Test Report of

Radiated and Conducted Emissions Testing Performed on ClearCast Precinct Tabulator

Issue Date: 24 September 2018

Prepared for: **Pro V&V**
700 Boulevard South
Suite 102
Huntsville, AL 35802

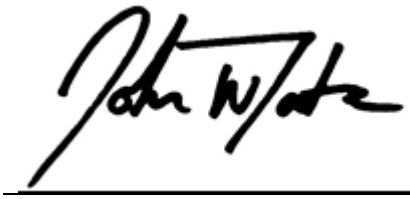
Prepared by: **National Technical Systems**
NTS Longmont
1736 Vista View Drive
Longmont, Colorado 80504

ACCREDITED
Certificate Number: 0214.43

SIGNATURES

Prepared by:  Date: 24 September 2018

Technical Writer, Greg Gagne

Reviewed by:  Date: 26 September 2018

Technical Reviewer, John Tate

REVISIONS

Revision	Reason for Revision	Date
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1.0 ADMINISTRATIVE DATA

1.1 PURPOSE OF TESTS

This report documents the test efforts performed on the ClearCast Precinct Tabulator to verify compliance to the Class B limits of CFR Title 47, FCC Part 15 and ICES-003. FCC Part 15 is the U.S. document which governs electromagnetic emissions from computing devices for conducted and radiated emissions, respectively. This was a formal qualification test and was conducted on 06 September 2018.

The emission limits applied to the product tested are defined in EN 55011, which is the product family standard for Industrial, Scientific and Medical (ISM) equipment. The UUT was set up as specified in CISPR 16.

The normative references of this standard define the test methods used for the emissions testing. These standards are contained in Table 1-1.

Table 1-1: Standards Table

CFR Title 47 FCC Part 15	ICES-003, Issue 6, 2016
ANSI C63.4: 2014	

1.2 DESCRIPTION OF TEST ITEM

The Unit Under Test (UUT) is a precinct tabulator, designed for use in voting during elections.

1.3 MANUFACTURER

Clear Ballot Group
700 Boulevard South
Suite 102
Huntsville, AL 35802

1.4 REFERENCE DOCUMENTS

1. Pro V&V SOW
2. ISO 17025:2005

1.5 QUANTITY OF ITEMS TESTED

Quantity	Test Item Description	Model Number	Serial Number
1	ClearCast Precinct Tabulator	Model 2, Version A	Unit 1

1.6 SECURITY CLASSIFICATION

Unclassified

1.7 TESTS CONDUCTED BY

National Technical Systems
NTS Longmont
1736 Vista View Drive
Longmont, Colorado 80504

1.8 DISPOSITION OF TEST ITEMS

Returned to:

Pro V&V
700 Boulevard South
Suite 102
Huntsville, AL 35802

1.9 TEST ENVIRONMENT

1.9.1 Radiated Emissions Test Site

Radiated emissions testing was performed at a distance of 10-meters in a semi-anechoic 10-meter chamber. This chamber is calibrated annually and meets the volumetric site attenuation requirements of CISPR 16 at a distance of 10 meters. For measurements from 30 MHz to 1 GHz, a biconilog antenna is used in conjunction with a high-gain, low-noise preamplifier. This is connected to a spectrum analyzer with a Quasi-Peak (QP) Adapter, via an RF Preselector.

Radiated emissions testing is broken into two parts: pre-scan and QP/maximization. Pre-scanning a product from 30 MHz to 1 GHz consists of measuring peak emissions from eight radials (every 45 degrees), at four antenna heights (1 m, 2 m, 3 m and 4 m) for both antenna polarities. Data is recorded in a graph showing amplitude vs. frequency of the emissions, and frequencies for QP/maximization are chosen based on this graph. The procedure for maximizing emissions is as follows:

1. The analyzer is tuned to the frequency associated with the emissions having the least margin.
2. The turntable and antenna mast are moved to the location where the maximum emission was measured during the pre-scan.
3. Both are then oriented such that the maximum emission is obtained.
4. Cables on the UUT are manually manipulated to achieve the maximum emission.

5. The turntable and antenna mast are then re-adjusted to ensure a maximum reading.
6. If the signal in question is less than 1 GHz, quasi-peak detection is performed on the signal for a minimum of 10 seconds. For signals greater than 1 GHz, video averaging is performed.
7. Turntable/antenna mast maximization and QP detection are performed on all other signals within 6 dB of the limit. In the event that there are not six signals within 6 dB of the limit, the highest six signals are maximized. This ensures that a minimum of six signals are maximized and appear in the final data table.

In the event that emission measurements are required above 1 GHz, the antenna is changed to a double-ridged horn equipped with a preamplifier and run directly into the spectrum analyzer. The QP adapter and RF preselector are not used above 1 GHz.

Pre-scanning a product from 1-18 GHz is performed similarly, except that 16 radials (every 22.5 degrees) and three antenna heights (1 m, 1.5 m and 2 m) are used. A similar maximization process is used as for the lower frequency range, except that average measurements are performed, rather than QP measurements.

1.9.2 Conducted Emissions Test Site

Conducted emissions testing was performed on a 10’ by 10’ ground plane, which is bonded to the wall of the 10-meter chamber, using its wall as the vertical coupling plane. Line impedance stabilization networks (LISNs) was inserted in series with both the UUT and the support equipment. The LISNs used were standard 50 Ω/50 µH LISNs which complied with the requirements of CISPR 16. These LISNs are calibrated annually for both complex impedance and insertion loss. Measurement equipment used was a spectrum analyzer with a QP adapter. In addition, a transient limiter and a high-pass filter are used to protect the front-end of the receiver from transients and low-frequency noise, respectively.

1.9.3 Measurement Uncertainty

The measurement uncertainty for NTS’s emissions test facility complies with the requirements defined in CISPR 16. The complete calculations of NTS’s measurement uncertainty is contained in an NTS memo, which is available upon request. However, a summary of NTS’s measurement uncertainty is given in Table 2-1.

Table 1-2: Measurement Uncertainty

Test	Requirement	Actual
Conducted Emissions	3.60 dB	3.04 dB
Radiated Emissions – Horizontal Polarity	5.20 dB	4.67 dB
Radiated Emissions – Vertical Polarity	5.20 dB	5.01 dB

1.10 TEST APPARATUS

The instrumentation used in the performance of these tests is periodically calibrated and standardized within manufacturer's rated accuracies and are traceable to the National Institute of Standards and Technology. The calibration procedures and practices are in accordance with ISO 17025:2005. Certification of calibration is on file subject to inspection by authorized personnel.

1.11 SOURCE INSPECTION

NTS QA

1.12 PURCHASE ORDER NUMBER

2018-010

2.0 TEST RESULTS SUMMARY

Table 2-1: Summary of Test Results

Test	Specification	Test Dates	Results
Radiated Emissions	CFR Title 47, FCC Part 15	06 September 2018	Complies
Conducted Emissions	CFR Title 47, FCC Part 15	06 September 2018	Complies

3.0 RADIATED EMISSIONS TEST

3.1 REFERENCES

CFR Title 47, FCC Part 15

3.2 SERIAL NUMBERS

Table 3-1: Serial Numbers

Unit 1

3.3 TEST PROCEDURE

The UUT was set up for Radiated Emissions Testing in accordance with CFR Title 47, FCC Parts 15 and tested to Class B limits specified in CFR Title 47, FCC Parts 15.107 and 15.109. The UUT was set up as specified in ANSI C63.4: 2014.

