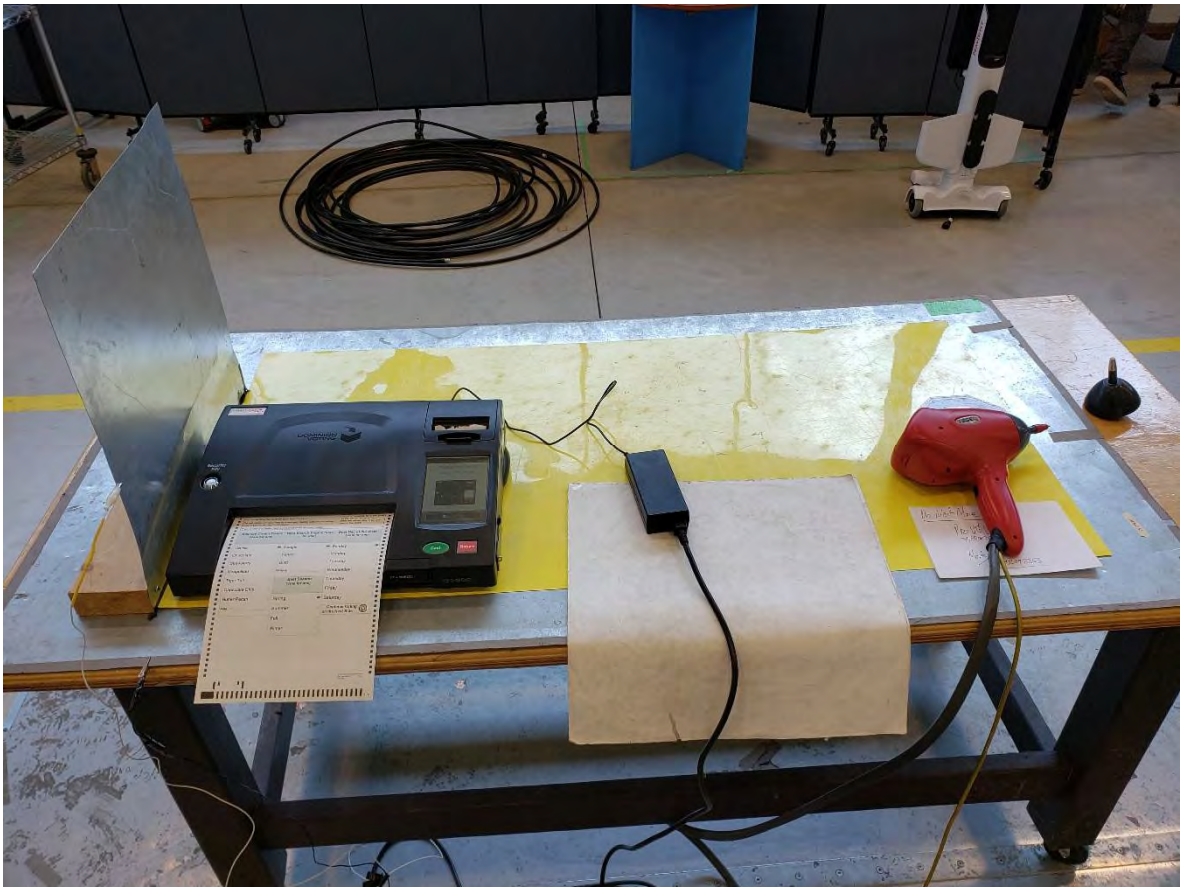

Figure 13 – Electrostatic Disruption Setup

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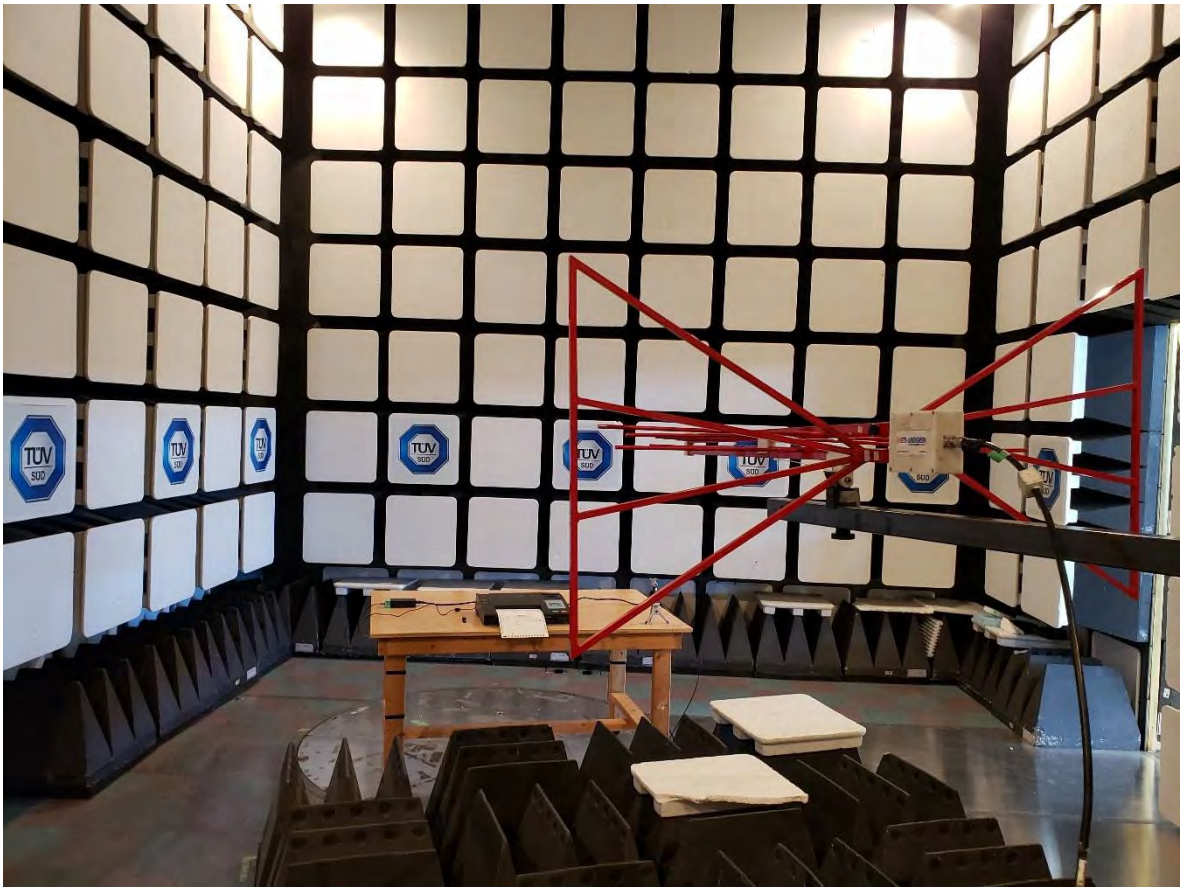

Figure 14 – Electromagnetic Susceptibility Setup – Photo 1

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Figure 15 – Electromagnetic Susceptibility Setup – Photo 2

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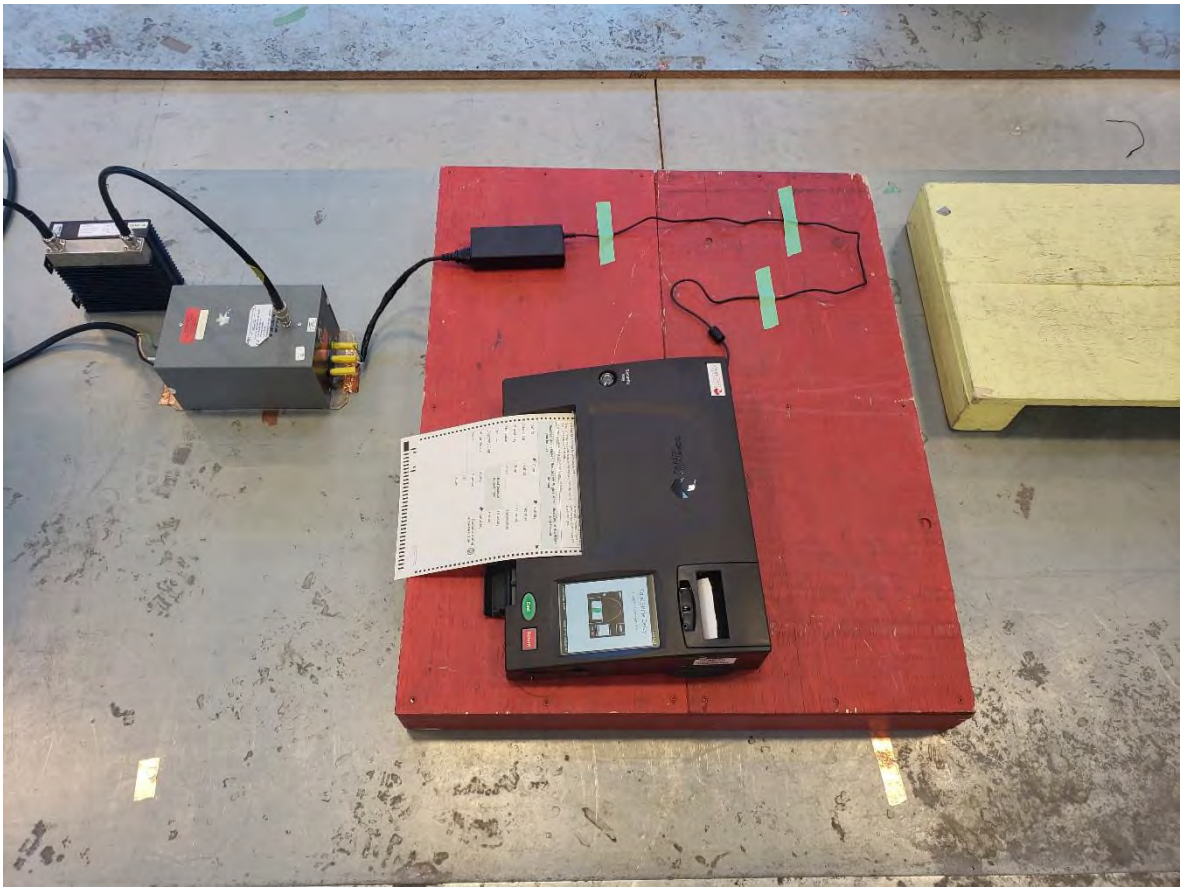

Figure 16 – Conducted RF Immunity Setup

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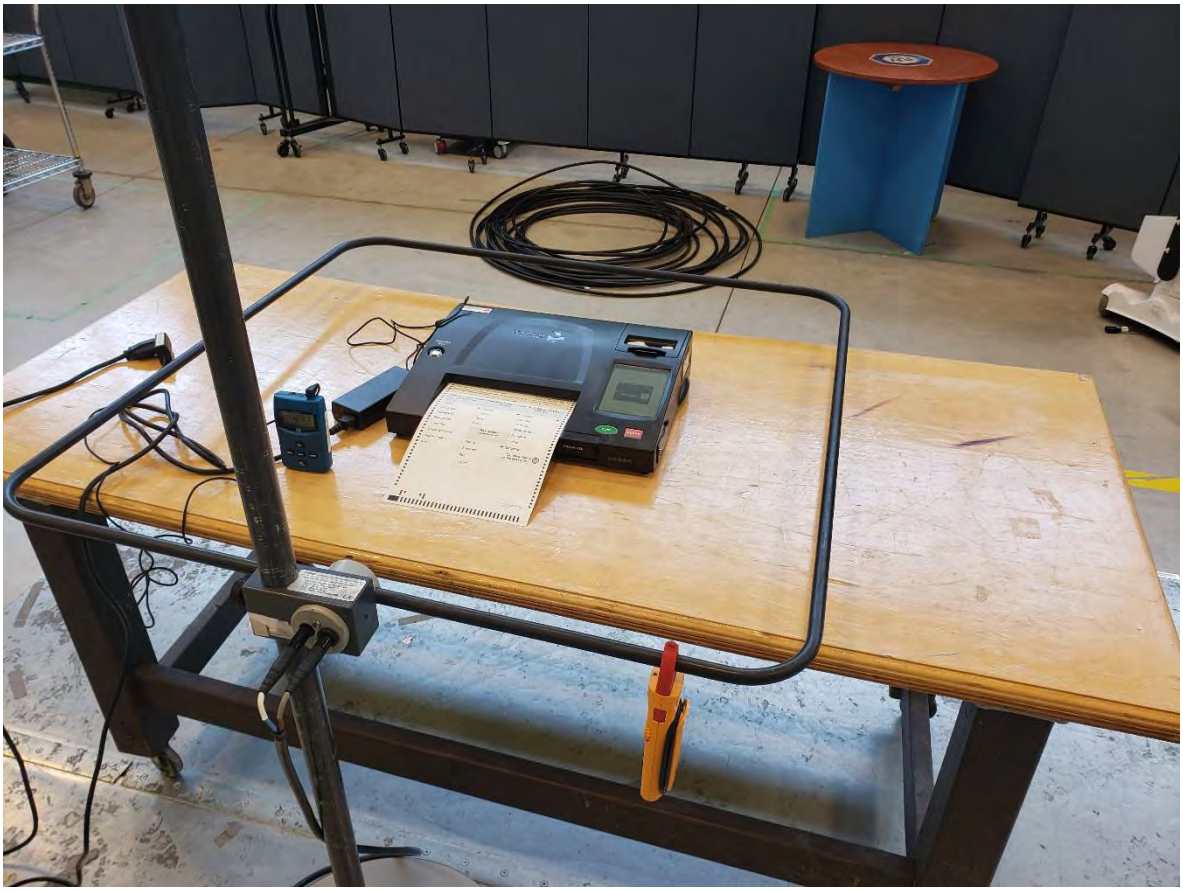

Figure 17 – Magnetic Fields Immunity

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Appendix C – Product Marking

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Product Marking

Products marketed in the US:
For products that are not intentional radiators and are subject to the 'verification' procedure in the US, according to the FCC, the product shall bear the following statement in a conspicuous location on the device:

> *This device complies with Part 15 of the FCC Rules.*
> *Operation is subject to the following two conditions:*
> *(1) this device may not cause harmful interference, and*
> *(2) this device must accept any interference received, including interference that may cause undesired operation.*

Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified is required to be affixed only to the main control unit.

When the device is so small or for such use that it is not practicable to place the statement specified on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed.

In this case, the following statement may accompany the product:

> *"This device complies with Part 15 of the FCC Rules. See manual for details*"

Also, the FCC identifier or other unique identifier such as a model number and serial number, as appropriate, must be displayed on the device.

Products marketed within Canada:
According to Industry Canada, the following statement shall be permanently affixed to the ITE or displayed electronically and its text must be clearly legible. If the dimensions of the device are too small or if it is not practical to place the label on the device and electronic labeling has not been implemented, the label shall be, upon agreement with Industry Canada, placed in a prominent location in the user manual supplied with the ITE.

> *CAN ICES-3 (*)/NMB-3(*)*

* Insert either "A" or "B" but not both to identify the applicable Class of ITE.

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www.nts.com

National Technical Systems
Environmental & Dynamics Lab
1601 Dry Creek Dr. #2000
Longmont, CO 80503

Main: 303-776-7249
Fax: 303-776-7314

Date: 20 MARCH 2019

Customer:
Pro V&V, Inc.
700 Boulevard South
Huntsville, AL 35802

Purchase Order Number: 2019-002

A. TEST: Environmental Hardware Testing

B. TEST ITEMS: Dominion ICE
See page 4 for Test Item Identification

C. SPECIFICATIONS:
1. Quotation Number OP0512325-0
2. MIL-STD-810D
3. ISO 17025:2005 (NTS Quality)

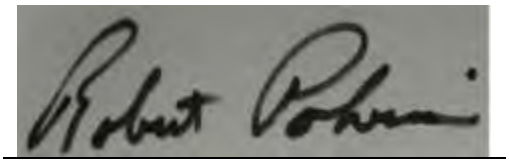
D. RESULTS:

This is to certify that the Dominion ICE Voting System was subjected to testing according to the above specifications.

