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Report Number:	**ERB20420, Rev. A**
Report Type:	**Engineering-level**
Reference Standard:	**IEC 61000-4-3, Ed. 3.0 (2006-02) + A1 (2007-11) + A2 (2010-03)** **EN 61000-4-3: 2006 + A1: 2008 + A2: 2010**
Date of Report:	**2 May 2012**
Product Name:	**Assure 1.3 AccuVote-OS MRAM Memory Card**
Model Number:	**181-001004**
Serial Number:	**42170 (SE) (Model D)**
Manufacturer:	**Dominion Voting Systems, Inc.**
Representative:	**Darrick Forester (SLI Global Solutions)**
Approved By:	

Prepared for:

Dominion Voting Systems, Inc.
1201 18th Street, Suite 210
Denver, Colorado 80202
Phone: 720-257-5209 x9221
Email: ian.piper@dominionvoting.com

Customer Representative:

Darrick Forester
Hardware Specialist
SLI Global Solutions

Tested at:

EMC Integrity, Inc.
1736 Vista View Drive
Longmont, Colorado 80504

Revision	Description of Revision	Date:
Rev. -	Initial Release	24 April 2012
Rev. A	Changes per client email request of 4-26-2012	2 May 2012

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LIST OF APPENDICES

1.0 SCOPE

This report outlines the engineering-level immunity testing that was performed on a piece of information technology equipment. The purpose of this test was to give a level of confidence that the new memory card in this unit complied with the RF immunity requirements of IEC/EN 61000-4-3.

2.0 PRODUCT DESCRIPTION

The product name was the Assure 1.3 AccuVote-OS MRAM Memory Card manufactured by Dominion Voting Systems, Inc. located in Denver, Colorado. The model number of the unit tested was 181-001004 and the serial number was 42170 (SE). This product is 128Kb data storage card using MRAM based memory and specifically designed for use with the Dominion's AccuVote-OS optical scan unit with its 40-pin card edge connector interface.

3.0 TEST DESCRIPTION

One immunity test was performed on this product, and this is defined as follows:

3.4 Radiated RF Immunity. Radiated RF immunity testing was performed on the UUT over the frequency range from 80 MHz to 1.0 GHz in 1% frequency increments. The UUT was a table-top device, which was placed on a non-conductive table 80 cm tall at a distance of 2 meters from the radiating antenna. The height of the antenna was 2 meters. The magnitude of the impinged field was 10 V/m and this field was amplitude modulated with a 1 kHz sine wave to a depth of 80%. The UUT was oriented such that all four sides were illuminated over the entire frequency range. Testing was performed for both vertical and horizontal polarities.

4.0 TEST RESULTS

With the RS232 and phone cables disconnected from the unit, the UUT complied with all testing. (This was deemed acceptable since the UUT was the memory card.) Data sheets, test setup photographs and test equipment lists are all contained in Appendix A of this report.

APPENDIX A

Radiated RF Immunity Test Data

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Radiated RF Immunity per IEC / EN 61000-4-3

Manufacturer:	Dominion Voting Systems, Inc.	Project Number:	B20419
Customer Representative:	Darrick Forester	Test Area:	CALC
Model:	Assure 1.3 AccuVote - OS MRAM Memory Card (181-001004) Rev. 1	S/N:	42170 (SE) (Model D)
Standard Referenced:	IEC/EN 61000-4-3 (VVSG 2005)	Date:	April 17, 2012
Temperature:	27˚C Humidity: 32%	Pressure:	839 mb
Input Voltage:	120Vac/60Hz		
Configuration of Unit:	Normal Operation Mode		
Test Engineer:	M. Novak / T. Wittig		

B20420-4-3.doc FR0100

Frequency (MHz)	Modulation				Step Size (%)	Field (V/m)	Polarity (V or H)	Dwell (sec)	Comments	Criteria Met	Pass / Fail
	Type	%	Freq	Form							
80 - 1000	AM	80	1kHz	Sine	1	10	V	3	Front Side	A	Pass
80 - 1000	AM	80	1kHz	Sine	1	10	H	3		A	Pass
80 - 1000	AM	80	1kHz	Sine	1	10	V	3	Left Side	A	Pass
80 - 1000	AM	80	1kHz	Sine	1	10	H	3		A	Pass
80 - 1000	AM	80	1kHz	Sine	1	10	V	3	Back Side	A	Pass
80 - 1000	AM	80	1kHz	Sine	1	10	H	3		A	Pass
80 - 1000	AM	80	1kHz	Sine	1	10	V	3	Right Side	A	Pass
80 - 1000	AM	80	1kHz	Sine	1	10	H	3		A	Pass
Note: All testing performed without the RS232 and phone line cables attached.											