Radiated electric field emissions were measured on the UUT over the frequency range from 30 MHz to 1 GHz. The UUT was powered by 120 VAC/60 Hz, configured in its normal operating mode, and exercised continually during testing. Cables were oriented such that the maximum emission was achieved and quasi-peak detection was performed on all signals (minimum of six) used in the final data table

3.4 SPECIAL CONFIGURATIONS

See Test Log, “Modifications Required for Compliance” (Page 42)

3.5 TEST RESULTS

Radiated Emissions Test Data is presented in Appendix A.

Test Input Voltage	Test Result	Margin dB	Frequency MHz
120 VAC / 60 Hz	Complies	2.21	200.333

4.0 CONDUCTED EMISSIONS TEST

4.1 REFERENCES

CFR Title 47, FCC Part 15

4.2 SERIAL NUMBERS

Table 4-1: Serial Numbers

Unit 1

4.3 TEST PROCEDURE

The UUT was set up for Radiated Emissions Testing in accordance with CFR Title 47, FCC Parts 15 and tested to Class B limits specified in CFR Title 47, FCC Parts 15.107 and 15.109. The UUT was set up as specified in ANSI C63.4: 2014.

Conducted emissions were measured on the AC power input of the UUT over the frequency range from 150 kHz to 30 MHz. With the UUT configured in its normal operating mode, testing was performed with UUT powered from 120 VAC/60 Hz. The input power to the UUT was run through a standard 50 Ω/50 µH line impedance stabilization network (LISN) which complied with the requirements of CISPR 16. Emissions were compared to both quasi-peak (QP) and average limits, with QP detection and averaging performed on the six highest signals.

4.4 SPECIAL CONFIGURATIONS

N/A

4.5 TEST RESULTS

Conducted Emissions Test Data is presented in Appendix B.

Test Input Voltage	Test Result	Margin dB	Frequency MHz
120 VAC / 60 Hz	Complies	16.89	0.165

APPENDIX A: Radiated Emissions Test Data

Radiated Emissions, FCC Part 15

Manufacturer:	Clear Ballot Group (manufacturer) Pro V&V (client)	Project Number:	PR085361
Customer Representative:	Stephen Han	Test Area:	10m2
Model:	ClearCast (Model 2, Version A)	S/N:	Unit 1
Standard Referenced:	FCC Part 15	Date:	September 6, 2018
Temperature:	24˚C Humidity: 47%	Pressure:	845mb
Input Voltage:	120Vac/60Hz		
Configuration of Unit:	Scanning ballots		
Test Engineer:	Kevin Johnson		

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Type	Frequency (MHz)	Level (dBuV)	Transducer (dB/m)	Gain / Loss (dB)	Final (dBuV/m)	Azm(deg)/Pol/Hgt(m)	Margin: FCC Class B QP (dB)
QP	668.251	33.2	23.8	-24.0	33.1	153/V-Pole/1.88	2.46
QP	200.333	41.9	16.6	-27.6	30.8	271/V-Pole/1.00	2.21
QP	222.750	44.7	14.9	-27.5	32.0	172/V-Pole/1.00	3.50
QP	394.652	38.5	19.4	-26.4	31.5	328/H-Pole/1.79	4.05
QP	128.262	38.8	18.2	-28.5	28.5	148/V-Pole/1.77	4.57
QP	288.942	40.5	17.4	-27.1	30.8	348/H-Pole/2.70	4.74
QP	38.242	34.5	19.1	-29.2	24.4	112/V-Pole/1.01	5.14
QP	161.318	35.7	16.3	-28.0	24.0	180/V-Pole/1.37	9.04

The highest emission measured was at **200.333 MHz,** which was **2.21 dB** below the limit.

- "Type" refers to the type of measurement performed. The type of measurement made is based on the requirements of the particular standard:
  - PK = Peak Measurement: RBW is 120kHz, VBW is 3 MHz
  - QP = Quasi-Peak Measurement: RBW is 120kHz, VBW is 3 MHz, and QP Detection is ENABLED
  - AV = Video Average Measurement: RBW is 1 MHz, VBW is 10 Hz
- The "field strength" (FS) emissions level is attained by adding the received amplitude measured (RA), Antenna factor (AF), and cable factor (CF) minus the amplifier gain (AG). FS = RA + AF + CF – AG .Final measurements are made with the Azimuth, Polarity, Height, and EUT Cables positioned for maximum radiation. If applicable, cables positions are noted in the test log. (Sample Calculation: 49.6 dBuV + 11.4 dB/m – 28.8 dB (CF/AG) = 32.2 dBuV/m. **Important Note**: This is a sample calculation only for the purpose of demonstration, and does not reflect data in this report.)
- The "Azm/Pol/Hgt" indicates the turn-table *azimuth*, the antenna *polarity*, and the antenna *height* where the maximum emissions level was measured.
- The "Margin" is with reference to the emissions limit. A positive number indicates that the emission measurement is below the limit. A negative number indicates that the emission measurement exceeds the limit.
- The PRESCAN is a peak measurement and is performed with the RBW set to 120 kHz, VBW set to 3 MHz (30 MHz to 1 GHz), and the RBW set to 1 MHz, VBW set to 100 kHz (> 1 GHz)

Radiated Emissions, FCC Part 15

Manufacturer:	Clear Ballot Group (manufacturer) Pro V&V (client)	Project Number:	PR085361
Customer Representative:	Stephen Han	Test Area:	10m2
Model:	ClearCast (Model 2, Version A)	S/N:	Unit 1
Standard Referenced:	FCC Part 15	Date:	September 6, 2018

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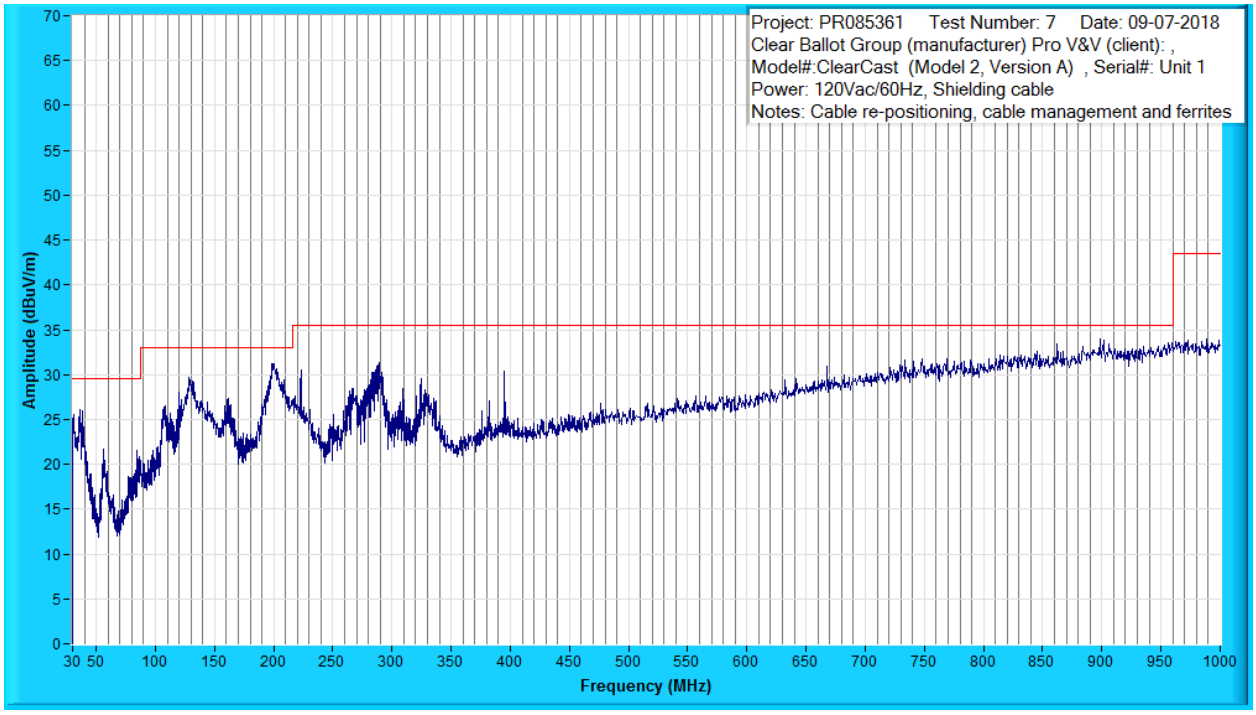