See Page 4 for Summary of Test Results. The test sample was returned to Pro V&V for post-tests and final evaluation.

Test data, an equipment list, and photographs are attached.

Greg Gagne,
Technical Writer



Bob Polverari,
Technical Reviewer

This report and the information contained herein represents the results of testing of only those articles/products identified in this document and selected by the client. The tests were performed to specifications and/or procedures approved by the client. National Technical Systems ("NTS") makes no representations expressed or implied that such testing fully demonstrates efficiency, performance, reliability, or any other characteristic of the articles being tested, or similar products. This report should not be relied upon as an endorsement or certification by NTS of the equipment tested, nor does it present any statement whatsoever as to the merchantability or fitness of the test article or similar products for a particular purpose. This document shall not be reproduced except in full without written approval from NTS.

REVISIONS

Revision	Reason for Revision	Date
NR	Initial Release	20 March 2019

Table of Contents

Test Item Identification 4

SUMMARY OF TEST RESULTS 4

Environmental and Vibration Testing 4

TEST LOGS 5

TEST DATA 12

TEST SETUP 23

TEST EQUIPMENT 25

END OF REPORT 28

TEST ITEM IDENTIFICATION

Quantity	Sample Description	Part Name	Serial Numbers
2	ICE Voting System	Dominion ICE	AAFEBIK1847
			AAFEBCN0012

SUMMARY OF TEST RESULTS

Upon completion of testing, the test sample was removed from the test fixture and subjected to a visual inspection. The Test Sample was returned to Pro V&V, Inc.

Environmental and Vibration Testing

Testing was started on 19 February 2019 and completed on 14 March 2019 by exposing two (2) test samples to testing in accordance with Quotation Number OP0512325-0 and MIL-STD-810D. The table below describes the test program. Testing was performed as indicated in the Test Log on the following page.

Test	Description	Dates
Low Temperature	MIL-810D Method 501.2 non-operating at -4F	04-05 March 2019
High Temperature	MIL-810D Method 502.2 non-operating at +140F	05-06 March 2019
Humidity	MIL-810D Method 507.2 non-operating for (10) 24-hr humidity cycles	19 February – 04 March 2019
Bench Handling	MIL-810D Method 516.3 Procedure VI. (6) 4" drops on each edge for 24 drops. Repeat for 2 sample configurations.	06 March 2019
Transportation Vibration	MIL-810D Method 514.3 Category 1 Basic Transportation Vibration per Figures 514.3-1 through 514.3-3 using suggested common carrier profiles and durations of 1 hour per axis along each of 3 axes.	07 March 2019
Temperature/Power Variation	24-hr operation with power cycled accordingly over 85 hours with NTS support provided 24-hrs daily for first 85 hours per Method 502.2 and 501.2.	11-14 March 2019

TEST LOGS

Low Temperature:

TEST Low Temp -20c Test MJO PR094223

CUSTOMER Pro V&V Inc P/N N/A S/N See Below

TEST ITEM ICE Voting System & Monitor - Qty 1 Each

SPECIFICATION MIL-STD-810D PARA

DATE	TIME	LOG ENTRIES	INITIALS
03/04/19	09:45	Start -20c high temp test	KM
03/05/19	06:30	-20c high temp temp has completed	KM
		Open chambers doors per customer and allow UUT's to set at air temperature	KM
03/05/19	10:00	Customer inspected UUT's and performed functional test	KM
		Note:All test pass or fail determinations decided by Pro V&V Inc.	
		ICE Voting System S/N - AAFEBIK1847	
		Monitor S/N - ICE-MON-001	

PAGE 1 OF 1

TEST BY Kerry Martin **DATE** 03/05/19

ENGINEER **GOV'T QAR** N/A

High Temperature:

TEST High Temperature +60c Test MJO PR094223

CUSTOMER Pro V&V Inc P/N N/A S/N See Below

TEST ITEM ICE Voting System & Monitor - Qty 1 Each

SPECIFICATION MIL-STD-810D PARA

DATE	TIME	LOG ENTRIES	INITIALS
03/05/19	09:25	Start +60c high temp test	KM
	14:30	+60c high temp temp has completed	KM
03/05/19	15:00	Open chambers doors per customer and allow UUT's to set at air temperature	KM
03/06/19	09:00	Customer inspected UUT's and performed functional test	KM
		Note:All test pass or fail determinations decided by Pro V&V Inc.	
		ICE Voting System S/N - AAFEBIK1847	
		Monitor S/N - ICE-MON-001	

PAGE 1 OF 1

TEST BY Kerry Martin **DATE** 03/06/19

ENGINEER **GOV'T QAR** N/A

Humidity:

TEST 10 Day Humidity Test MJO PR094223

CUSTOMER Pro V&V Inc P/N N/A S/N See below

TEST ITEM ICE Voting System & Monitor - Qty 1 Each

SPECIFICATION MIL-STD-810D PARA

DATE	TIME	LOG ENTRIES	INITIALS
02/19/19	11:45	Install UUT into chamber	KM
	11:50	Start 10 day humidity test	KM
03/04/19	06:30	Test complete & open chambers doors and allow UUT to drift back to ambient	KM
		Note after lookind at data test ran a total of 11 cycles have informed customer	KM
03/04/19		Customer inspected UUT and performed functional test	KM
		Note:All test pass or fail determinations decided by Pro V&V Inc.	
		ICE Voting System S/N - AAFEBIK1847	
		Monitor S/N - ICE-MON-001	

PAGE 1 OF 1

TEST BY Kerry Martin **DATE** 03/04/19

ENGINEER **GOV'T QAR** N/A

Bench Handling:

TEST Bench Test MJO PR094223

CUSTOMER Pro V&V Inc P/N N/A S/N See Below

TEST ITEM ICE Voting System & Monitor - Qty 1 Each

SPECIFICATION MIL-STD-810D PARA

DATE	TIME	LOG ENTRIES	INITIALS
03/06/19	10:30	Start 6 drops per corner of UUT from 4 inches	KM
03/06/19	11:30	Total of 24 drops from 4 inches for UUT complete	KM
		Note:All test pass or fail determinations decided by Pro V&V Inc.	
		ICE Voting System S/N - AAFEBIK1847	
		Monitor S/N - ICE-MON-001	

PAGE 1 OF 1

TEST BY Kerry Martin **DATE** 03/06/19

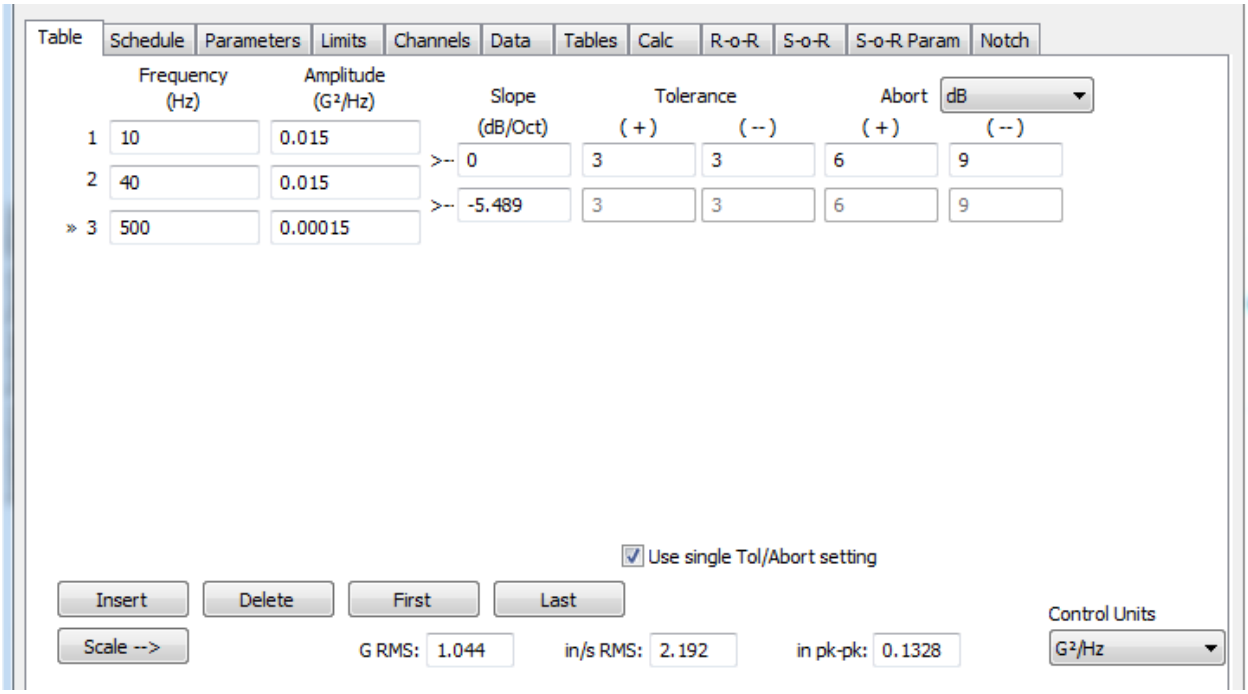
ENGINEER **GOV'T QAR** N/A

Transportation Vibration:

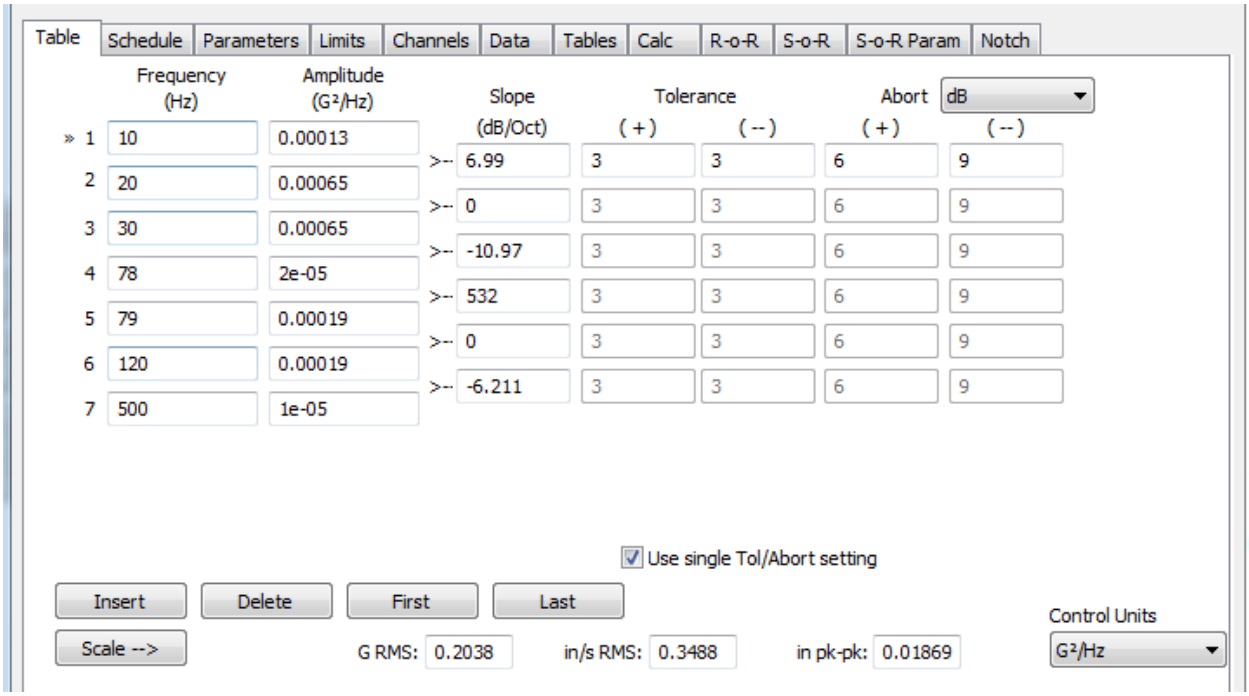
Start Date: 3-7-19 End Date: 3-7-19						**MJO No: PR094223**
Customer: Pro V&V				Test Performed: Random Vibration	Test Engineer:	G. Mathews
Part Name:				Serial numbers:	Customer Witness:	
Test Specification: MIL-STD 810D Fig 514.3-1					Temp: 70° Humidity: 22%	
Date	**Time**	**Axis**	**Run No.**	**Serial No.**	**Remarks**	**Initials**
3-7-19					Set up both UUT's on shaker #ED3 for testing in the Longitudinal axis.	GM
3-7-19	1254	Longitudinal	1		Run the 0.74 gRMS random profile for 30 minutes in the Longitudinal axis.	GM
3-7-19					Set up both UUT's on shaker #HYD06 for testing in the Transverse axis.	GM
3-7-19	1418	Transverse	2		Run the 0.74 gRMS random profile for 30 minutes in the Transverse axis.	GM
3-7-19					Set up the UUT on shaker #ED3 for testing in the Vertical axis.	GM
3-7-19	1457	Vertical	3		Run the 1.04 gRMS random profile for 30 minutes in the Vertical axis.	GM

Test profiles

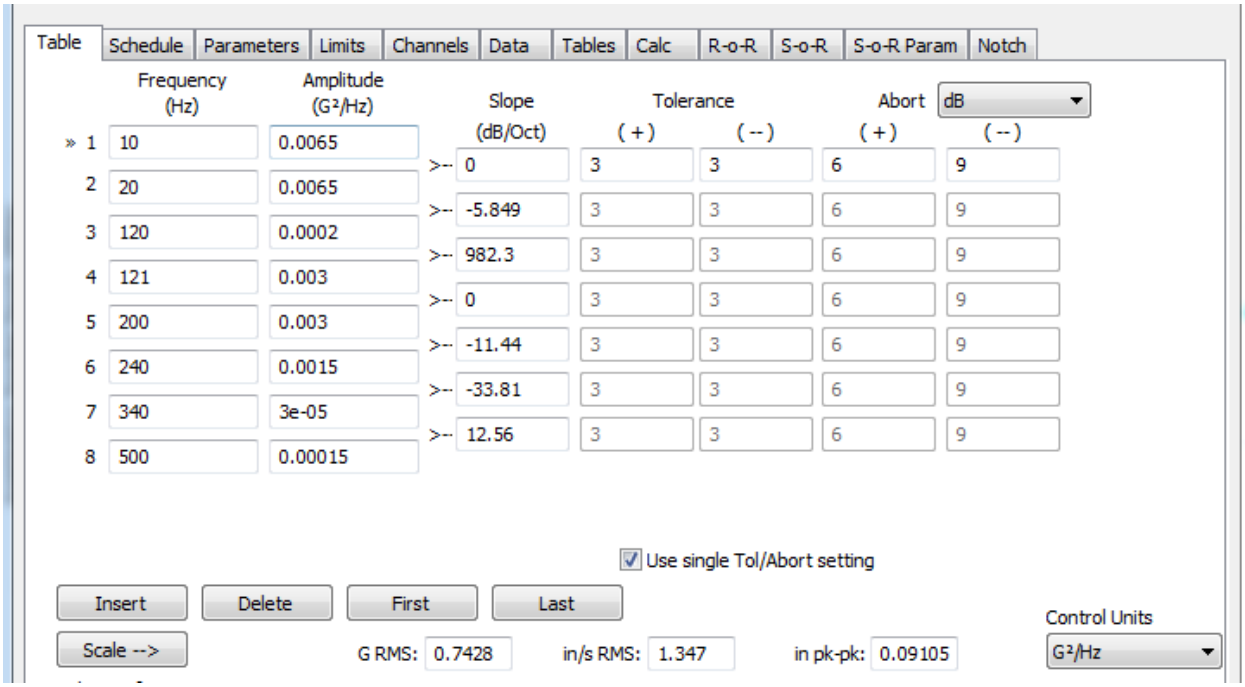
Vertical



Transverse



Longitudinal



Temperature/Power Variation:

TEST Temperature Power Variation Test MJO PR094223

CUSTOMER Pro V&V P/N N/A S/N See Below

TEST ITEM See Below

SPECIFICATION MIL-STD-810D PARA

DATE	TIME	LOG ENTRIES	INITIALS
03/11/19	09:00	Set VAC to 117vlts & ramp to +10c	RSP
	09:00	Start dwell at 117vlts & +10c for 4hrs	RSP
	13:00	Lower VAC to 105vlts & dwell for 4hrs	RSP
	17:00	Raise VAC to 129vlts & dwell for 4hrs	KM
	21:00	Lower VAC to 117vlts & Raise temperature to +35c & dwell for 4hrs	KM
03/12/19	01:00	Lower VAC to 105vlts & dwell for 4hrs	KM
	05:00	Raise VAC to 129vlts & dwell for 4hrs	KM
	09:00	Lower VAC to 117vlts & Lower temperature to +10c & dwell for 4hrs	RSP
	13:00	Lower VAC to 105vlts & dwell for 4hrs	RSP
	17:00	Raise VAC to 129vlts & dwell for 4hrs	KM
	21:00	Lower VAC to 117vlts & Raise temperature to +35c & dwell for 4hrs	KM
03/13/19	01:00	Lower VAC to 105vlts & dwell for 4hrs	KM
	05:00	Raise VAC to 129vlts & dwell for 4hrs	KM
	09:00	Lower VAC to 117vlts & ramp to +23c ambient	RSP
	09:00	Temp and power variation portion of test has completed	RSP
03/13/19	09:00	Test will continue to run at +23c ambient for another 37hrs	RSP
03/14/19	22:00	All Testing complete for a total of 85hrs	KM
		Note:All test pass or fail determinations decided by Pro V&V Inc.	
		ICE Voting System S/N - AAFEBIK1847	
		ICE Voting System S/N - AAFEBCN0012	
		ICE M260 - HG306013	
		ICE M260 - HG306012	
		ICE HighPro - 0078K28 - Note UUT failed 03/12/19 test will continue with remaining UUT's	
		ICE HighPro - 0080K28 - Note UUT failed 03/12/19 test will continue with remaining UUT's	

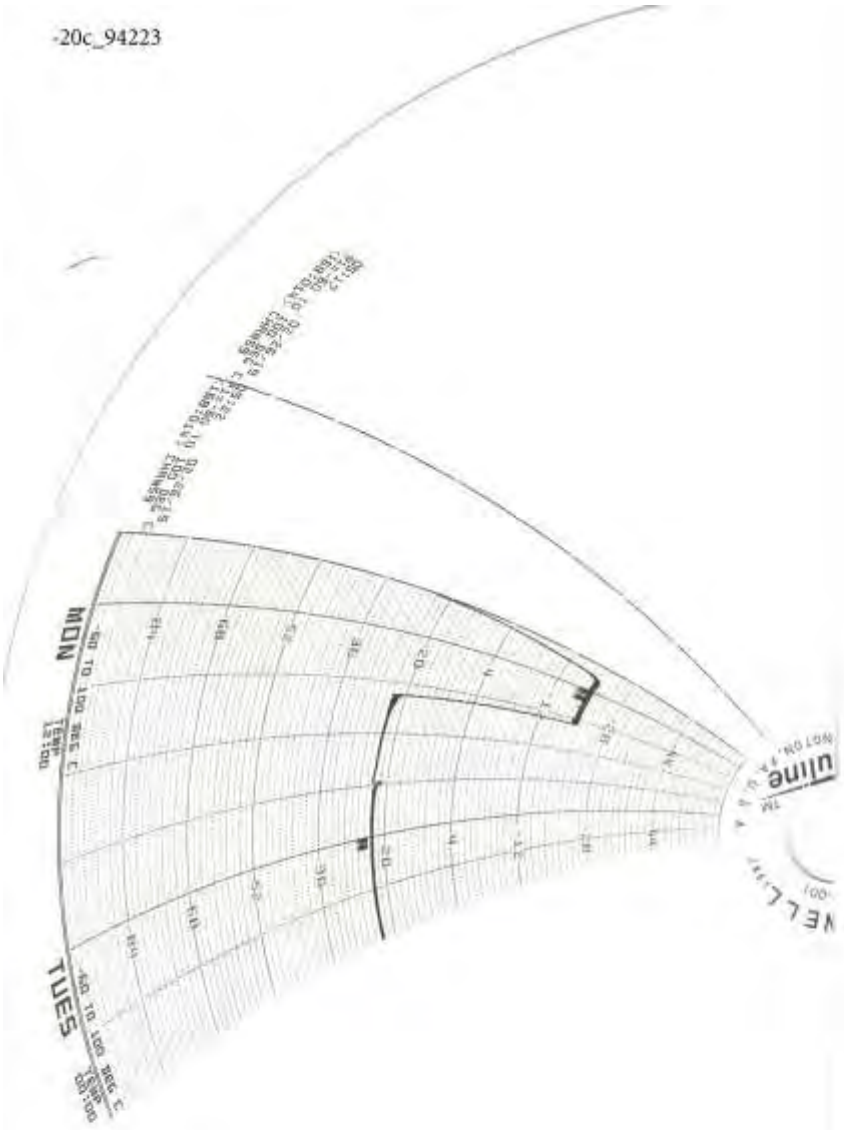
PAGE 1 OF 1

TEST BY Kerry Martin **DATE** 03/14/19

ENGINEER **GOV'T QAR** N/A

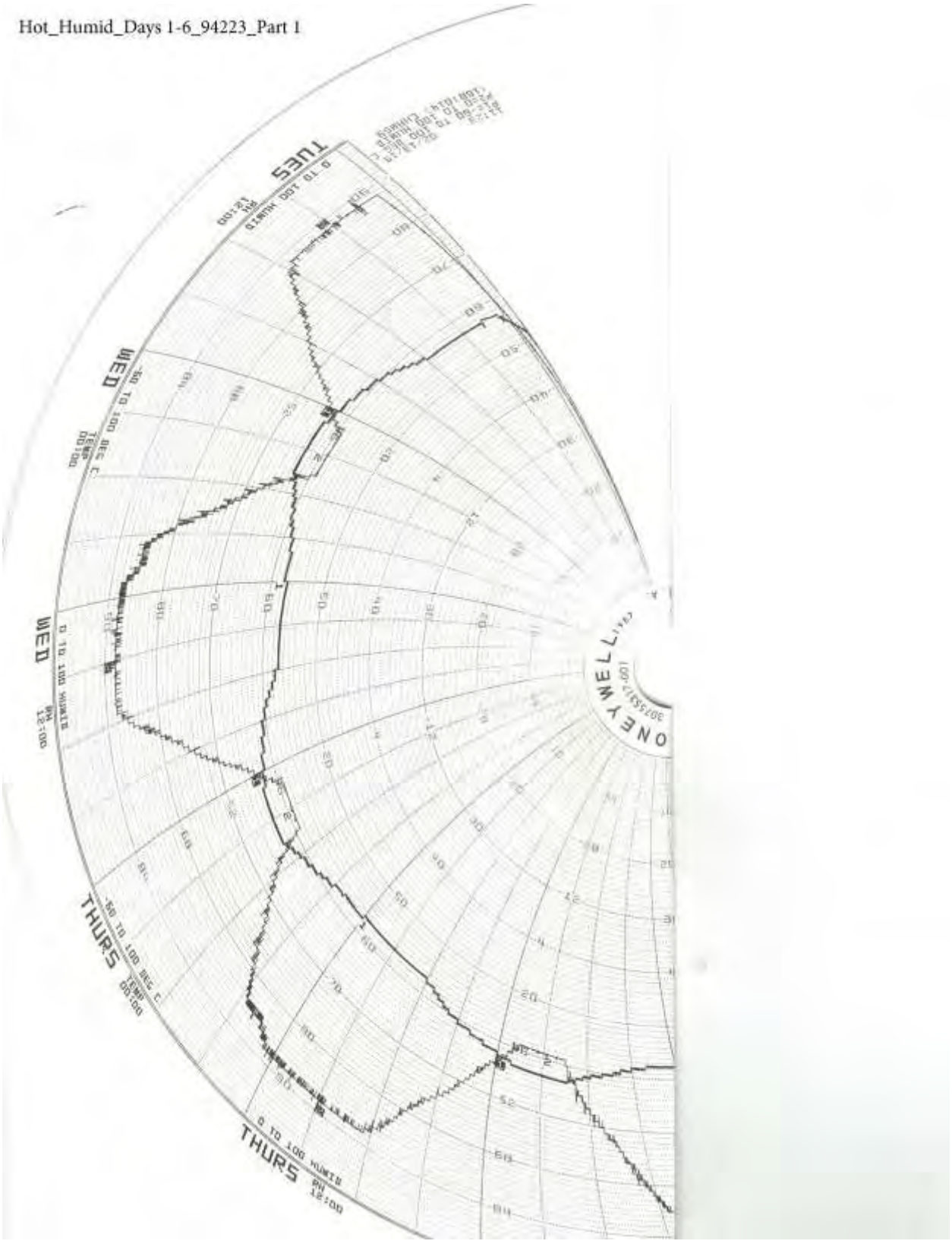
TEST DATA

Low Temperature:

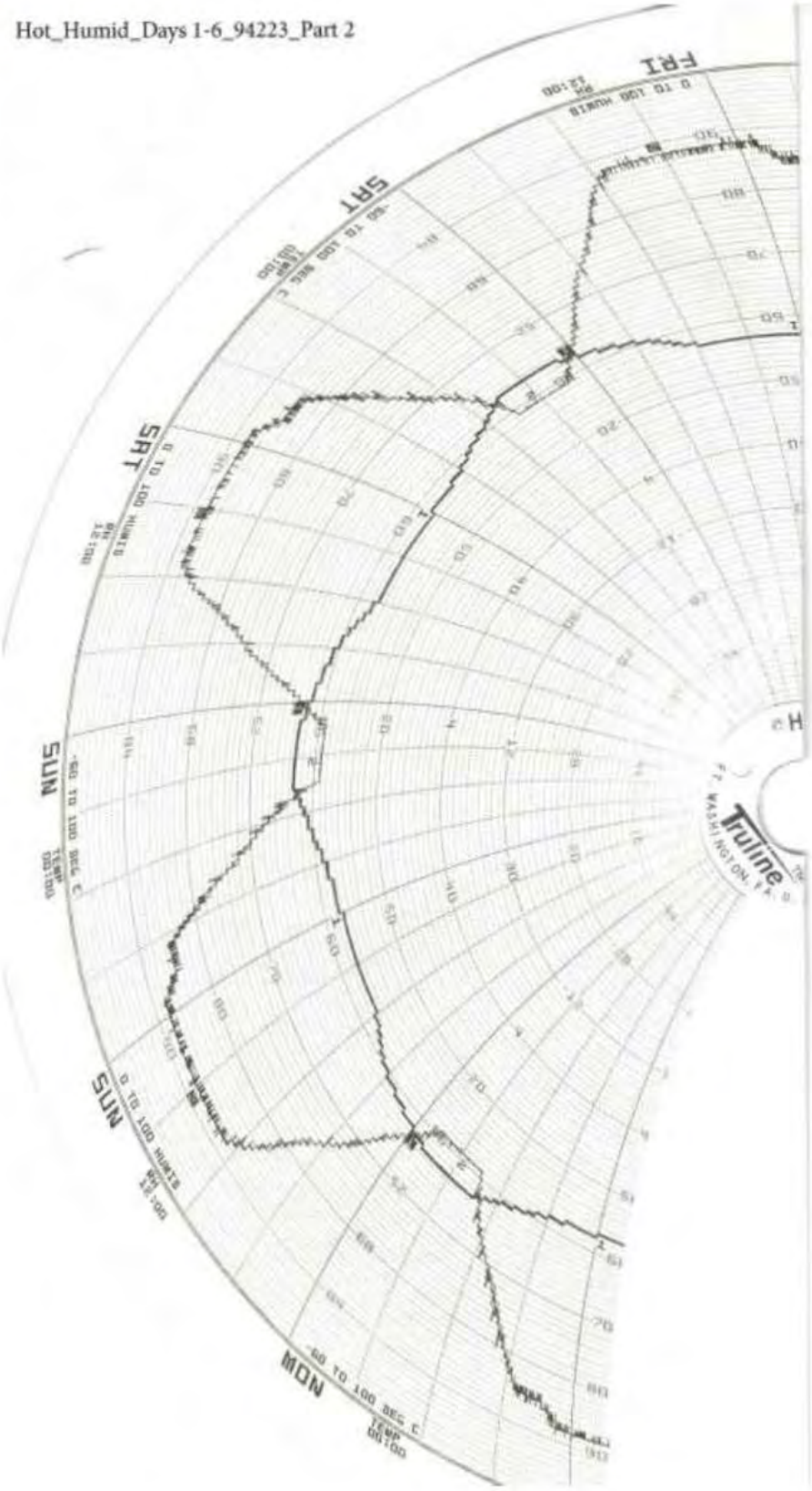


High Temperature:

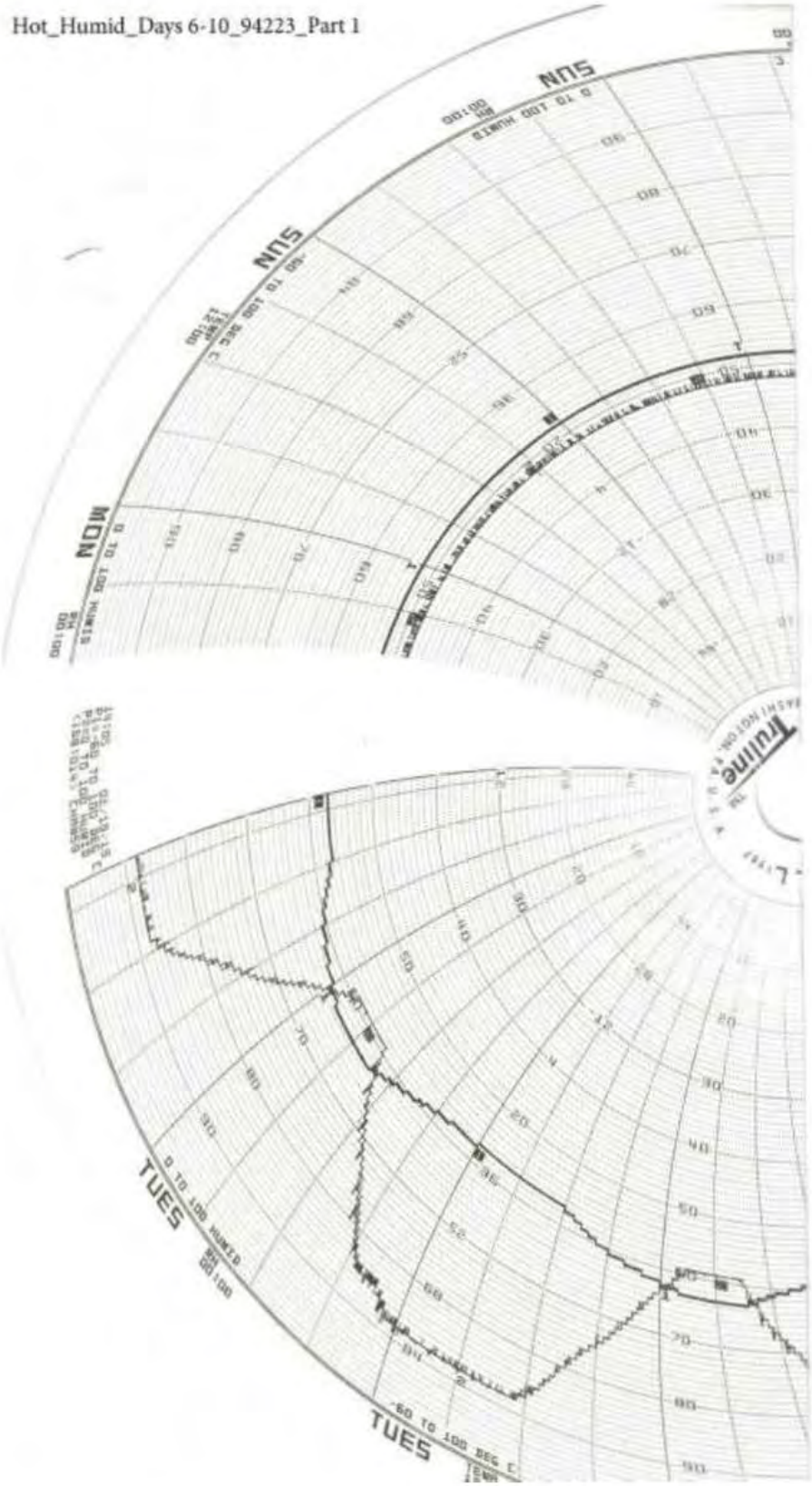
Humidity:



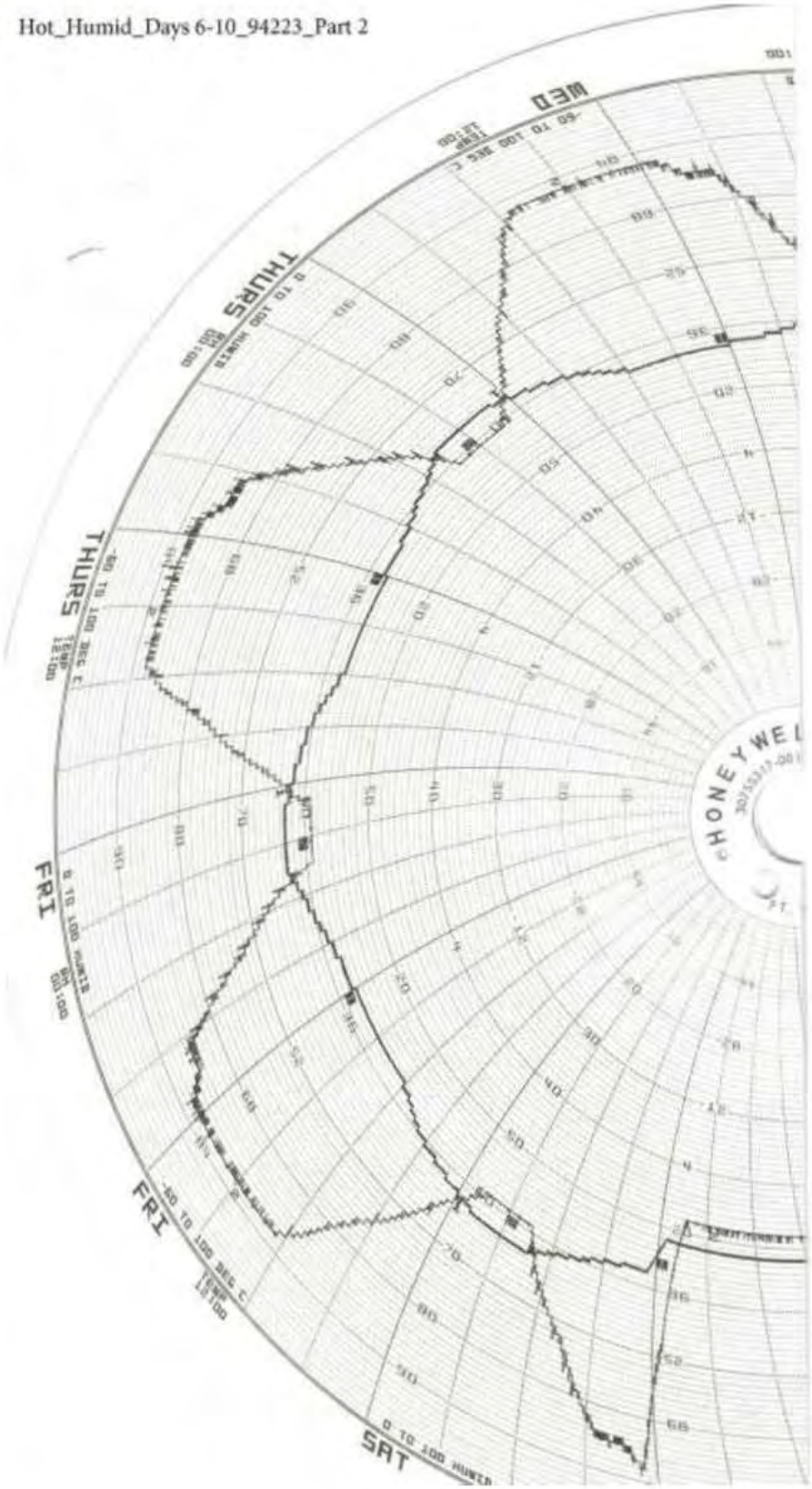
Hot_Humid_Days 1-6_94223_Part 2



Hot_Humid_Days 6-10_94223_Part 1

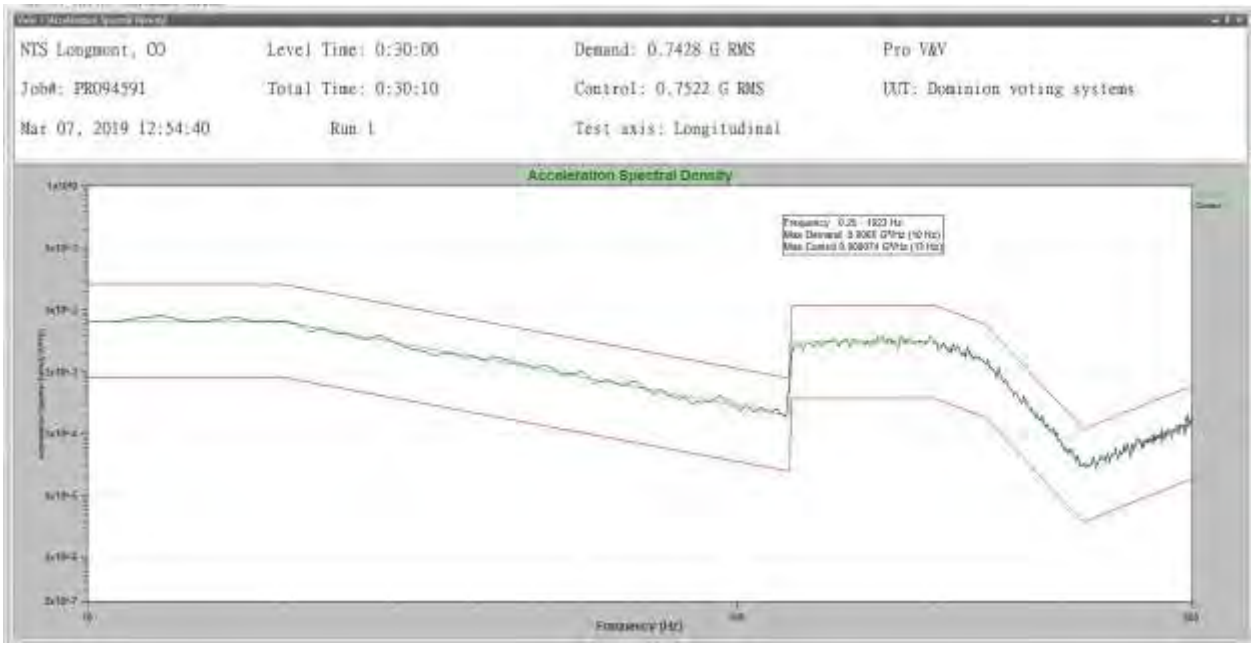


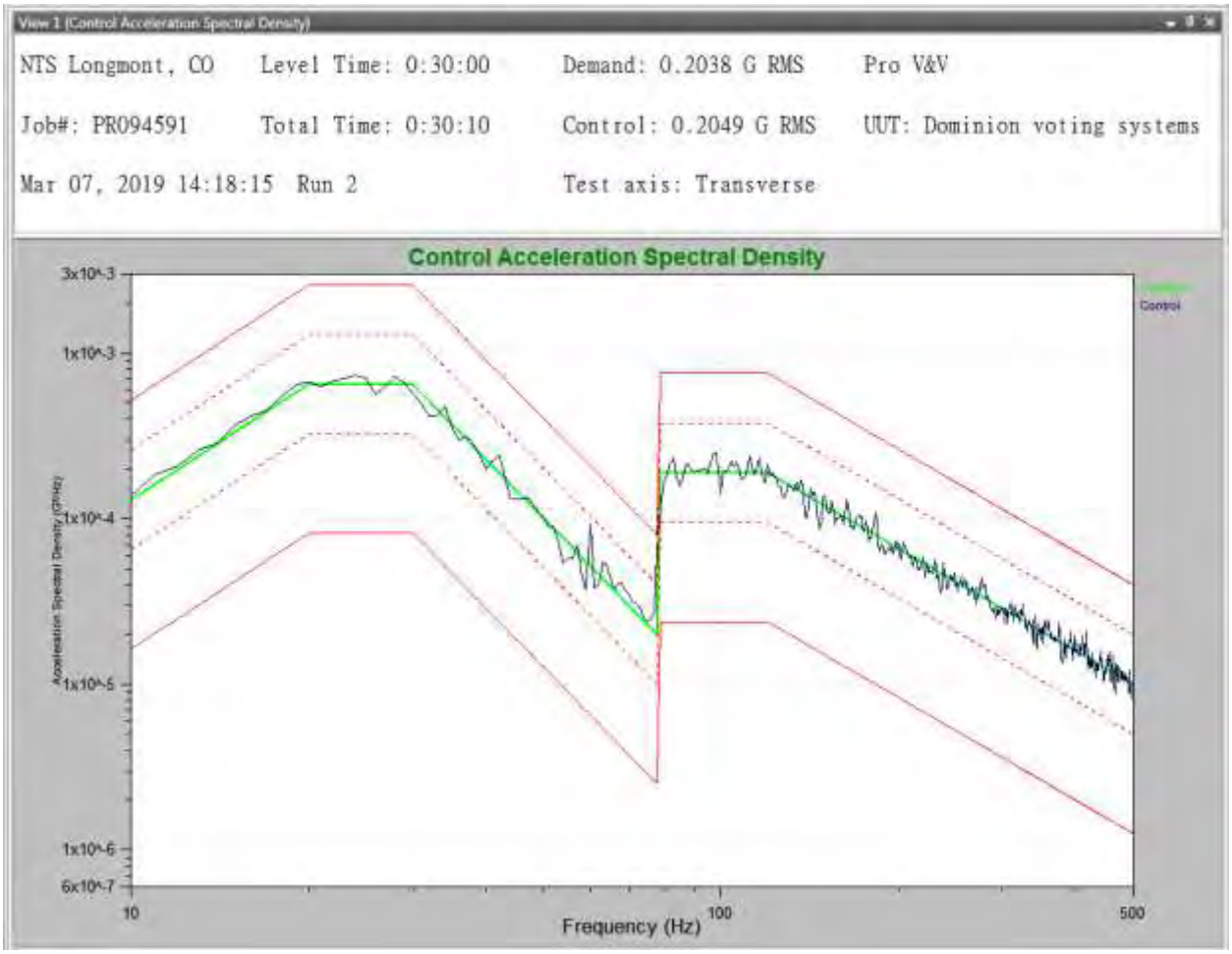
Hot_Humid_Days 6-10_94223_Part 2

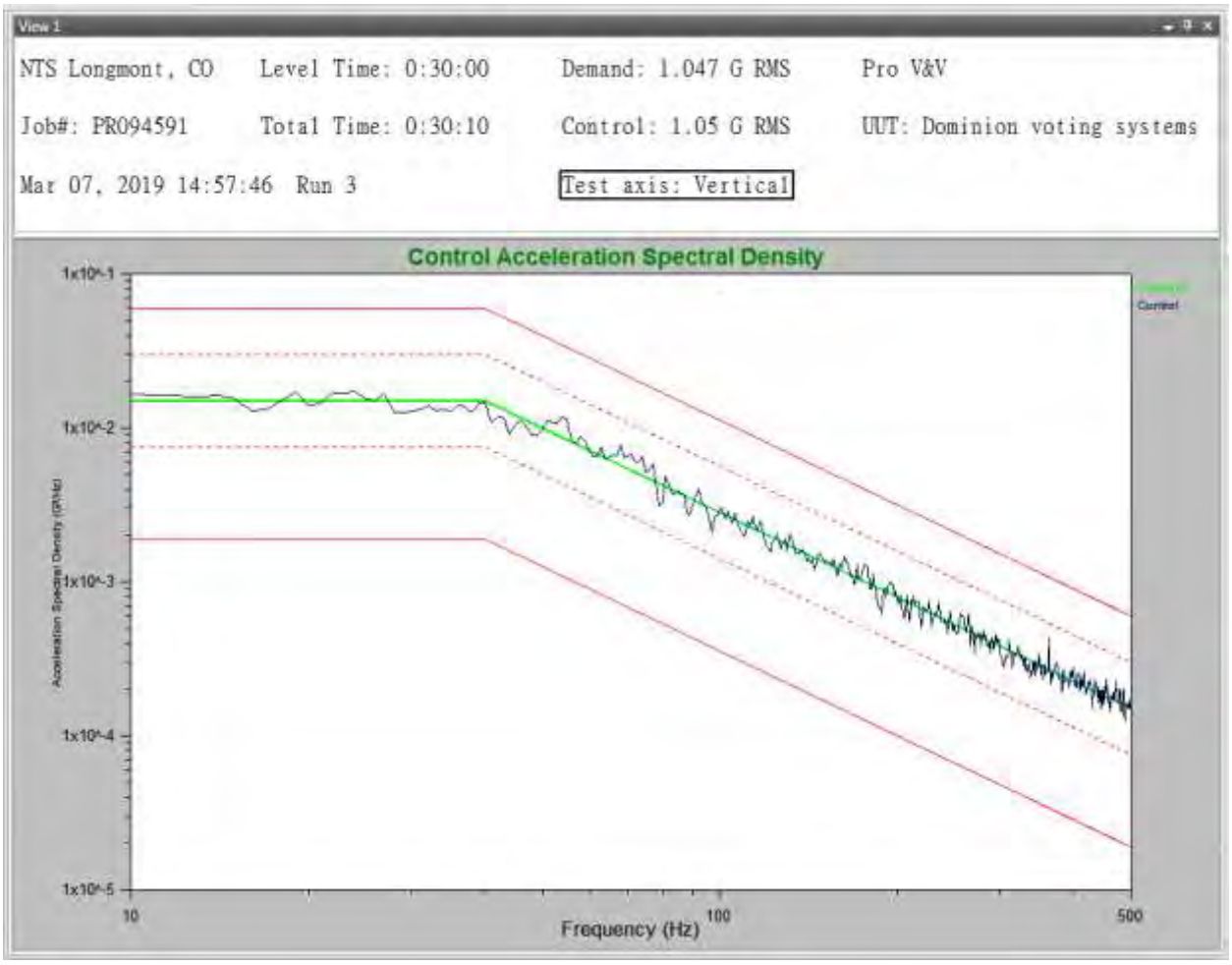


Bench Handling:

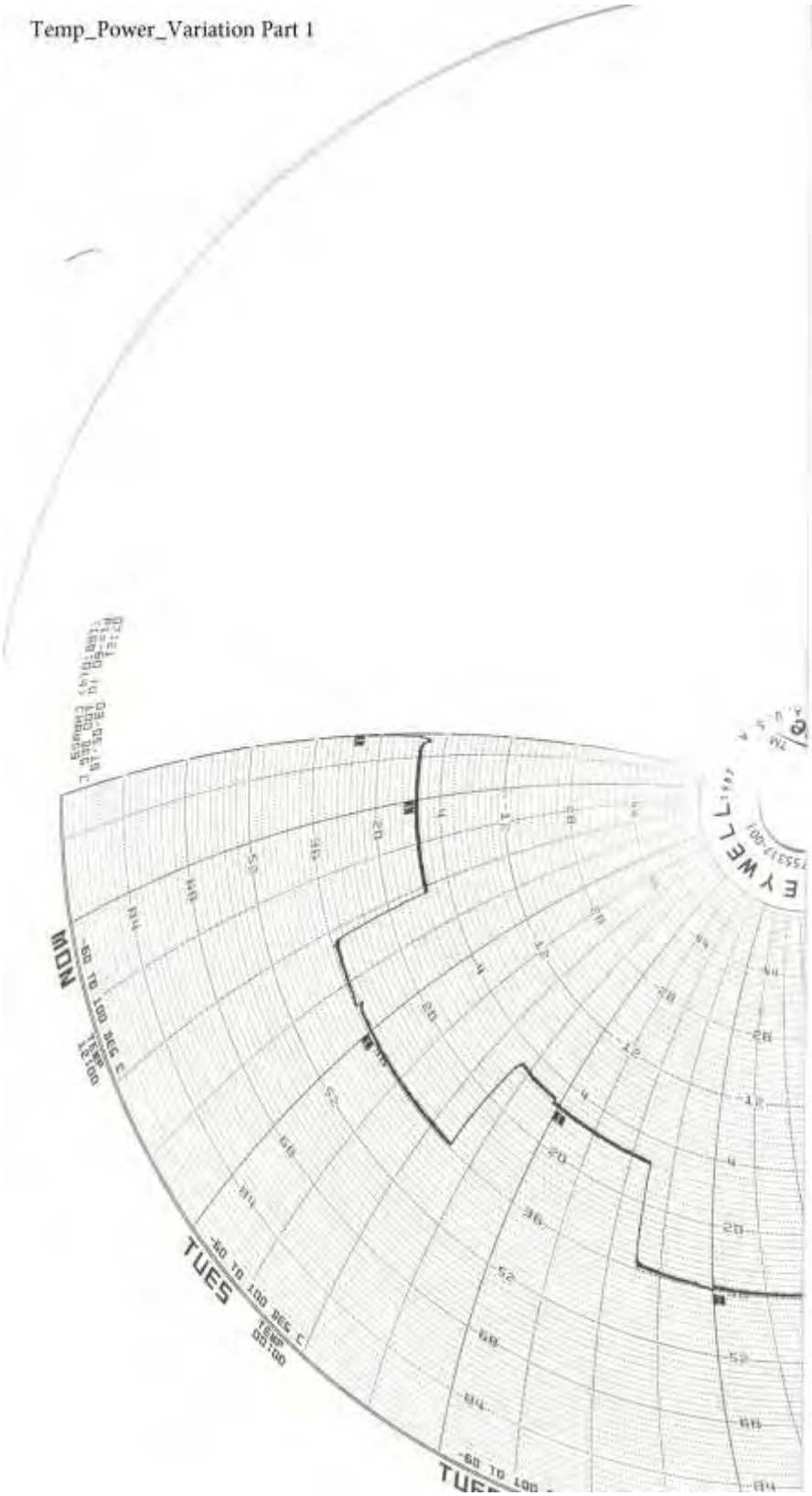
Transportation Vibration:



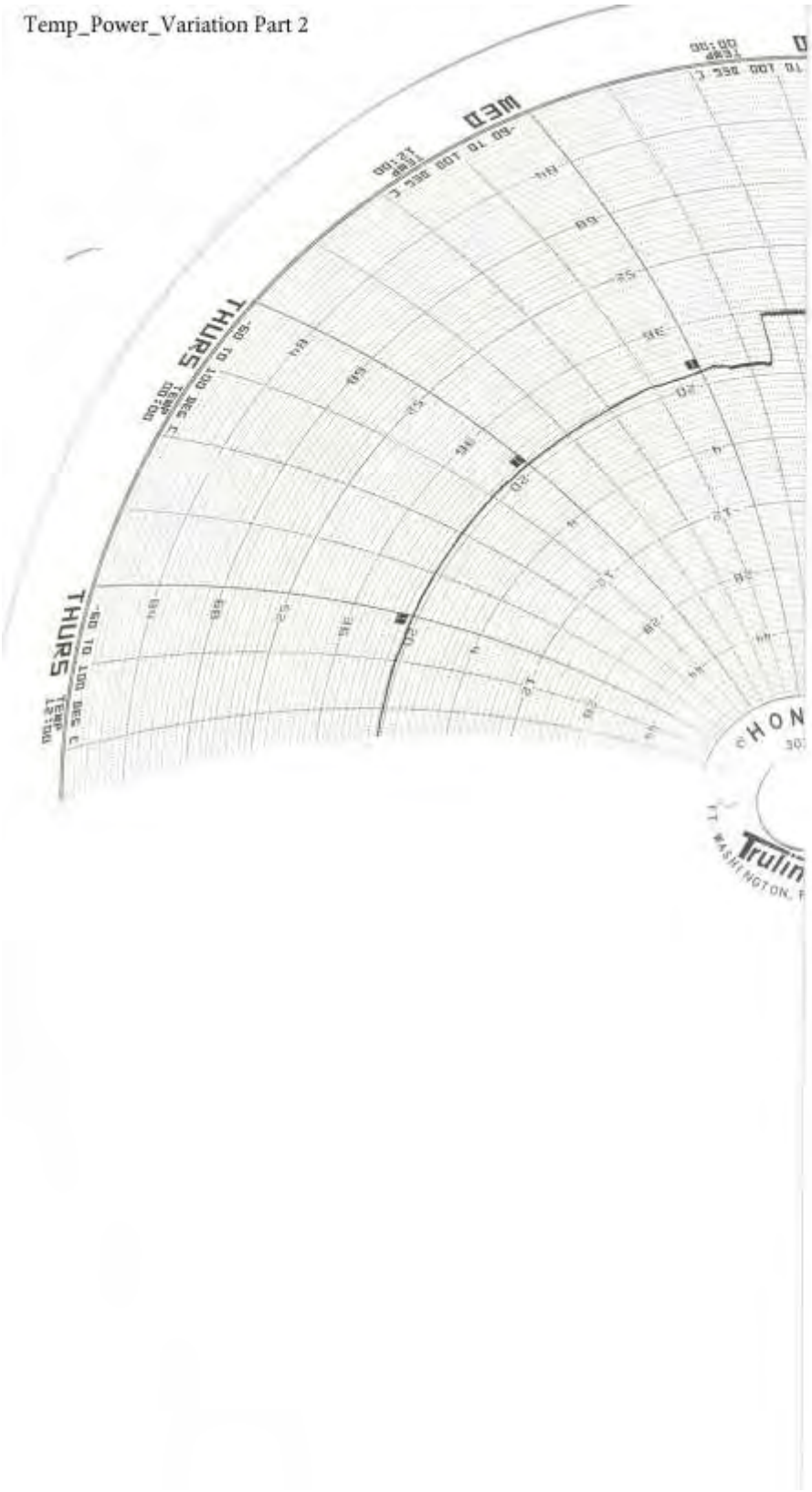



View 1
NTS Longmont, CO
Level Time: 0:30:00
Demand: 1.047 G RMS
Pro V&V
Job#: PR094591
Total Time: 0:30:10
Control: 1.05 G RMS
UUT: Dominion voting systems
Mar 07, 2019 14:57:46 Run 3
Test axis: Vertical
Control Acceleration Spectral Density
1x10^-1
1x10^-2
1x10^-3
1x10^-4
1x10^-5
Acceleration Spectral Density (G²/Hz)
10
100
500
Frequency (Hz)
Control

Temperature and Power Variation:



Temp_Power_Variation Part 2



TEST SETUP

Transportation Vibration:

TEST EQUIPMENT

Low Temperature:

Test Title:	Low Temperature -20c Test		
Customer:	Pro V&V Inc	**Date:**	03/04/19
Part Name:	ICE Voting System & Monitor - Qty 1 Each		PR094223
		MJO No.:	
Part No.:	N/A	**P.O. No.:**	
Serial No.:	See below	**NTS Eng.:**	
Test Spec:	MIL-STD-810D	**Revision:**	

Equipment	Manufacture / Model	NTS I.D. #	Cal. Date	In-Service	Due Date
Chamber 59	N/A	1733	N/A	Yes	N/A
Controller	Watlow F4	1653	09/21/18	Yes	09/21/19
Chart Recorder	Honeywell	1654	09/21/18	Yes	09/21/19
ICE Voting System S/N	AAFEBIK1847				
Monitor S/N	ICE-MON-001				

Test By: Kerry Martin **Date:** 03/05/19

Page 1 **of** 1 **Engr.:** **Govt. QAR:**

High Temperature:

TEST High Temperature +60c Test MJO PR094223

CUSTOMER Pro V&V Inc P/N N/A S/N See Below

TEST ITEM ICE Voting System & Monitor - Qty 1 Each

SPECIFICATION MIL-STD-810D PARA

DATE	TIME	LOG ENTRIES	INITIALS
03/05/19	09:25	Start +60c high temp test	KM
	14:30	+60c high temp temp has completed	KM
03/05/19	15:00	Open chambers doors per customer and allow UUT's to set at air temperature	KM
03/06/19	09:00	Customer inspected UUT's and performed functional test	KM
		Note:All test pass or fail determinations decided by Pro V&V Inc.	
		ICE Voting System S/N - AAFEBIK1847	
		Monitor S/N - ICE-MON-001	

PAGE 1 **OF** 1

TEST BY Kerry Martin **DATE** 03/06/19

ENGINEER **GOV'T QAR** N/A

Humidity:

TEST 10 Day Humidity Test MJO PR094223

CUSTOMER Pro V&V Inc P/N N/A S/N See below

TEST ITEM ICE Voting System & Monitor - Qty 1 Each

SPECIFICATION MIL-STD-810D PARA

DATE	TIME	LOG ENTRIES	INITIALS
02/19/19	11:45	Install UUT into chamber	KM
	11:50	Start 10 day humidity test	KM
03/04/19	06:30	Test complete & open chambers doors and allow UUT to drift back to ambient	KM
		Note after lookind at data test ran a total of 11 cycles have informed customer	KM
03/04/19		Customer inspected UUT and performed functional test	KM
		Note:All test pass or fail determinations decided by Pro V&V Inc.	
		ICE Voting System S/N - AAFEBIK1847	
		Monitor S/N - ICE-MON-001	

PAGE 1 OF 1

TEST BY Kerry Martin DATE 03/04/19

ENGINEER GOV'T QAR N/A

Bench Handling:

Test Title: Bench Test

Customer: Pro V&V Inc **Date:** 03/06/19

Part Name: ICE Voting System & Monitor - Qty 1 Each **MJO No.:** PR094223

Part No.: N/A **P.O. No.:**

Serial No.: See Below **NTS Eng.:**

Test Spec: MIL-STD-810D **Revision:**

Equipment	Manufacture / Model	NTS I.D. #	Cal. Date	In-Service	Due Date
Wooden Block	4 Inch Wooden Block	N/A	N/A	N/A	N/A
ICE Voting System S/N	AAFEBIK1847				
Monitor S/N	ICE-MON-001				

Test By: Kerry Martin **Date:** 03/06/19

Page 1 **of** 1 **Engr.:** **Govt. QAR:**

Transportation Vibration:

ID Number	Manufacturer	Model #	Serial #	Description	Cal Date	Cal Due
WC021574	UD	T-1000	n/a	Shaker system ED3	For reference only	
1751	Team	483 48-16	494	Shaker System HYD05	For reference only	
	Vibration Research	VR9500	95268B57	Vibration Controller	9/18/2018	9/18/2019
1671	PCB	333A12	30540	Control accelerometer	8/17/2018	8/17/2019
1673	PCB	333A1**2**	30641	Control accelerometer	8/17/2018	8/17/2019
1869	PCB	352C34	LW256906	Control accelerometer	10/1/2018	10/1/2019
1870	PCB	352C34	LW256907	Control accelerometer	10/1/2018	10/1/2019
1766	Fluke	971	3623064	Temperature/Humidity meter	4/23/2018	4/23/2019
1858	CDI Torque Products	1002MFRMH	518704072	Torque Wrench	5/23/2018	5/23/2019

Temperature and Power Variation:

Test Title: Temperature Power Variation Test
Customer: Pro V&V Inc **Date:** 03/11/19
Part Name: See Below PR094223
Part No.: N/A **MJO No.:**
Serial No.: See below **P.O. No.:**
Test Spec: MIL-STD-810D **NTS Eng.:**
Revision:

Equipment	Manufacture / Model	NTS I.D. #	Cal. Date	In-Service	Due Date
Chamber 59	N/A	1733	N/A	Yes	N/A
Controller	Watlow F4	1653	09/21/18	Yes	09/21/19
Chart Recorder	Honeywell	1654	09/21/18	Yes	09/21/19
ICE Voting System	S/N - AAFEBIK1847				
ICE Voting System	S/N - AAFEBCN0012				
ICE M260	S/N - HG306013				
ICE M260	S/N - HG306012				
ICE HighPro	S/N - 0078K28				
ICE HighPro	S/N - 0080K28				

Test By: Kerry Martin **Date:** 03/14/19

Page 1 **of** 1 **Engr.:** **Govt. QAR:**

END OF REPORT

www.nts.com

National Technical Systems
Environmental & Dynamics Lab
1601 Dry Creek Dr. #2000
Longmont, CO 80503

Main: 303-776-7249
Fax: 303-776-7314

Date: 10 MAY 2019

Customer:
Pro V&V, Inc.
700 Boulevard South
Huntsville, AL 35802

Purchase Order Number: 2019-006

A. TEST: Power Variation Testing

B. TEST ITEMS: Voting Scanner Machine
See page 4 for Test Item Identification

C. SPECIFICATIONS: 1. Quotation Number OP0517642-0
2. ISO 17025:2005 (NTS Quality)

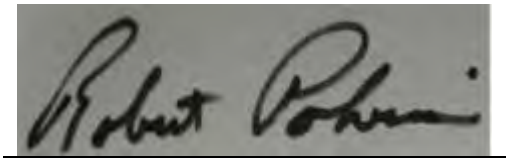
D. RESULTS:

This is to certify that the Voting Scanner Machine samples were subjected to testing according to the above specifications.

See Page 4 for Summary of Test Results. The test samples were returned to Pro V&V, Inc for post-tests and final evaluation.

Test data, an equipment list, and photographs are attached.

Greg Gagne,
Technical Writer



Bob Polverari,
Technical Reviewer

This report and the information contained herein represents the results of testing of only those articles/products identified in this document and selected by the client. The tests were performed to specifications and/or procedures approved by the client. National Technical Systems ("NTS") makes no representations expressed or implied that such testing fully demonstrates efficiency, performance, reliability, or any other characteristic of the articles being tested, or similar products. This report should not be relied upon as an endorsement or certification by NTS of the equipment tested, nor does it present any statement whatsoever as to the merchantability or fitness of the test article or similar products for a particular purpose. This document shall not be reproduced except in full without written approval from NTS.