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Radiated RF Immunity per IEC / EN 61000-4-3

Manufacturer:	Dominion Voting Systems, Inc.	Project Number:	B20420
Customer Representative:	Darrick Forester	Test Area:	CALC
Model:	Assure 1.3 AccuVote - OS MRAM Memory Card (181-001004) Rev. 1	S/N:	42170 (SE) (Model D)
Standard Referenced:	IEC/EN 61000-4-3 (VVSG 2005)	Date:	April 17,2012

B20420-4-3.doc FR0100

Figure A1. Radiated RF Immunity Test Setup – Front Side.

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Radiated RF Immunity per IEC / EN 61000-4-3

Manufacturer:	Dominion Voting Systems, Inc.	Project Number:	B20420
Customer Representative:	Darrick Forester	Test Area:	CALC
Model:	Assure 1.3 AccuVote - OS MRAM Memory Card (181-001004) Rev. 1	S/N:	42170 (SE) (Model D)
Standard Referenced:	IEC/EN 61000-4-3 (VVSG 2005)	Date:	April 17,2012

B20420-4-3.doc FR0100

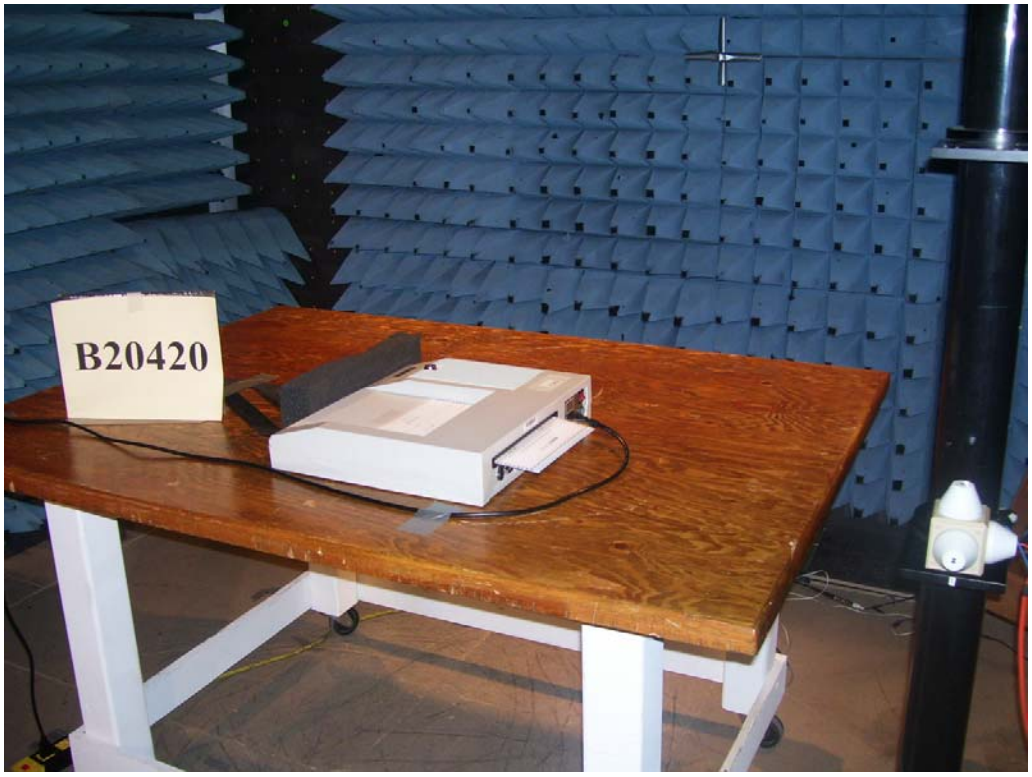

Figure A2. Radiated RF Immunity Test Setup – Right Side.