Figure A1: Radiated Emissions Prescan, 30MHz to 1000MHz, Peak Measurements at 10m Distance

Radiated Emissions, FCC Part 15

Manufacturer:	Clear Ballot Group (manufacturer) Pro V&V (client)	Project Number:	PR085361
Customer Representative:	Stephen Han	Test Area:	10m2
Model:	ClearCast (Model 2, Version A)	S/N:	Unit 1
Standard Referenced:	FCC Part 15	Date:	September 6, 2018

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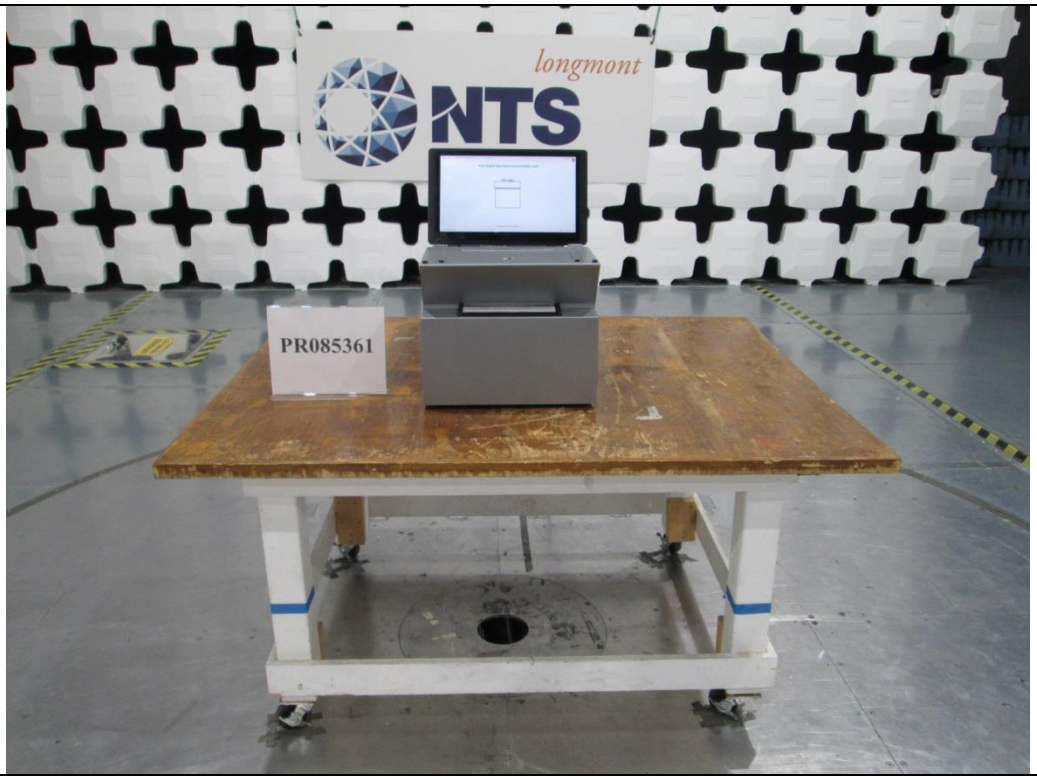

Figure A3: Radiated Emissions Test Setup - Front

Radiated Emissions, FCC Part 15

Manufacturer:	Clear Ballot Group (manufacturer) Pro V&V (client)	Project Number:	PR085361
Customer Representative:	Stephen Han	Test Area:	10m2
Model:	ClearCast (Model 2, Version A)	S/N:	Unit 1
Standard Referenced:	FCC Part 15	Date:	September 6, 2018

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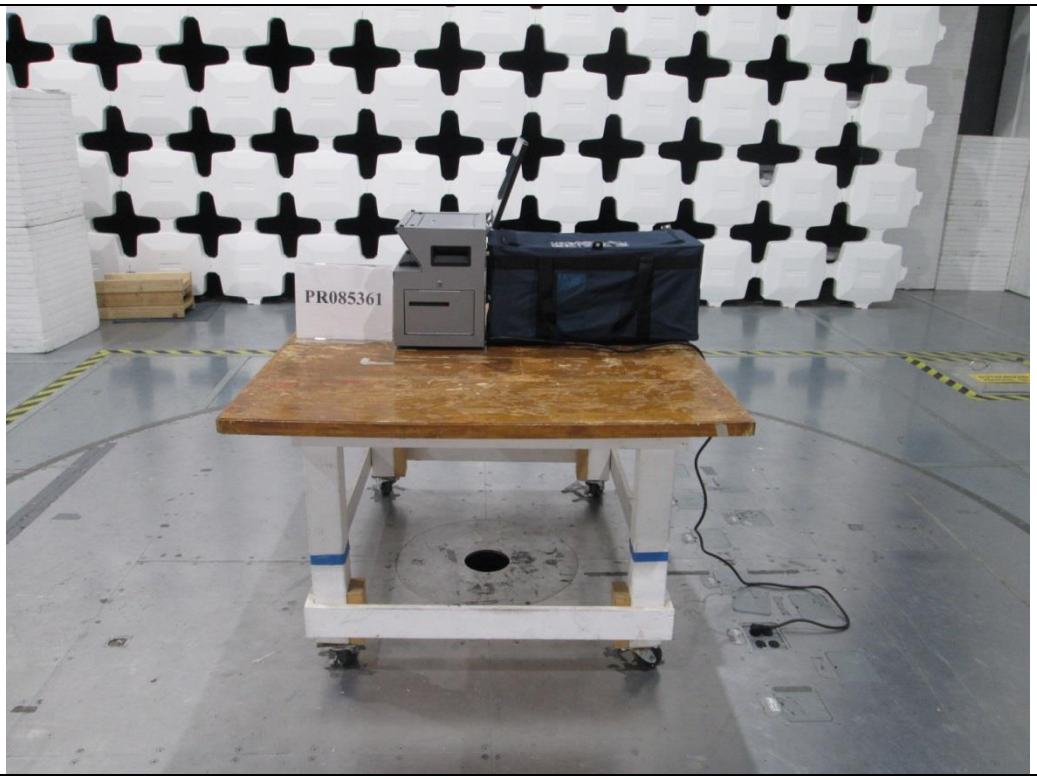