REVISIONS

Revision	Reason for Revision	Date
NR	Initial Release	10 May 2019

Table of Contents

TEST ITEM IDENTIFICATION 4

SUMMARY OF TEST RESULTS 4

POWER VARIATION TESTING 4

TEST LOG 5

TEST DATA 6

TEST SETUP 8

TEST EQUIPMENT 9

END OF REPORT 10

TEST ITEM IDENTIFICATION

Quantity	Sample Description	Part Name	Serial Numbers
2	Voting Scanner Machine	Interscan HiPro	0078K28
			0080K28
2	Voting Scanner Machine	ICP2	FAL18480494
			FAL18480510

SUMMARY OF TEST RESULTS

Upon completion of testing, the test sample was removed from the test fixture and subjected to a visual inspection. The Test Samples were returned to Pro V&V, Inc.

Power Variation Testing

Testing was started on 29 April 2019 and completed on 03 May 2019 by exposing four (4) test samples to testing in accordance with Quotation Number OP0517642-0 and MIL-STD-810G, as described in the table below. Testing was performed as indicated in the Test Log on the following page.

Test	Description
Temperature/Power Variation	24-hr operation with power cycled accordingly over 85 hours with NTS support provided 24-hrs daily for first 85 hours per Method 502.2 and 501.2.

TEST LOG

TEST Temperature Power Variation Test MJO PR097523

CUSTOMER Pro V&V P/N N/A S/N See Below

TEST ITEM See Below (Qty-2 of each type)

SPECIFICATION MIL-STD-810D PARA

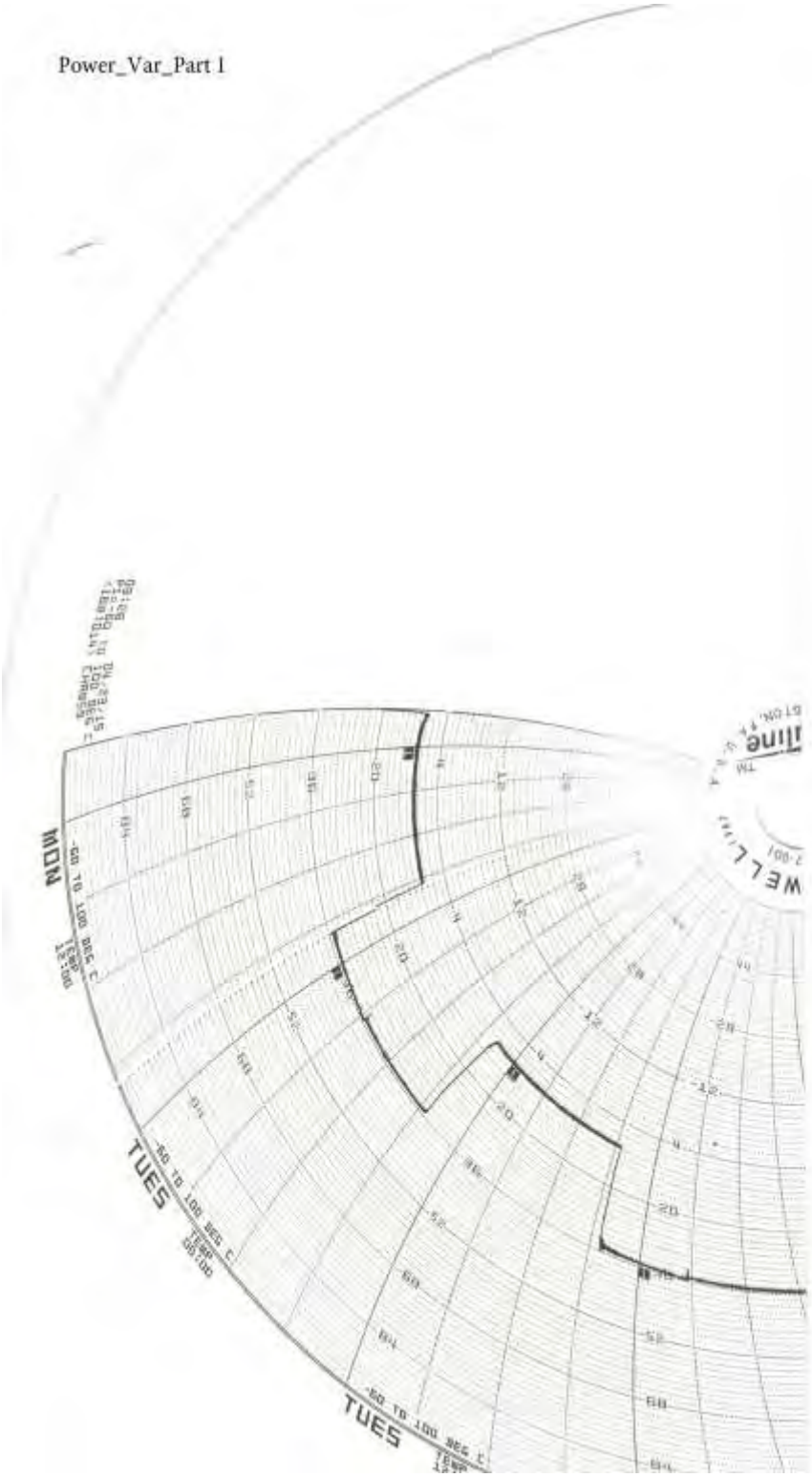
DATE	TIME	LOG ENTRIES	INITIALS
04/29/19	10:50	Set VAC to 117vlts & ramp to +10c	RSP
	11:00	Start dwell at 117vlts & +10c for 4hrs	RSP
	15:00	Lower VAC to 105vlts & dwell for 4hrs	CL
	19:00	Raise VAC to 129vlts & dwell for 4hrs	KM
	23:00	Lower VAC to 117vlts & Raise temperature to +35c & dwell for 4hrs	KM
04/30/19	03:00	Lower VAC to 105vlts & dwell for 4hrs	KM
	07:00	Raise VAC to 129vlts & dwell for 4hrs	GM
	11:00	Lower VAC to 117vlts & Lower temperature to +10c & dwell for 4hrs	CL
	15:00	Lower VAC to 105vlts & dwell for 4hrs	CL
	19:00	Raise VAC to 129vlts & dwell for 4hrs	KM
	23:00	Lower VAC to 117vlts & Raise temperature to +35c & dwell for 4hrs	KM
05/01/19	03:00	Lower VAC to 105vlts & dwell for 4hrs	KM
	07:00	Raise VAC to 129vlts & dwell for 4hrs	GM
	11:00	Lower VAC to 117vlts & ramp to +23c ambient	RSP
	11:00	Temp and power variation portion of test has completed	RSP
	11:00	Test will continue to run at +23c ambient for another 37hrs	KM
05/03/19	17:15	Lab took a brief power loss UUT's did power off but recovered when powered back on	KM
05/03/19	24:00	All Testing complete for a total of 85hrs	KM
		Note:All test pass or fail determinations decided by Pro V&V Inc.	
		Part Name & S/N's Below	
		Interscan HiPro, S/N - 0078K28	
		Interscan HiPro, S/N - 0080K28	
		ICP2, S/N - FAL18480494	
		ICP2, S/N - FAL18480510	

PAGE 1 OF 1

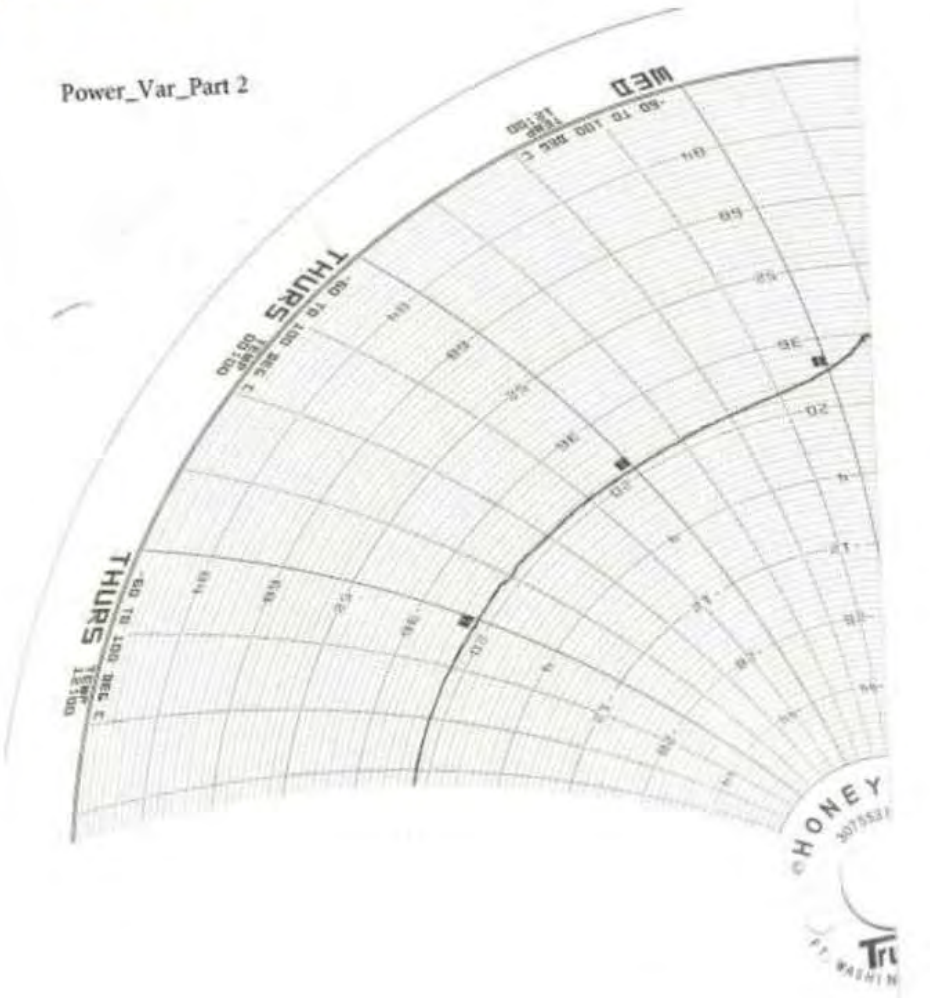
TEST BY Kerry Martin **DATE** 05/03/19

ENGINEER **GOV'T QAR** N/A

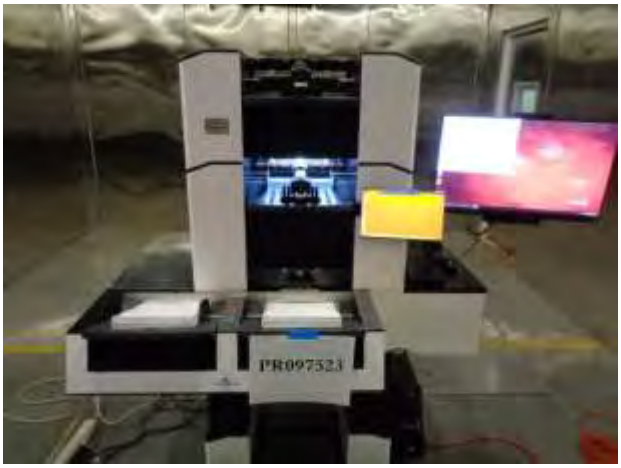
TEST DATA



Power_Var_Part 2



TEST SETUP


PR097523

PR097523

DOMINION VOTING
PR097523

DOMINION VOTING
PR097523

TEST EQUIPMENT

Test Title:	Temperature Power Variation Test		
Customer:	Pro V&V Inc	**Date:**	04/29/19
Part Name:	See Below		PR097523
Part No.:	N/A	**MJO No.:**	
Serial No.:	See Below	**P.O. No.:**	
Test Spec:	MIL-STD-810D	**NTS Eng.:**	
		Revision:	

Equipment	Manufacture / Model	NTS I.D. #	Cal. Date	In-Service	Due Date
Chamber 59	N/A	1733	N/A	Yes	N/A
Controller	Watlow F4	1653	09/21/18	Yes	09/21/19
Chart Recorder	Honeywell	1654	09/21/18	Yes	09/21/19
Part Name & S/N's Below					
Interscan HiPro	S/N - 0078K28				
Interscan HiPro	S/N - 0080K28				
ICP2	S/N - FAL18480494				
ICP2	S/N - FAL18480510				

Test By: Kerry Martin **Date:** 05/03/19

Page 1 **of** 1 **Engr.:** **Govt. QAR:**

END OF REPORT

U. S. ELECTION ASSISTANCE COMMISSION
VOTING SYSTEM TESTING AND CERTIFICATION PROGRAM
1335 East West Highway, Suite 4300
Silver Spring, MD 20910

September 4, 2019 **Sent via e-mail**

Ian Piper, Director of Certification
Dominion Voting Systems
1201 18th Street, Suite 210
Denver, CO 80202

Re: Initial Decision on Certification

Dear Mr. Piper,

This correspondence is to inform you that the Dominion Democracy Suite 5.5-B voting system completed the initial step towards receipt of an EAC certification. This Initial Decision on Certification represents an EAC acknowledgement that Democracy Suite 5.5-B has successfully completed conformance testing to the *Voluntary Voting System Guidelines version 1.0*.

However, as provided in §5.9 of the EAC's *Voting System Testing and Certification Program Manual* (Certification Manual), for an Initial Decision to become final and to issue a certification number and a Certificate of Conformance, a manufacturer must provide documentation to the Program Director verifying that the trusted build has been performed, software has been deposited in an approved repository, and system identification tools are available to election officials. A manufacturer must submit a letter, signed by both its management representative and an SLI Compliance official, stating (under penalty of law) that it has:

1. Performed a trusted build consistent with the requirements of §5.6 of the EAC's Certification Manual;
2. Deposited software consistent with §5.7 of the EAC's Certification Manual;
3. Created and made available system identification tools consistent with §5.8 of the EAC's Certification Manual (a copy and description of the system identification tool developed must be provided with the letter); and
4. Upon a final decision to grant certification, the manufacturer accepts the certification and all conditions placed on the certification.

Upon receipt of documentation demonstrating the successful completion of the requirements above and recommendation of the Program Director, I will issue an Agency Decision granting certification and provide Dominion Democracy Suite 5.5-B with a certification number and Certificate of Conformance.

If you have any questions or need further information, please do not hesitate to contact Jerome Lovato at your earliest convenience. I thank you in advance for your time and attention to this matter.

Sincerely,

Brian D. Newby
Executive Director
Decision Authority

Cc: Jerome Lovato, EAC
Jack Cobb, Pro V&V

U. S. ELECTION ASSISTANCE COMMISSION
VOTING SYSTEM TESTING AND CERTIFICATION PROGRAM
1335 East West Highway, Suite 4300
Silver Spring, MD 20910

September 4, 2019 **Sent via e-mail**

Ian Piper, Director of Certification
Dominion Voting Systems
1201 18th Street, Suite 210
Denver, CO 80202

Re: Initial Decision on Certification

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If you have any questions or need further information, please do not hesitate to contact Jerome Lovato at your earliest convenience. I thank you in advance for your time and attention to this matter.

Sincerely,

Brian D. Newby
Executive Director
Decision Authority

Cc: Jerome Lovato, EAC
Jack Cobb, Pro V&V

U. S. Election Assistance Commission
Voting System Testing and Certification Program
1335 East West Highway, Suite 4300
Silver Spring, MD 20910

September 12, 2019

Ian Piper, Director of Certification
Dominion Voting Systems
1201 18th Street, Suite 210
Denver, CO 80202

Sent via e-mail

Re: Agency Decision – Grant of Certification

Dear Mr. Piper,

As required under §5.9 of the EAC's Voting System Testing and Certification Program Manual, Dominion Voting Systems and Pro V&V have provided the necessary documentation for the Dominion Democracy Suite 5.5-B voting system verifying that 1) the trusted build has been performed, 2) software has been deposited in an approved repository, 3) system identification tools are available to election officials, and 4) signed a letter stating, under penalty of law, that you have:

1. Performed a trusted build consistent with the requirements of §5.6 of the EAC's Certification Manual;
2. Deposited software consistent with §5.7 of the EAC's Certification Manual;
3. Created and made available system identification tools consistent with §5.8 of the EAC's Certification Manual (a copy and description of the system identification tool developed must be provided with the letter); and
4. Upon a final decision to grant certification, the manufacturer accepts the certification and all conditions placed on the certification.