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Radiated RF Immunity per IEC / EN 61000-4-3

Manufacturer:	Dominion Voting Systems, Inc.	Project Number:	B20420
Customer Representative:	Darrick Forester	Test Area:	CALC
Model:	Assure 1.3 AccuVote - OS MRAM Memory Card (181-001004) Rev. 1	S/N:	42170 (SE) (Model D)
Standard Referenced:	IEC/EN 61000-4-3 (VVSG 2005)	Date:	April 17,2012

B20420-4-3.doc FR0100

Figure A3. Radiated RF Immunity Test Setup –Back Side.

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Radiated RF Immunity per IEC / EN 61000-4-3

Manufacturer:	Dominion Voting Systems, Inc.	Project Number:	B20420
Customer Representative:	Darrick Forester	Test Area:	CALC
Model:	Assure 1.3 AccuVote - OS MRAM Memory Card (181-001004) Rev. 1	S/N:	42170 (SE) (Model D)
Standard Referenced:	IEC/EN 61000-4-3 (VVSG 2005)	Date:	April 17,2012

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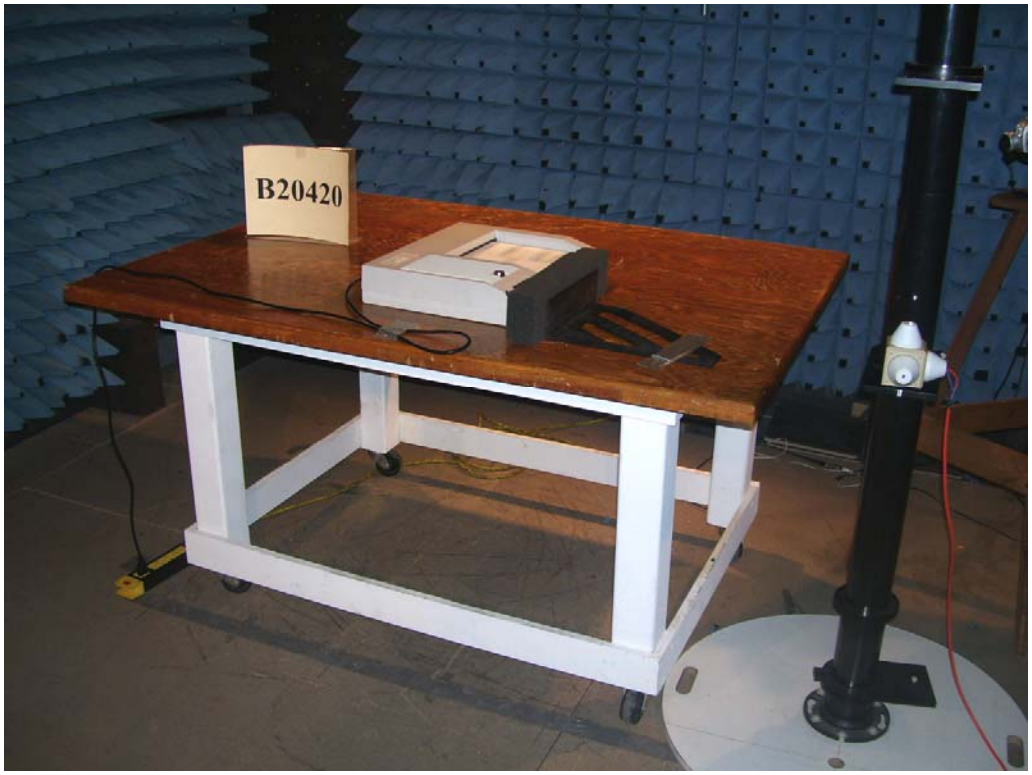

Figure A4. Radiated RF Immunity Test Setup – Left Side.