Figure A4: Radiated Emissions Test Setup - Right

Radiated Emissions, FCC Part 15

Manufacturer:	Clear Ballot Group (manufacturer) Pro V&V (client)	Project Number:	PR085361
Customer Representative:	Stephen Han	Test Area:	10m2
Model:	ClearCast (Model 2, Version A)	S/N:	Unit 1
Standard Referenced:	FCC Part 15	Date:	September 6, 2018

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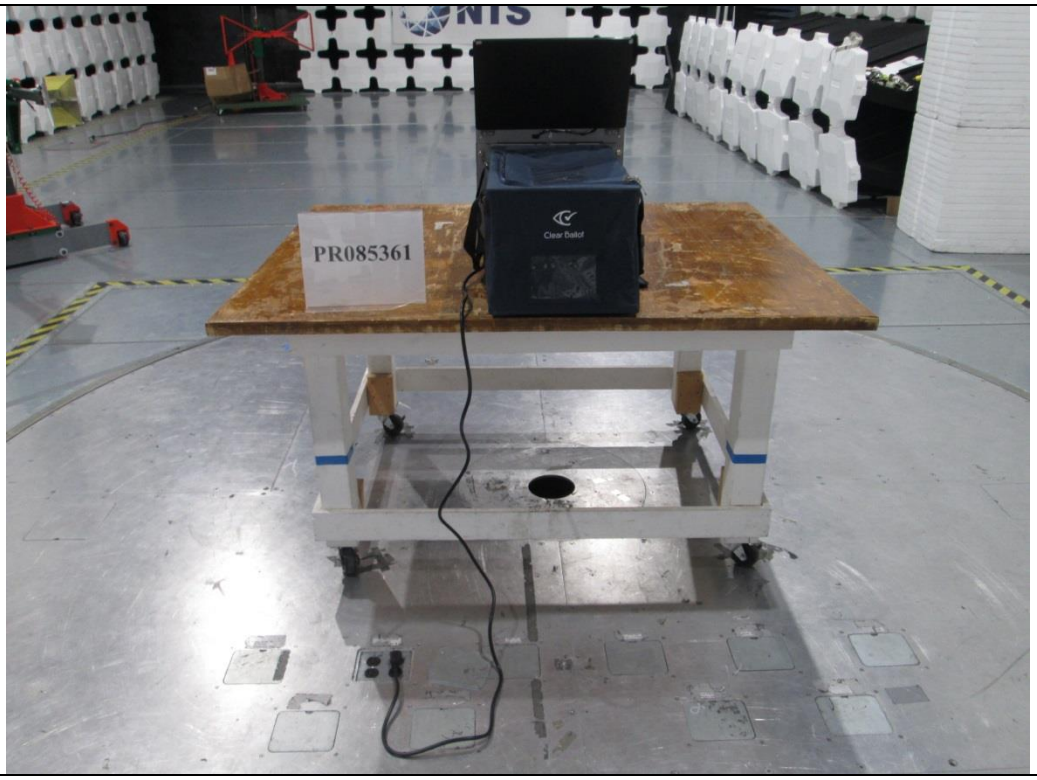

Figure A5: Radiated Emissions Test Setup - Back

Radiated Emissions, FCC Part 15

Manufacturer:	Clear Ballot Group (manufacturer) Pro V&V (client)	Project Number:	PR085361
Customer Representative:	Stephen Han	Test Area:	10m2
Model:	ClearCast (Model 2, Version A)	S/N:	Unit 1
Standard Referenced:	FCC Part 15	Date:	September 6, 2018

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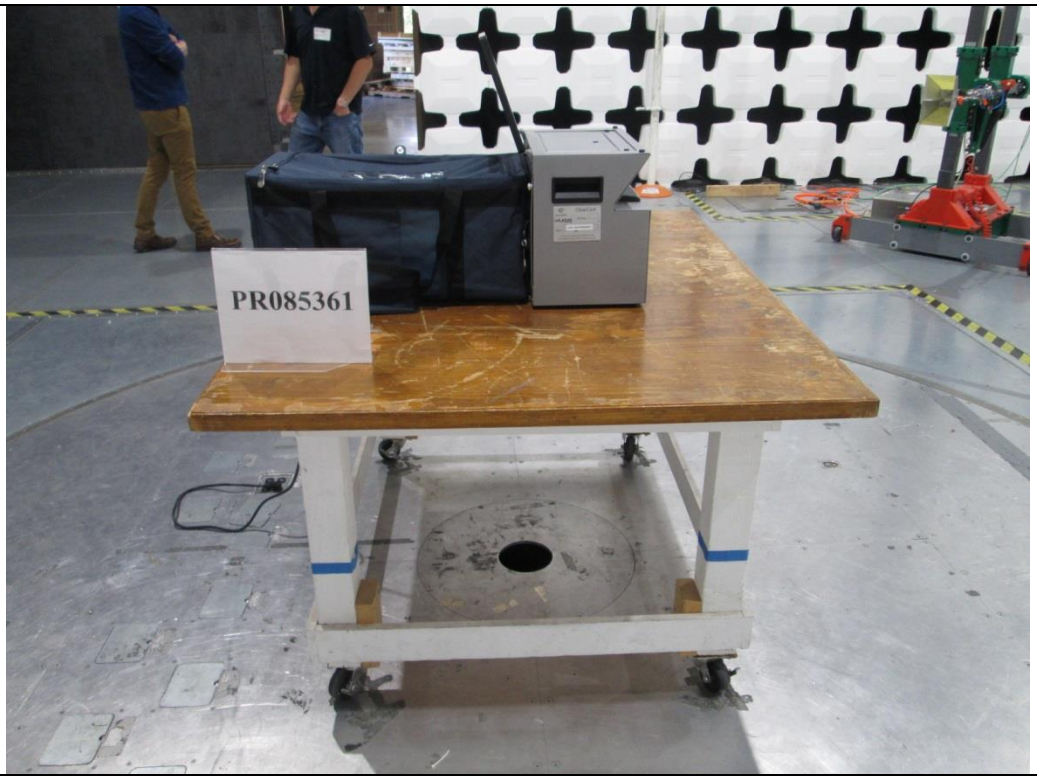

Figure A6: Radiated Emissions Test Setup - Left

Radiated Emissions, FCC Part 15

Manufacturer:	Clear Ballot Group (manufacturer) Pro V&V (client)	Project Number:	PR085361
Customer Representative:	Stephen Han	Test Area:	10m2
Model:	ClearCast (Model 2, Version A)	S/N:	Unit 1
Standard Referenced:	FCC Part 15	Date:	September 6, 2018