Based on the review of the documentation above and the fact that the Dominion Democracy Suite 5.5-B voting system successfully completed conformance testing to the 2005 Voluntary Voting System Guidelines (2005 VVSG), the Voting System Testing & Certification Program Director has recommended EAC certification of this system.

I have reviewed all of the documentation and concur with the Program Director's recommendation. As such, I hereby grant EAC Certification to the Dominion Democracy Suite 5.5-B voting system to the 2005 Voluntary Voting System Guidelines.

The EAC certification number issued for this system is: **DVS-DemSuite5.5-B**. In addition, a Certificate of Conformance shall be provided to Dominion Voting Systems as evidence of the EAC certification of the Dominion Democracy Suite 5.5-B voting system. The Certificate of Conformance shall be provided to Dominion Voting Systems no later than five business days from the date of this letter, and it shall be posted on the EAC's Web site.

As stated in §5.11 of the EAC's Certification Manual, *the EAC certification and certificate apply only to the specific voting system configuration(s) identified, submitted, and evaluated under the Certification Program. Any modification to the system not authorized by the EAC shall void the certificate.*

If you have any questions or need further information, please do not hesitate to contact Jerome Lovato at your earliest convenience. I thank you in advance for your time and attention to this matter and congratulate on this achievement.

Sincerely,

Brian D. Newby
Executive Director
Decision Authority

cc: Jack Cobb, Pro V&V

United States Election Assistance Commission

Certificate of Conformance

Dominion Voting Systems
Democracy Suite 5.5-B

VVSG 2005 VER. I

EAC CERTIFIED

The voting system identified on this certificate has been evaluated at an accredited voting system testing laboratory for conformance to the *Voluntary Voting System Guidelines Version 1.0 (VVSG 1.0)* . Components evaluated for this certification are detailed in the attached Scope of Certification document. This certificate applies only to the specific version and release of the product in its evaluated configuration. The evaluation has been verified by the EAC in accordance with the provisions of the EAC *Voting System Testing and Certification Program Manual* and the conclusions of the testing laboratory in the test report are consistent with the evidence adduced. This certificate is not an endorsement of the product by any agency of the U.S. Government and no warranty of the product is either expressed or implied.

Product Name: Democracy Suite

Model or Version: 5.5-B

Name of VSTL: Pro V&V

EAC Certification Number: DVS-DemSuite5.5-B

Date Issued: September 11, 2019

Executive Director
U.S. Election Assistance Commission

Scope of Certification Attached

Scope of Certification

This document describes the scope of the validation and certification of the system defined above. Any use, configuration changes, revision changes, additions or subtractions from the described system are not included in this evaluation.

Significance of EAC Certification

An EAC certification is an official recognition that a voting system (in a specific configuration or configurations) has been tested to and has met an identified set of Federal voting system standards. An EAC certification is **not**:

- An endorsement of a Manufacturer, voting system, or any of the system's components.
- A Federal warranty of the voting system or any of its components.
- A determination that a voting system, when fielded, will be operated in a manner that meets all HAVA requirements.
- A substitute for State or local certification and testing.
- A determination that the system is ready for use in an election.
- A determination that any particular component of a certified system is itself certified for use outside the certified configuration.

Representation of EAC Certification

Manufacturers may not represent or imply that a voting system is certified unless it has received a Certificate of Conformance for that system. Statements regarding EAC certification in brochures, on Web sites, on displays, and in advertising/sales literature must be made solely in reference to specific systems. Any action by a Manufacturer to suggest EAC endorsement of its product or organization is strictly prohibited and may result in a Manufacturer's suspension or other action pursuant to Federal civil and criminal law.

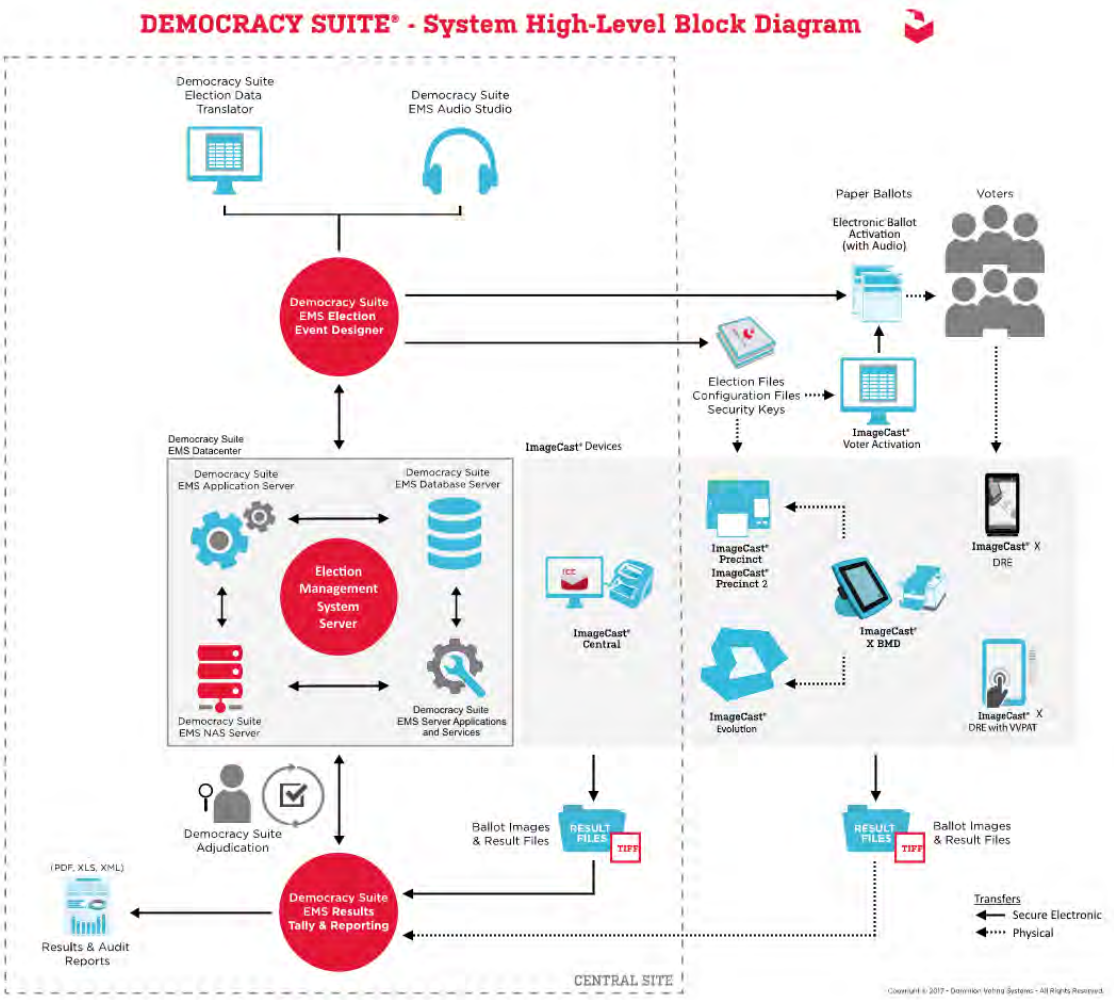
System Overview:

The D-Suite 5.5-B Voting System is a paper-based optical scan voting system with a hybrid paper/DRE option consisting of the following major components: The Election Management System (EMS), the ImageCast Central (ICC), the ImageCast Precinct (ICP and ICP2), the ImageCast Evolution (ICE), the ImageCast X (ICX) DRE w/ Reports Printer, ImageCast X (ICX) DRE w/ voter-verifiable paper audit trail (VVPAT), and the ImageCast X ballot marking device (BMD). The D-Suite 5.5-B Voting System configuration is a modification from the EAC approved D-Suite 5.5 system configuration.

Language capability:

System supports Alaska Native, Apache, Bengali, Chinese, English, Eskimo, Filipino, French, Hindi, Japanese, Jicarilla, Keres, Khmer, Korean, Navajo, Seminole, Spanish, Thai, Towa, Ute, Vietnamese, and Yuman.

Democracy Suite 5.5-B System Diagram



Components Included:

This section provides information describing the components and revision level of the primary components included in this Certification.

Voting System Software Components:

System Component	Software or Firmware Version	Operating System or COTS	Comments
EMS Election Event Designer (EED)	5.5.32.4	Windows 10 Pro	EMS
EMS Results Tally and Reporting (RTR)	5.5.32.4	Windows 10 Pro	EMS
EMS Application Server	5.5.32.4	Windows Server 2012 R2 Windows 10 Pro	EMS
EMS File System Service (FSS)	5.5.32.4	Window 10 Pro	EMS
EMS Audio Studio (AS)	5.5.32.4	Windows 10 Pro	EMS
EMS Data Center Manager (DCM)	5.5.32.4	Windows Server 2012 R2 Windows 10 Pro	EMS
EMS Election Data Translator (EDT)	5.5.32.4	Windows 10 Pro	EMS
ImageCast Voter Activation (ICVA)	5.5.32.4	Windows 10 Pro	EMS
EMS Adjudication (ADJ)	5.5.32.4	Windows 10 Pro	EMS
EMS Adjudication Services	5.5.32.4	Windows 10 Pro	EMS
Smart Card Helper Service (SCHS)	5.5.32.4	Windows 10 Pro	EMS
Election Firmware	5.5.31.1	uClinux	ICP
Firmware Updater	5.5.31.1	uClinux	ICP
Firmware Extractor	5.5.31.1	uClinux	ICP
Kernel (uClinux)	5.5.31.1	Modified COTS	ICP
Boot Loader (COLILO)	20040221	Modified COTS	ICP
Asymmetric Key Generator	5.5.31.1	uClinux	ICP
Asymmetric Key Exchange Utility	5.5.31.1	uClinux	ICP
Firmware Extractor (Technician Key)	5.5.31.1	uClinux	ICP
ICP2 Application	5.5.1.8	uClinux	ICP2
ICP2 Update Card	5.5.1.8	uClinux	ICP2
Voting Machine	5.5.6.5	Ubuntu Linux	ICE
Election Application	5.5.6.5	Ubuntu Linux	ICE
ImageCast Central Application	5.5.32.5	Windows 10 Pro	ICC
ICX Application	5.5.13.2	Android 5.1.1 (ICX Prime) Android 4.4.4 (ICX Classic)	ICX

Voting System Platform:

System Component	Version	Operating System or COTS	Comments
Microsoft Windows Server	2012 R2 Standard	Unmodified COTS	EMS Server SW Component
Microsoft Windows	10 Professional	Unmodified COTS	EMS Client/Server SW Component
.NET Framework	3.5	Unmodified COTS	EMS Client/Server SW Component
Microsoft Visual J#	2.0	Unmodified COTS	EMS Client/Server SW Component
Microsoft Visual C++ 2013 Redistributable	2013	Unmodified COTS	EMS Client/Server SW Component
Microsoft Visual C++ 2015 Redistributable	2015	Unmodified COTS	EMS Client/Server SW Component

System Component	Version	Operating System or COTS	Comments
Java Runtime Environment	7u80	Unmodified COTS	EMS Client/Server SW Component
Java Runtime Environment	8u144	Unmodified COTS	EMS Client/Server SW Component
Microsoft SQL Server 2016Standard	2016 Standard	Unmodified COTS	EMS Client/Server SW Component
Microsoft SQL Server 2016 Service Pack 1	2016 SP1	Unmodified COTS	EMS Client/Server SW Component
Microsoft SQL Server 2016 SP1 Express	2016 SP1	Unmodified COTS	EMS Client/Server SW Component
Cepstral Voices	6.2.3.801	Unmodified COTS	EMS Client/Server SW Component
Arial Narrow Fonts	2.37a	Unmodified COTS	EMS Client/Server SW Component
Maxim iButton Driver	4.05	Unmodified COTS	EMS Client/Server SW Component
Adobe Reader DC	AcrobatDC	Unmodified COTS	EMS Client/Server SW Component
Microsoft Access Database Engine	2010	Unmodified COTS	EMS Client/Server SW Component
Open XML SDK 2.0 for Microsoft Office	2.0	Unmodified COTS	EMS Client/Server SW Component
Infragistics NetAdvantage Win Forms 2011.1	2011 Vol. 1	Unmodified COTS	EMS SW Platform
Infragistics NetAdvantage WPF 2012.1	2012 Vol. 1	Unmodified COTS	EMS SW Platform
TX Text Control Library for .NET	16.0	Unmodified COTS	EMS SW Platform
SOX	14.3.1	Unmodified COTS	EMS SW Platform
NLog	1.0.0.505	Unmodified COTS	EMS SW Platform
iTextSharp	5.0.5	Unmodified COTS	EMS SW Platform
OpenSSL	1.0.2K	Unmodified COTS	EMS SW Platform
OpenSSL FIPS Object Module	2.0.14 (Cert 1747)	Unmodified COTS	EMS SW Platform
SQLite	1.0.103.0	Unmodified COTS	EMS SW Platform
Lame	3.99.4	Unmodified COTS	EMS SW Platform
Speex	1.0.4	Unmodified COTS	EMS SW Platform
Ghostscript	9.04	Unmodified COTS	EMS SW Platform
One Wire API for .NET	4.0.2.0	Unmodified COTS	EMS SW Platform
Avalon-framework-cvs-20020806	20020806	Unmodified COTS	EMS SW Platform
Batik	0.20-5	Unmodified COTS	EMS SW Platform
Fop	0.20-5	Unmodified COTS	EMS SW Platform
Microsoft Visual J# 2.0 Redistributable Package – Second Edition (x64)	2.0	Unmodified COTS	EMS SW Platform
Entity framework	6.1.3	Unmodified COTS	EMS SW Platform
Spreadsheetlight	3.4.3	Unmodified COTS	EMS SW Platform
Open XML SDK 2.0 for Microsoft Office	2.0.5022.0	Unmodified COTS	EMS SW Platform
Open SSL	1.0.2K	Unmodified COTS	ICP
OpenSSL FIPS Object Module	2.0.10 (Cert 1747)	Unmodified COTS	ICP
Zlib	1.2.3	Unmodified COTS	ICP
uClinux	20070130	Modified COTS	ICP
Kernel (Linux)	2.6.30.9-dvs-36	Modified COTS	ICE