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Radiated RF Immunity per IEC / EN 61000-4-3

Manufacturer:	Dominion Voting Systems, Inc.	Project Number:	B20420
Customer Representative:	Darrick Forester	Test Area:	CALC
Model:	Assure 1.3 AccuVote - OS MRAM Memory Card (181-001004) Rev. 1	S/N:	42170 (SE) (Model D)
Standard Referenced:	IEC/EN 61000-4-3 (VVSG 2005)	Date:	April 17, 2012

B20420-4-3.doc FR0100

Test Equipment List

ID Number	Manufacturer	Model #	Serial #	Description	Cal Date	Cal Due
1024	Amplifier Research	FP4000	18358	Isotropic Field Probe (10 kHz - 1 GHz)	08/15/2011	08/15/2012
1055	Marconi	2024	112113/027	Signal Generator (9 kHz - 2.4 GHz)	05/10/2011	05/10/2012
1058	Ray Proof	RF Shield Room	6698	Completely Anechoic Lined Chamber	06/15/2011	06/15/2012
1181	EMCI	RFS	NA	Release 02 July 2004	NA	NA
1250	OPHIR	5127F	1034	RF Power Amplifier 20-1000MHz, 200 Watts	NA	NA
1404	EXTECH Instruments	445715	N/A	Hygro-Thermometer	08/17/2011	08/17/2012

APPENDIX B

Product Data Sheet

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1.0 Client Information

Client Information	
Manufacturer Name	Dominion Voting Systems, Inc.
Address	1201 18th Street, Suite 210
City	Denver
State	CO
Zip Code	80202
Client Representative	Ian Piper
Title	Director, Certification
Phone	720-257-5209 x9221
Fax	---
Email	ian.piper@dominionvoting.com

2.0 Product Information - General

Product Information	
Product Name (as it should appear on test report)	Assure 1.3 AccuVote-OS MRAM Memory Card
Model Number	181-001004
Functional description of product(Detailed)	128Kb data storage card using MRAM based memory and specifically designed for use with the Dominion's AccuVote-OS optical scan unit with its 40-pin card edge connector interface.
Product type (IT, Medical, Scientific, Industrial, etc.)	IT
Is the product an intentional radiator	No
Product Dimensions	Approx. 87mmL x 54mmW x 2.25mmH (5mm at grip)
Product Weight	Approx. 1 oz.
Will fork lift be required	No
Applicable Standards, if known	VVSG 2005
Describe all environment(s) where product will be used	Operating Environment: Temperature +5 to +38 ºC, Relative Humidity 30% - 90% (non-condensing). Storage environment: Temperature -15 to +40 ºC, Relative Humidity 5% to 95% (non-condensing).
Does product consist of multiple components? (If yes, please describe each system component)	No
Cycle time > 3 seconds? (If yes, How long?)	Ballot scan cycle is approx.. 3 seconds.
Highest internally generated frequency	None in memory card product. Supporting equip (AV-OS units) can generate 32.7MHz.
Product Set-up Time	Approx. 10 minutes
Boot up time in the event of an unintentional power down	Approx. 1 minute (including stepping through the program to get to the test point.)

Identify all I/O Connections as well as maximum associated cable lengths below

Model No.	Description	Shielded?	Length	Quantity
NA	NA			

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3.0 Power

Power Requirements	
Input Voltage Rating as it appears on unit, power supply, or power brick	Supporting equip (AV-OS unit, model D) uses 120Vac.
Input Current (specify @ 230 Vac/50 Hz)	Supporting equip (AV-OS unit, model D) uses 0.3Amps @120Vac 60/50Hz.
Single or Multi-Phase (If multi-phase, specify delta or wye)	Supporting equip (AV-OS unit, model D) uses single phase power.
Is input power connector two-prong (Hot & Neutral) or 3-prong (H, N, Ground)	Supporting equip (AV-OS unit, model B) uses a 3-prong input power connector.
Does UUT have more than 1 power cord? (If yes, explain.)	No. Supporting equip (AV-OS unit, model D) uses only one power cord.

4.0 Unit Under Test (UUT) – Detailed Information

UUT Hardware	
Condition	Normal operation.
Configuration During Test	Unit prepared with programming to match test ballot layout. Supporting equipment configured in Test Election mode, scanning a test ballot in recirculation mode.
Input Power	Supporting equip (AV-OS unit, model D) uses 120Vac.