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Test Equipment List

ID Number	Manufacturer	Model #	Serial #	Description	Cal Date	Cal Due
1339	Hewlett Packard	8566B	2937A06103	Spectrum Analyzer with 2542A11546	09/09/2017	09/09/2018
1340	Hewlett Packard	8566B	2542A11546	Spectrum Analyzer Display	09/09/2017	09/09/2018
1341	Hewlett Packard	85650A	2811A01351	Quasi-Peak Adapter	08/09/2017	09/09/2018
1345	Hewlett Packard	85685A	2901A00865	RF Preselector	10/15/2017	10/15/2018
1396	CIR Enterprises	10m Chamber #2	002	10m Chamber with 4m turntable	03/29/2018	03/29/2020
1410	Sunol Sciences	SC110V	021611-1	System Controller 10meter #2	NA	NA
1492	Fluke	87/5 Multimeter	23350032	True RMS Multimeter	05/08/2018	05/08/2019
1586	EXTECH Instruments	445715	NA	Hygro-Thermometer	01/25/2018	01/25/2019
1592	EMCI	CEAS	V4.1.2	Commercial Emissions Automation Software - 10M # 2	NA	NA

APPENDIX B: Conducted Emissions Test Data

Conducted Emissions, FCC Part 15

Manufacturer:	Clear Ballot Group (manufacturer) Pro V&V (client)	Project Number:	PR085361
Customer Representative:	Stephen Han	Test Area:	10m2
Model:	ClearCast (Model 2, Version A)	S/N:	Unit 1
Standard Referenced:	FCC Part 15	Date:	September 6, 2018
Temperature:	24˚C Humidity: 47%	Pressure:	847mb
Input Voltage:	120Vac/60Hz		
Configuration of Unit:	Scanning ballots		
Test Engineer:	Kevin Johnson		

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Type	Frequency (MHz)	Level (dBuV)	Transducer (dB)	Gain / Loss (dB)	Final (dBuV)	Test Point	Margin: FCC Class B AV (dB)	Margin: FCC Class B QP (dB)
AV	0.159	17.8	-1.4	16.1	32.5	Line 1	23.21	-
QP	0.159	32.4	-1.4	16.1	47.1	Line 1	-	18.61
AV	0.173	15.1	-1.3	16.1	29.9	Line 1	25.44	-
QP	0.173	29.1	-1.3	16.1	43.9	Line 1	-	21.44
AV	0.201	12.1	-1.1	16.1	27.1	Line 1	27.44	-
QP	0.201	26.0	-1.1	16.1	41.0	Line 1	-	23.55
AV	0.223	10.3	-1.0	16.1	25.5	Line 1	28.43	-
QP	0.223	24.9	-1.0	16.1	40.0	Line 1	-	23.91
AV	13.006	11.3	-0.3	15.8	26.8	Line 1	23.23	-
QP	13.006	22.0	-0.3	15.8	37.5	Line 1	-	22.50
AV	16.345	9.2	-0.3	15.7	24.6	Line 1	25.42	-
QP	16.345	17.5	-0.3	15.7	32.9	Line 1	-	27.12
AV	0.165	18.9	-1.3	16.1	33.6	Neutral	21.97	-
QP	0.165	33.9	-1.3	16.1	48.7	Neutral	-	16.89
AV	0.191	13.7	-1.2	16.1	28.6	Neutral	26.24	-
QP	0.191	28.6	-1.2	16.1	43.5	Neutral	-	21.33
AV	0.209	11.8	-1.1	16.1	26.8	Neutral	27.53	-
QP	0.209	25.9	-1.1	16.1	40.9	Neutral	-	23.37
AV	0.227	9.7	-1.0	16.1	24.8	Neutral	29.02	-
QP	0.227	22.3	-1.0	16.1	37.5	Neutral	-	26.33
AV	13.029	12.2	-0.3	15.8	27.7	Neutral	22.29	-
QP	13.029	20.3	-0.3	15.8	35.8	Neutral	-	24.24
AV	16.888	8.7	-0.3	15.8	24.1	Neutral	25.91	-
QP	16.888	12.8	-0.3	15.8	28.2	Neutral	-	31.76

The highest emission measured was at **0.165 MHz,** which was **16.89 dB** below the limit.

- "Type" refers to the type of measurement performed. The type of measurement made is based on the requirements of the particular standard:
  - PK = Peak Measurement: RBW is 9 kHz, VBW is 3 MHz
  - QP = Quasi-Peak Measurement: RBW is 9 kHz, VBW is 3 MHz, and QP Detection is ENABLED
  - AV = Video Average Measurement: RBW is 9 kHz, VBW is 10 Hz
- The "field strength" (FS) emissions level is attained by adding the received amplitude measured (RA), Antenna factor (AF), and cable factor (CF) minus the amplifier gain (AG). FS = RA + AF + CF – AG .Final measurements are made with the Azimuth, Polarity, Height, and EUT Cables positioned for maximum radiation. If applicable, cables positions are noted in the test log. (Sample Calculation: 49.6 dBuV + 11.4 dB/m – 28.8 dB (CF/AG) = 32.2 dBuV/m. **Important Note**: This is a sample calculation only for the purpose of demonstration, and does not reflect data in this report.)
- The "TestPoint" indicates which AC or DC input power line or which I/O cable the measurement was made on.
- The "Margin" is with reference to the emissions limit. A positive number indicates that the emission measurement is below the limit. A negative number indicates that the emission measurement exceeds the limit.
- The PRESCAN is a peak measurement and is performed with the RBW set to 9 kHz, and the VBW set to 3 MHz

Conducted Emissions, FCC Part 15

Manufacturer:	Clear Ballot Group (manufacturer) Pro V&V (client)	Project Number:	PR085361
Customer Representative:	Stephen Han	Test Area:	10m2
Model:	ClearCast (Model 2, Version A)	S/N:	Unit 1
Standard Referenced:	FCC Part 15	Date:	September 6, 2018

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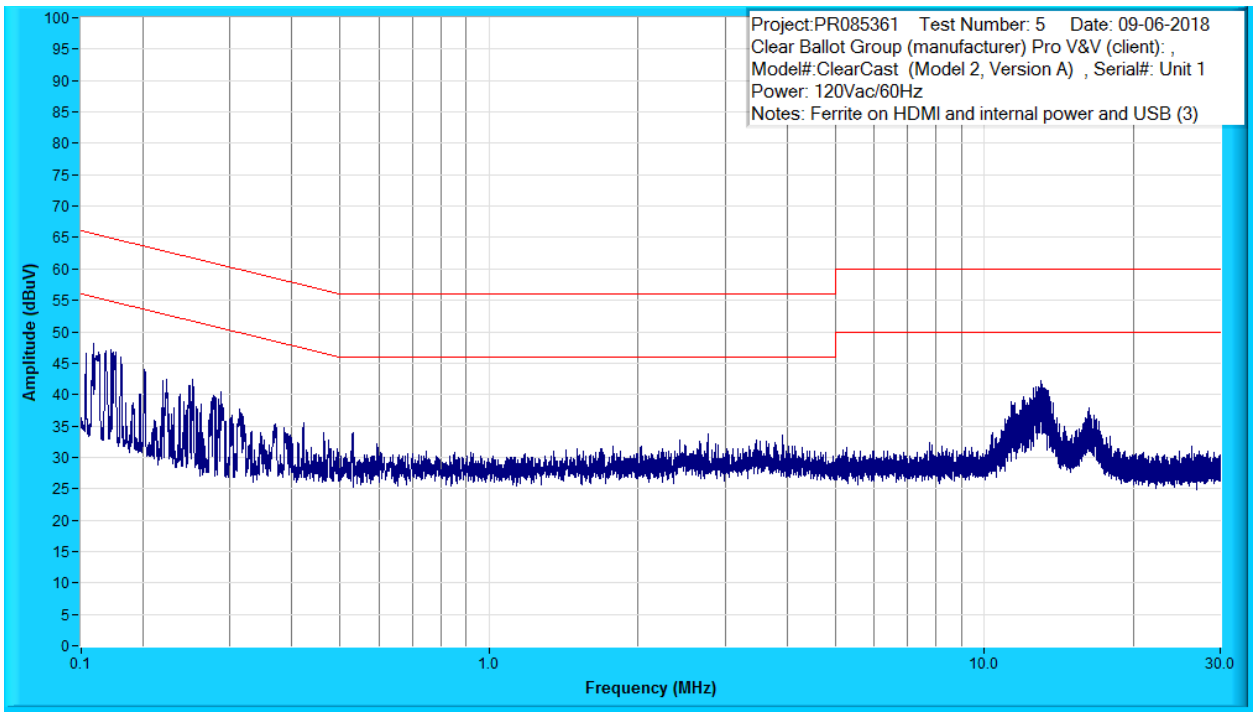