System Component	Version	Operating System or COTS	Comments
U-Boot	1.3.4	Modified COTS	ICE
Google Text-to-Speech Engine	3.11.12	Unmodified COTS	ICX SW
Kernel	4.9.11	Modified COTS	ICP2
U-Boot	2017.03	Modified COTS	ICP2
Zxing Barcode Scanner	4.7.5	Modified COTS	ICX SW
SoundTouch	1.9.2	Modified COTS	ICX SW
ICX Prime Android 5.1.1 Image	0405	Modified COTS	ICX SW
ICX Classic Android 4.4.4 Image	0.0.98	Modified COTS	ICX SW
OpenSSL FIPS Object Module	2.0.10 (Cert 2473)	Unmodified COTS	ICX SW Build Library
OpenSSL	1.0.2K	Unmodified COTS	ICC SW Build Library
OpenSSL FIPS Object Module	2.0.10 (Cert 1747)	Unmodified COTS	ICC SW Build Library
1-Wire Driver (x86)	4.05	Unmodified COTS	ICC Runtime SW
1-Wire Driver (x64)	4.05	Unmodified COTS	ICC Runtime SW
Canon DR-G1130 TWAIN Driver	1.2 SP6	Unmodified COTS	ICC Runtime SW
Canon DR-G160II TWAIN Driver	1.2 SP6	Unmodified COTS	ICC Runtime SW
Canon DR-M260 TWAIN Driver,	1.1 SP2	Unmodified COTS	ICC Runtime SW
InoTec HiPro 821 TWAIN Driver	1.2.3.17	Unmodified COTS	ICC Runtime SW
Visual C++ 2013 Redistributable (x86)	12.0.30501	Unmodified COTS	ICC Runtime SW
Machine Configuration File (MCF)	5.5.12.1_20190510	Proprietary	ICX Configuration File
Device Configuration File (DCF)	5.5.31_20190423	Proprietary	ICP and ICC Configuration File
ICE Machine Behavior Settings	5.5.6.3 20190512	Proprietary	ICE Configuration
ICP2 Machine Behavior Settings	5.5.1.4 20190510	Proprietary	ICP2 Configuration

Hardware Components:

System Component	Hardware Version	Proprietary or COTS	Comments
ImageCast Precinct (ICP)	PCOS-320C	Proprietary	Precinct Scanner
ImageCast Precinct (ICP)	PCOS-320A	Proprietary	Precinct Scanner
ImageCast 2 Precinct (ICP2)	PCOS-330A	Proprietary	Precinct Scanner
ImageCast Evolution (ICE)	PCOS-410A	Proprietary	Precinct Scanner
ICP Ballot Box	BOX-330A	Proprietary	Ballot Box
ICP Ballot Box	BOX-340C	Proprietary	Ballot Box
ICP Ballot Box	BOX-341C	Proprietary	Ballot Box
ICP Ballot Box	ElectionSource IM-COLLAPSIBLE	Proprietary	Ballot Box
ICE Ballot Box	BOX-410A	Proprietary	Ballot Box
ICE Ballot Box	BOX-420A	Proprietary	Ballot Box
ICP2 Ballot Box	BOX-350A	Proprietary	Ballot Box
ICP2 Ballot Box	BOX-340C	Proprietary	Ballot Box
ICP2 Ballot Box	BOX-341C	Proprietary	Ballot Box
ICP2 Ballot Box	ElectionSource IM-COLLAPSIBLE	Proprietary	Ballot Box
ICX UPS Inline EMI Filter	1.0	Proprietary	EMI Filter
ICX Tablet (Classic)	aValue 15” Tablet (SID-15V)	COTS	Ballot Marking Device
ICX Tablet (Classic)	aValue 21” Tablet (SID-21V) (Steel or Aluminum chassis)	COTS	Ballot Marking Device
ICX Tablet (Prime)	aValue 21” Tablet (HID-21V) (Steel or Aluminum chassis)	COTS	Ballot Marking Device or Direct Recording Electronic
Thermal Printer	SII RP-D10	COTS	Report Printer

System Component	Hardware Version	Proprietary or COTS	Comments
Thermal Printer	KFI VRP3	COTS	Voter-verifiable paper audit trail (VVPAT)
Server	Dell PowerEdge R620	COTS	Standard Server
Server	Dell PowerEdge R630	COTS	Standard Server
Server	Dell PowerEdge R640	COTS	Standard Server
ICC Workstation HW	Dell OptiPlex 7440 All in One	COTS	
ICC Workstation HW	Dell OptiPlex 3050 All In One	COTS	
ICC Workstation HW	Dell OptiPlex 9030 All In One	COTS	
ICC Workstation HW	Dell OptiPlex 9020 All In One	COTS	
ICC Workstation HW	Dell OptiPlex 9010 All In One	COTS	
ICC Scanner	Canon imageFormula DR-G1130	COTS	Central Count Scanner
ICC Scanner	Canon imageFormula DR-M160II	COTS	Central Count Scanner
ICC Scanner	Canon imageFormula DR-M260	COTS	Central Count Scanner
ICC Scanner	InoTec HiPro 821	COTS	Central Count Scanner
ICC Scanner	Dell Optiplex 7050	COTS	
ICC Scanner	Dell 2418HT Monitor	COTS	
Client Workstation HW and Express Server	Dell Precision 3430	COTS	
Client Workstation HW and Express Server	Dell Precision 3431	COTS	
Client Workstation HW and Express Server	Dell Precision T3420	COTS	
Client Workstation HW	Dell Precision T1700	COTS	
Client Workstation HW	Dell Latitude 3400	COTS	
Client Workstation HW	Dell Latitude 3490	COTS	
Client Workstation HW	Dell Latitude E3480	COTS	
Client Workstation HW	Dell Latitude E3470	COTS	
Client Workstation HW	Dell Latitude E7450	COTS	
ICX Printer	HP LaserJet Pro Printer M402dn	COTS	
ICX Printer	HP LaserJet Pro Printer M402dne	COTS	
Monitor	Dell Monitor KM632	COTS	
Monitor	Dell Monitor P2414Hb	COTS	
Monitor	P2419H	COTS	
Monitor	P2417H	COTS	
Monitor	Dell Ultrasharp 24” Monitor U2414H	COTS	
CD/DVD Reader	Dell DVD Multi Recorder GP60NB60	COTS	
iButton Programmer	Maxim iButton Programmer DS9490R# with DS1402-RP8+	COTS	
UPS	Tripp Lite SMART1500RMXL2U	COTS	
UPS	APC SMT1500C Smart-UPS	COTS	
UPS	APC SMT1500 Smart-UPS	COTS	
UPS	APC BE600M1	COTS	
UPS	APC BR1000G	COTS	
Network Switch	Dell X1008	COTS	
Network Switch	Dell X1018	COTS	
Network Switch	Dell X1026	COTS	
Network Switch	Dell PowerConnect 2808	COTS	
Sip and Puff	Enabling Devices #972	COTS	
Headphones	Cyber Acoustics ACM-70 and ACM-70B	COTS	
4-way Joystick Controller	S26	Modified COTS	

System Component	Hardware Version	Proprietary or COTS	Comments
Rocker (Paddle) Switch	Enabling Device #971	COTS	
Rocker (Paddle) Switch	AbleNet 10033400 (2x)	COTS	
CF Card Reader	IOGEAR SDHC/microSDHC 0U51USC410	COTS	
CF Card Dual-Slot Reader	Lexar USB 3.0	COTS	
CF Card Reader	Hoodman Steel USB 3.0 102015	COTS	
CF Card Reader	Lexar Professional CFR1	COTS	
CF Card Reader	Kingston FCR-HS4	COTS	
ATI	ATI handset	Proprietary	
ATI	ATI-USB handset	Proprietary	
ACS PC-Linked Smart Card Reader	ACR38	COTS	
ACS PC-Linked Smart Card Reader	ACR39	COTS	

System Limitations

This table depicts the limits the system has been tested and certified to meet.

Characteristic	Limiting Component	Limit	Comment
Ballot positions	Ballot	292*/462**	Landscape Ballot: 240 candidates + 24 write-ins + 28 Yes/No choices.
Precincts in an election	EMS	1000; 250	Standard; Express
Contests in an election	EMS	1000; 250	Standard; Express
Candidates/Counters in an election	EMS	10000; 2500	Standard; Express
Candidates/Counters in a precinct	Ballot	240*/462**	Both
Candidates/Counters in a tabulator	Tabulator	10000; 2500	Standard; Express
Ballot Styles in an election	Tabulator	3000; 750	Standard; Express
Ballot IDs in a tabulator	Tabulator	200	Both
Contests in a ballot style	Ballot	38*/156**	Both
Candidates in a contest	Ballot	240*/231**	Both
Ballot styles in a precinct	Tabulator	5	Both
Number of political parties	Tabulator	30	Both
“vote for” in a contest	Ballot	24*/30**	Both
Supported languages in an election	Tabulator	5	Both
Number of write-ins	Ballot	24*/462**	Both

* Reflects the system limit for a ballot printed in landscape.

** Reflects the system limit for a ballot printed in portrait.

Functionality

2005 VVSG Supported Functionality Declaration

Feature/Characteristic	Yes/No	Comment
Voter Verified Paper Audit Trails		
VVPAT	YES	
Accessibility		
Forward Approach	YES	
Parallel (Side) Approach	YES	
Closed Primary		
Primary: Closed	YES	
Open Primary		
Primary: Open Standard (provide definition of how supported)	YES	
Primary: Open Blanket (provide definition of how supported)	YES	
Partisan & Non-Partisan:		
Partisan & Non-Partisan: Vote for 1 of N race	YES	
Partisan & Non-Partisan: Multi-member ("vote for N of M") board races	YES	
Partisan & Non-Partisan: "vote for 1" race with a single candidate and write-in voting	YES	
Partisan & Non-Partisan "vote for 1" race with no declared candidates and write-in voting	YES	
Write-In Voting:		
Write-in Voting: System default is a voting position identified for write-ins.	YES	
Write-in Voting: Without selecting a write in position.	NO	
Write-in: With No Declared Candidates	YES	
Write-in: Identification of write-ins for resolution at central count	YES	
Primary Presidential Delegation Nominations & Slates:		
Primary Presidential Delegation Nominations: Displayed delegate slates for each presidential party	YES	
Slate & Group Voting: one selection votes the slate.	YES	
Ballot Rotation:		
Rotation of Names within an Office; define all supported rotation methods for location on the ballot and vote tabulation/reporting	YES	Equal time rotation
Straight Party Voting:		
Straight Party: A single selection for partisan races in a general election	YES	
Straight Party: Vote for each candidate individually	YES	
Straight Party: Modify straight party selections with crossover votes	YES	
Straight Party: A race without a candidate for one party	YES	
Straight Party: "N of M race (where "N">1)	YES	
Straight Party: Excludes a partisan contest from the straight party selection	YES	

Feature/Characteristic	Yes/No	Comment
Cross-Party Endorsement:		
Cross party endorsements, multiple parties endorse one candidate.	YES	
Split Precincts:		
Split Precincts: Multiple ballot styles	YES	
Split Precincts: P & M system support splits with correct contests and ballot identification of each split	YES	
Split Precincts: DRE matches voter to all applicable races.	YES	
Split Precincts: Reporting of voter counts (# of voters) to the precinct split level; Reporting of vote totals is to the precinct level	YES	
Vote N of M:		
Vote for N of M: Counts each selected candidate, if the maximum is not exceeded.	YES	
Vote for N of M: Invalidates all candidates in an overvote (paper)	YES	
Recall Issues, with options:		
Recall Issues with Options: Simple Yes/No with separate race/election. (Vote Yes or No Question)	YES	
Recall Issues with Options: Retain is the first option, Replacement candidate for the second or more options (Vote 1 of M)	NO	
Recall Issues with Options: Two contests with access to a second contest conditional upon a specific vote in contest one. (Must vote Yes to vote in 2nd contest.)	NO	
Recall Issues with Options: Two contests with access to a second contest conditional upon any vote in contest one. (Must vote Yes to vote in 2nd contest.)	NO	
Cumulative Voting		
Cumulative Voting: Voters are permitted to cast, as many votes as there are seats to be filled for one or more candidates. Voters are not limited to giving only one vote to a candidate. Instead, they can put multiple votes on one or more candidate.	NO	
Ranked Order Voting		
Ranked Order Voting: Voters can write in a ranked vote.	NO	
Ranked Order Voting: A ballot stops being counting when all ranked choices have been eliminated	NO	
Ranked Order Voting: A ballot with a skipped rank counts the vote for the next rank.	NO	
Ranked Order Voting: Voters rank candidates in a contest in order of choice. A candidate receiving a majority of the first choice votes wins. If no candidate receives a majority of first choice votes, the last place candidate is deleted, each ballot cast for the deleted candidate counts for the second choice candidate listed on the ballot. The process of eliminating the last place candidate and recounting the ballots continues until one candidate receives a majority of the vote	NO	

Feature/Characteristic	Yes/No	Comment
Ranked Order Voting: A ballot with two choices ranked the same, stops being counted at the point of two similarly ranked choices.	NO	
Ranked Order Voting: The total number of votes for two or more candidates with the least votes is less than the votes of the candidate with the next highest number of votes, the candidates with the least votes are eliminated simultaneously and their votes transferred to the next-ranked continuing candidate.	NO	

Feature/Characteristic	Yes/No	Comment
Provisional or Challenged Ballots		
Provisional/Challenged Ballots: A voted provisional ballots is identified but not included in the tabulation, but can be added in the central count.	YES	
Provisional/Challenged Ballots: A voted provisional ballots is included in the tabulation, but is identified and can be subtracted in the central count	NO	
Provisional/Challenged Ballots: Provisional ballots maintain the secrecy of the ballot.	YES	
Overvotes (must support for specific type of voting system)		
Overvotes: P & M: Overvote invalidates the vote. Define how overvotes are counted.	YES	Overvotes cause a warning to the voter and can be configured to allow voter to override.
Overvotes: DRE: Prevented from or requires correction of overvoting.	YES	
Overvotes: If a system does not prevent overvotes, it must count them. Define how overvotes are counted.	YES	If allowed via voter override, overvotes are tallied separately.
Overvotes: DRE systems that provide a method to data enter absentee votes must account for overvotes.	N/A	
Undervotes		
Undervotes: System counts undervotes cast for accounting purposes	YES	
Blank Ballots		
Totally Blank Ballots: Any blank ballot alert is tested.	YES	Precinct voters receive a warning; both precinct and central scanners will warn on blank ballots.
Totally Blank Ballots: If blank ballots are not immediately processed, there must be a provision to recognize and accept them	YES	Blank ballots are flagged. These ballots can be manually examined and then be scanned and accepted as blank; or precinct voter can override and accept.
Totally Blank Ballots: If operators can access a blank ballot, there must be a provision for resolution.	YES	Operators can examine a blank ballot, re-mark if needed and allowed, and then re-scan it.
Networking		
Wide Area Network – Use of Modems	NO	
Wide Area Network – Use of Wireless	NO	

Feature/Characteristic	Yes/No	Comment
Local Area Network – Use of TCP/IP	YES	Client/server only
Local Area Network – Use of Infrared	NO	
Local Area Network – Use of Wireless	NO	
FIPS 140-2 validated cryptographic module	YES	
Used as (if applicable):		
Precinct counting device	YES	ImageCast Precinct
Central counting device	YES	ImageCast Central

Baseline Certification Engineering Change Orders (ECO)

ECO #	Component	Description
100503	ICP PCOS-320C & ICP PCOS-320A	Adding a COTS collapsible ballot box to AVL for use with the ICP
100521	Servers and Workstations	Added DELL P2419H monitor as a display device.
100527	EMS Workstations.	Added DELL Latitude 3490 computer with updated i3-8130U processor (Dual Core, 4MB Cache, 2.2GHz) to DVS PN 190-000061 (a client workstation).
100543	ICC Scanner	Update to the DR-G1130 Scanner LCD Panel User Interface.
100588	ICX Workstation	Added new models of VVPAT printer for use with the D-Suite ICX workstation due to previous model becoming commercially unavailable
100596	EMS Workstation	Added DELL Latitude 3400 computer as a client workstation due to the DELL Latitude 3490 computer becoming commercially unavailable for purchase
100597	EMS Server	Added DELL PowerEdge R640 computer with new processor and RAM as an AVL to the existing R640 server computer configurations
100602	EMS Server and Workstations	Added DELL Precision 3431 computer in an EMS Express Server and EMS Client Workstation configuration due to the DELL Precision 3430 computer becoming commercially unavailable for purchase
100603	ICC Scanner	Added DELL P2418HT monitor as a display device for ICC HiPro scanner workstation configuration due to the Lenovo 10QXPAR1US monitor becoming commercially unavailable for purchase