UUT Components			
Name	**Model No.**	**Serial No.**	**Description**
AV-OS Memory Card	181-001004	n/a	AV-OS Memory Card, 128KB, MRAM

I/O Cabling
See Section 2.0 for details

UUT Software/Firmware		
Name	**Version/Revision**	**Functionality**
N/A		

UUT Operating Conditions	
List all frequencies the product generates/uses	Memory card product uses the supporting equipment's address/data bus clock cycle frequency of 7.5MHz. The supporting equipment generates the following frequencies: 32.7MHz Scanner Module Clock Crystal 15MHz CPU Clock Crystal 52KHz Power Supply Switching Frequency
How will product be exercised during test?	Recirculating test ballot scan.
How will product be monitored during test?	Visually. During testing, the ballot will continue to recirculate through the supporting equipment.
What are the product's critical parameters?	Visually. During testing, the ballot will continue to recirculate through the supporting equipment with no errors and writing to MRAM memory card
Specify tolerance of all critical parameters.	Visually. During testing, the ballot will continue to recirculate through the supporting equipment with no errors and writing to MRAM memory card

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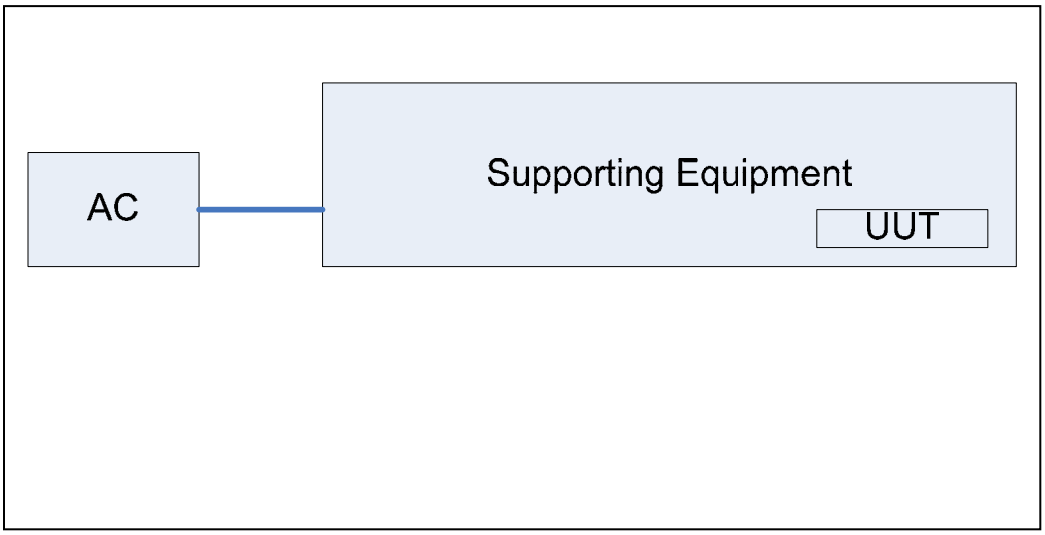
5.0 Support Equipment (SE) – Detailed Information

Support Equipment (SE)						
Name	**Model No.**	**Serial No.**	**Description**			
AccuVote-OS	D	42170	Optical scan unit with EAC certified hardware configuration.			
Model No.	**Description**			**Shielded?**	**Length**	**Quantity**
Belden 17250 or equivalent	AC Power Cable				6.7 FT (2m)	1

SE Software/Firmware		
Name	**Version/Revision**	**Functionality**
AV-OS	PC 1.96.14	Precinct Count optical scan tabulator programming.

6.0 Block Diagram



APPENDIX C

EMI Test Log

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EMI Test Log

Manufacturer:	Dominion Voting Systems, Inc.	Project Number:	B20420
Model:	Assure 1.3 AccuVote - OS MRAM Memory Card (181-001004) Rev. 1	S/N:	42170 (SE) (Model D)
Customer Representative:	Darrick Forester		
Standard Referenced:	EN61000-4-3		

FR0105

Ground Planes / CALC

Test	Test Code	Date	Event	OT	Time (hrs)	Result	Initials
4-3	4354	April 17, 2012 1500-1800	Radiated RF Immunity 10V/m, 80 - 1000 MHz, 1% Step, 80% AM, 1kHz sine, 3s dwell 120 VAC / 60 Hz		3.0	Pass	TW/KJ
			 **Assure 1.3 AccuVote - OS MRAM Memory Card (181-001004) Rev. 1**				
			Note: Client requested for engineering report on RF Immunity testing only Derrick requested that his name was on the data sheets which are different from the PDS.		---	---	TW

Regular hours:	4.0
Overtime/Prem hours:	
Total hours:	4.0

END OF REPORT