Figure B1: Conducted Emissions Prescan, Line 1, 0.150MHz to 30MHz, Peak Measurements

Conducted Emissions, FCC Part 15

Manufacturer:	Clear Ballot Group (manufacturer) Pro V&V (client)	Project Number:	PR085361
Customer Representative:	Stephen Han	Test Area:	10m2
Model:	ClearCast (Model 2, Version A)	S/N:	Unit 1
Standard Referenced:	FCC Part 15	Date:	September 6, 2018

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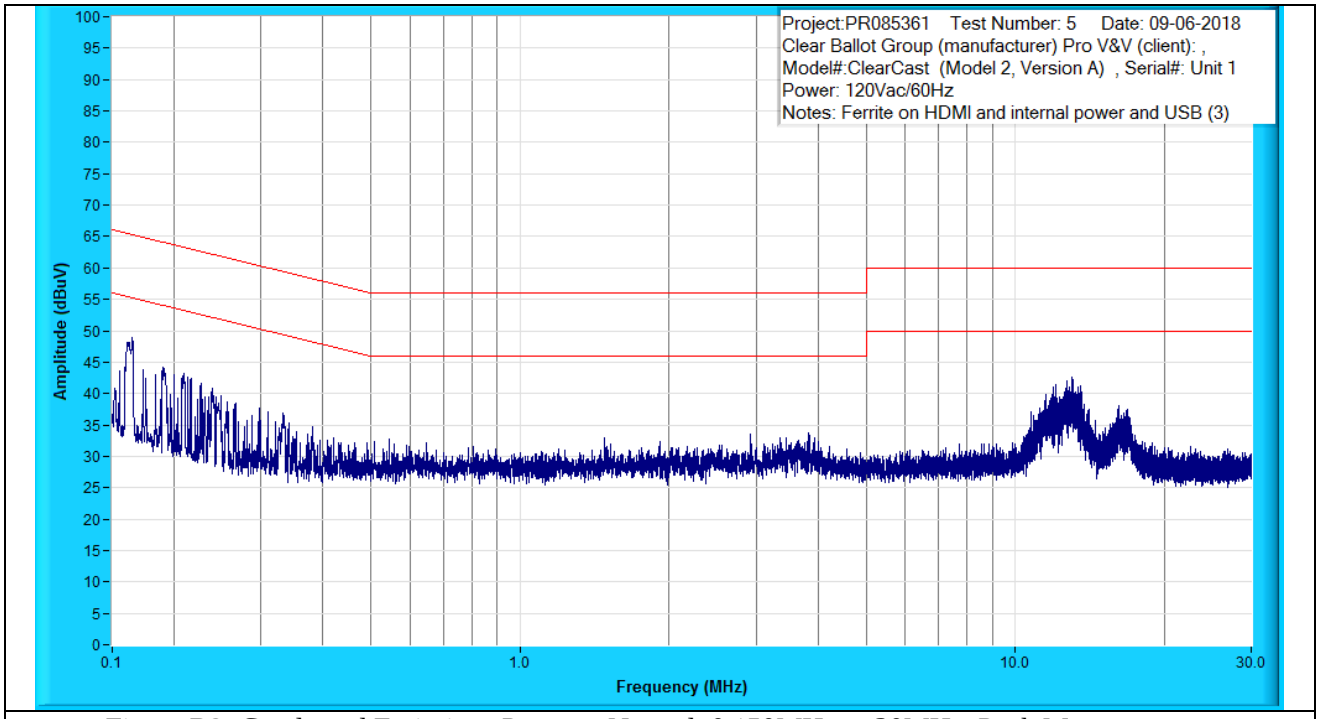

Figure B2: Conducted Emissions Prescan, Neutral, 0.150MHz to 30MHz, Peak Measurements

Conducted Emissions, FCC Part 15

Manufacturer:	Clear Ballot Group (manufacturer) Pro V&V (client)	Project Number:	PR085361
Customer Representative:	Stephen Han	Test Area:	10m2
Model:	ClearCast (Model 2, Version A)	S/N:	Unit 1
Standard Referenced:	FCC Part 15	Date:	September 6, 2018

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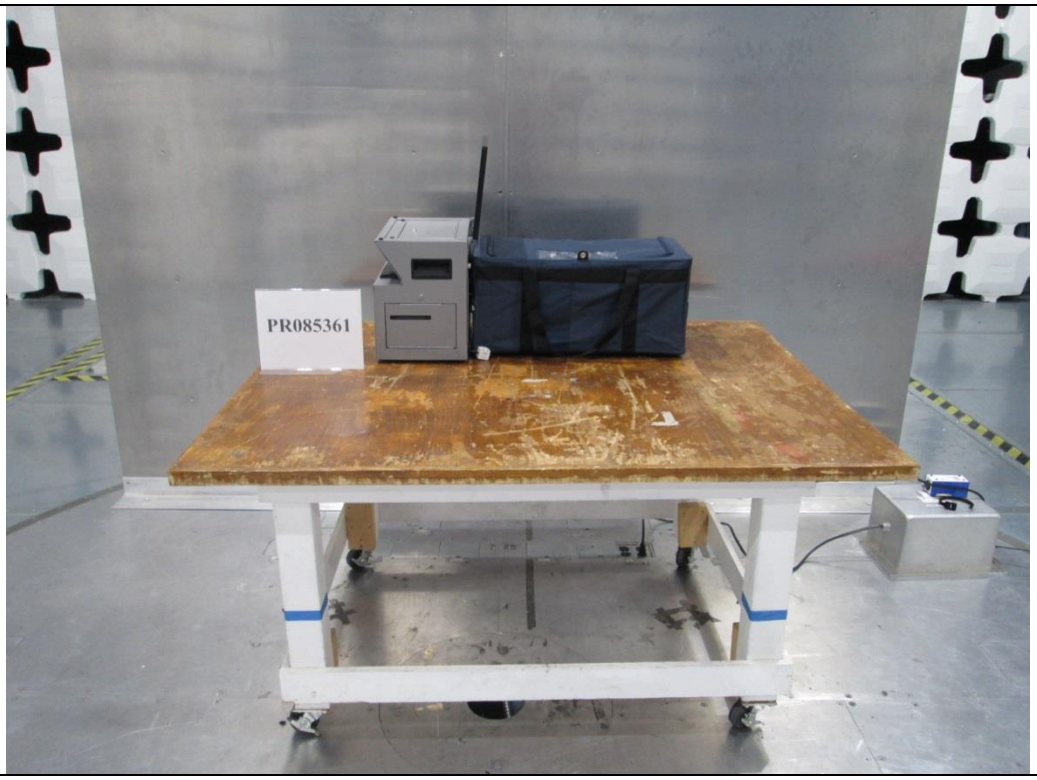

Figure B3: Conducted Emissions Test Setup – Front Side

Conducted Emissions, FCC Part 15

Manufacturer:	Clear Ballot Group (manufacturer) Pro V&V (client)	Project Number:	PR085361
Customer Representative:	Stephen Han	Test Area:	10m2
Model:	ClearCast (Model 2, Version A)	S/N:	Unit 1
Standard Referenced:	FCC Part 15	Date:	September 6, 2018

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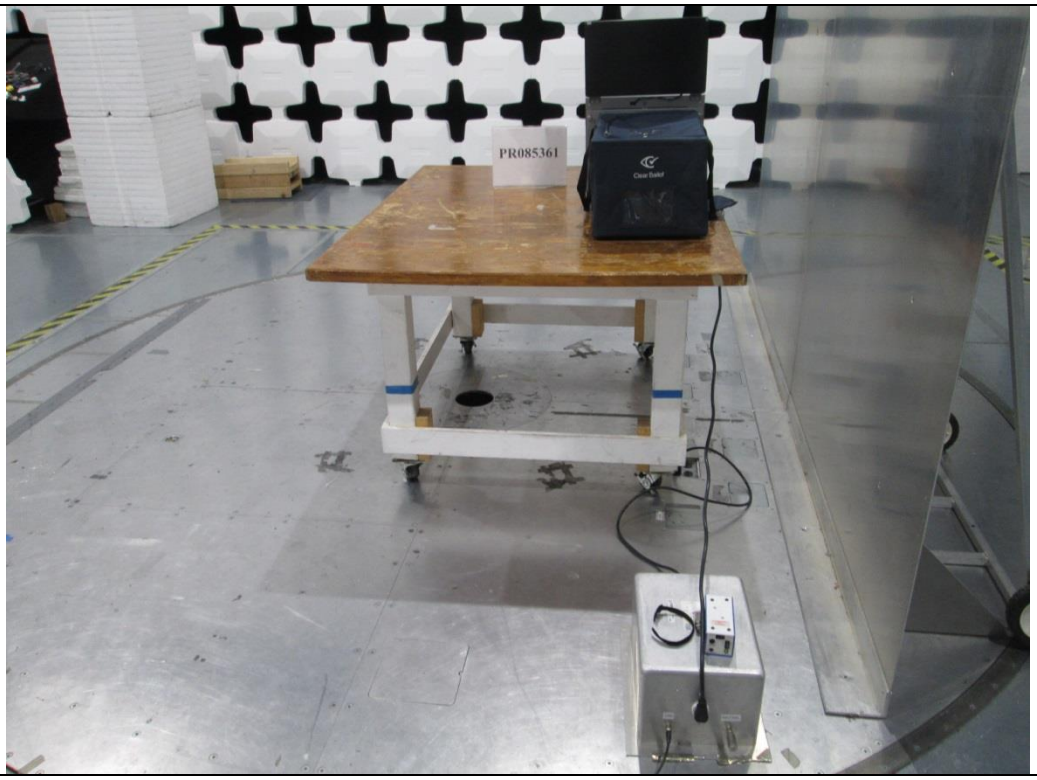


Figure B4: Conducted Emissions Test Setup – Right Side

Conducted Emissions, FCC Part 15

Manufacturer:	Clear Ballot Group (manufacturer) Pro V&V (client)	Project Number:	PR085361
Customer Representative:	Stephen Han	Test Area:	10m2
Model:	ClearCast (Model 2, Version A)	S/N:	Unit 1
Standard Referenced:	FCC Part 15	Date:	September 6, 2018

PR085361-11-CE.doc FR0100

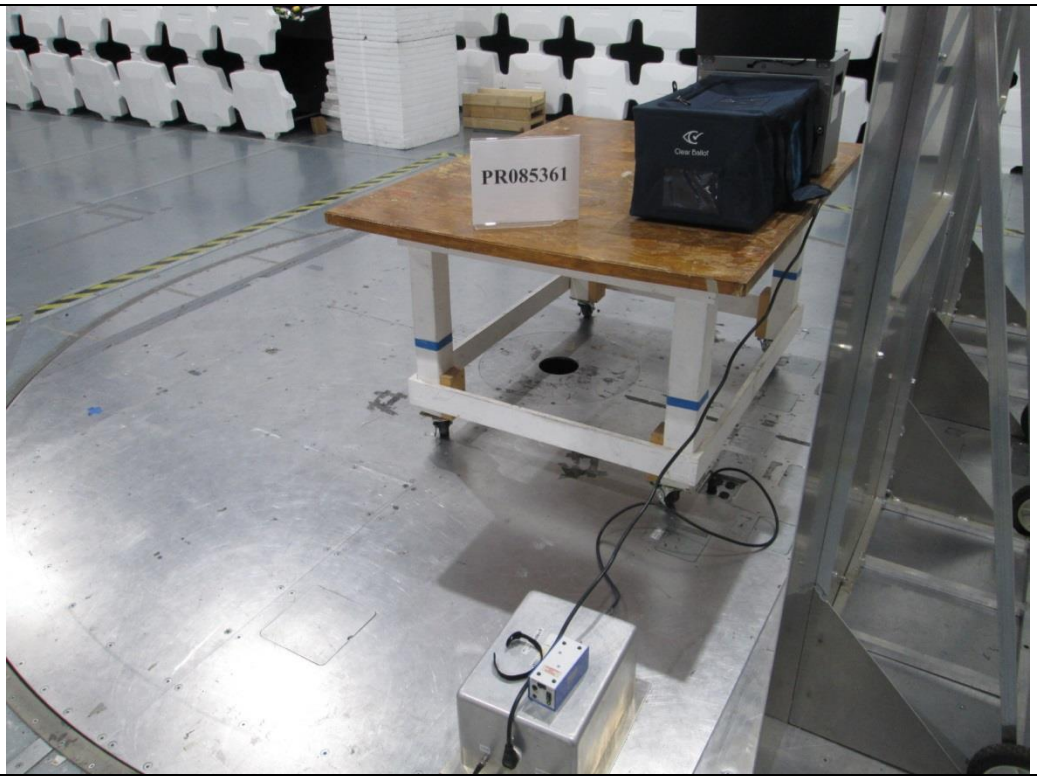


Figure B5: Conducted Emissions Test Setup – Back Side

Conducted Emissions, FCC Part 15

Manufacturer:	Clear Ballot Group (manufacturer) Pro V&V (client)	Project Number:	PR085361
Customer Representative:	Stephen Han	Test Area:	10m2
Model:	ClearCast (Model 2, Version A)	S/N:	Unit 1
Standard Referenced:	FCC Part 15	Date:	September 6, 2018

PR085361-11-CE.doc FR0100

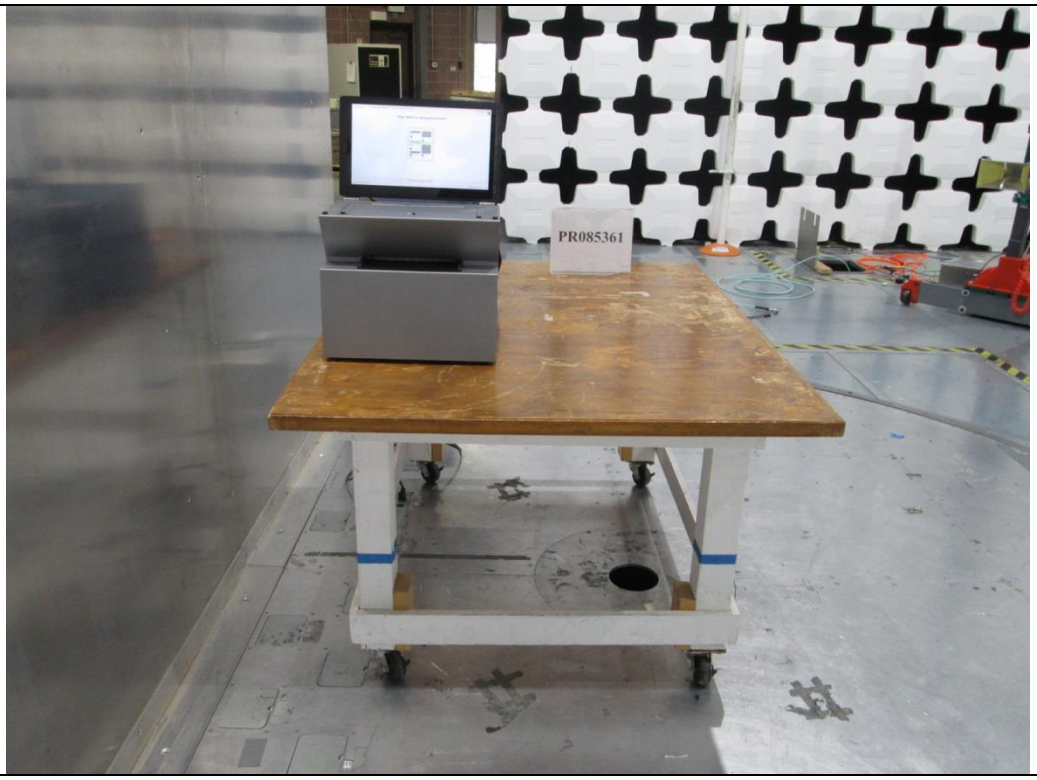


Figure B6: Conducted Emissions Test Setup – Left Side

Conducted Emissions, FCC Part 15

Manufacturer:	Clear Ballot Group (manufacturer) Pro V&V (client)	Project Number:	PR085361
Customer Representative:	Stephen Han	Test Area:	10m2
Model:	ClearCast (Model 2, Version A)	S/N:	Unit 1
Standard Referenced:	FCC Part 15	Date:	September 6, 2018

PR085361-11-CE.doc FR0100

Test Equipment List

ID Number	Manufacturer	Model #	Serial #	Description	Cal Date	Cal Due
1201	Agilent Technology	11947A	3107A03805	Transient Limiter, 9 kHz to 200 MHz	11/27/2017	11/27/2018
1339	Hewlett Packard	8566B	2937A06103	Spectrum Analyzer with 2542A11546	09/09/2017	09/09/2018
1340	Hewlett Packard	8566B	2542A11546	Spectrum Analyzer Display	09/09/2017	09/09/2018
1341	Hewlett Packard	85650A	2811A01351	Quasi-Peak Adapter	08/09/2017	09/09/2018
1345	Hewlett Packard	85685A	2901A00865	RF Preselector	10/15/2017	10/15/2018
1396	CIR Enterprises	10m Chamber #2	002	10m Chamber with 4m turntable	03/29/2018	03/29/2020
1492	Fluke	87/5 Multimeter	23350032	True RMS Multimeter	05/08/2018	05/08/2019
1556	EMCI	EMCI, 2 Phase LISN	10	150 kHz to 30 MHz, 277 Vac/400 Vdc, 50/60 Hz, 16 A	02/22/2018	02/22/2019
1586	EXTECH Instruments	445715	NA	Hygro-Thermometer	01/25/2018	01/25/2019
1590	Solor Electronics Company	7930-100	7930160101	High Pass Filter	02/07/2018	02/07/2019
1592	EMCI	CEAS	V4.1.2	Commercial Emissions Automation Software - 10M # 2	NA	NA

APPENDIX C: Product Data Sheet

1.0 Client Information

Client Information	
Manufacturer Name	Clear Ballot Group (manufacturer) Pro V&V (client)
Address	700 Boulevard South Suite 102
City	Huntsville
State	AL
Zip Code	35802
Client Representative	Stephen Han
Title	Sr. Project Engineer
Phone	256-713-1111
Fax	256-713-1112
Email	stephen.han@provandv.com

2.0 Product Information - General

Product Information	
Product Name (**as it should appear on test report**)	ClearCast
Model Number (of UUT to be tested)	ClearCast
Functional description of product (what is it, what does it do, etc.)	Precinct Tabulator
List all modes of operation	Normal
Can modes be operated simultaneously? If so, explain.	No
What mode(s) will be used for testing?	Normal
Product type (IT, Medical, Scientific, Industrial, etc.)	IT
Is the product an intentional radiator	no
Product Dimensions	
Product Weight	
Will fork lift be required	No
Applicable Standards, if known	EAC 2005 VVSG Volumes I and II
Describe all environment(s) where product will be used (residential, commercial, industrial, etc.)	Used for voting during elections
Does product consist of multiple components? (If yes, please describe each system component)	No
Cycle time > 3 seconds? (If yes, how long?)	Yes. 5 sec
Highest internally generated frequency	
Product Set-up Time	15 minutes
Boot up time in the event of an unintentional power down	0 minutes - internal backup battery

Identify **ALL** I/O connections on the unit(s) under test, as well as **MAXIMUM** associated cable lengths below

Model No.	Description	I/O Type		Length (m)	Patient Connect? (See Note)	QTY
		UUT-UUT	UUT - SE			
	power					

Note: "Patient Connect" column applies only to medical devices.

3.0 Power

Power Requirements	
Does/can product connect to AC mains? (If so, can the UUT function when connected to AC?)	Yes.
Input Voltage Rating as it appears on unit, power supply, or power brick	115 VAC ; 230 VAC
Input Current (specify @ 230 Vac/50 Hz)	Normal
Single or Multi-Phase (If multi-phase, specify delta or wye)	single
Is input power connector two-prong (Hot & Neutral) or 3-prong (H, N, Ground)	3 prong
Does UUT have more than 1 power cord? (If yes, explain.)	No

4.0 Unit Under Test (UUT) – Detailed Information

UUT Hardware	
Condition	New
Configuration During Test	Scanning ballots
Input Power	Normal AC power

UUT Components

Name	Model No.	Serial No.	Description
ClearCast	Model 2, Version A	Unit 1	Precinct Tabulator

I/O Cabling

See Section 2.0 for details

UUT Software/Firmware

Name	Version/Revision	Functionality
ClearCast	N/A	Voting systems software

UUT Operating Conditions	
List all frequencies generated/used by the product.	n/a
How will product be exercised during test?	Scanning Ballots
How will product be monitored during test?	Visually
What are the product's critical parameters?	Unit keeps scanning
Specify tolerance of all critical parameters.	Unit keeps scanning

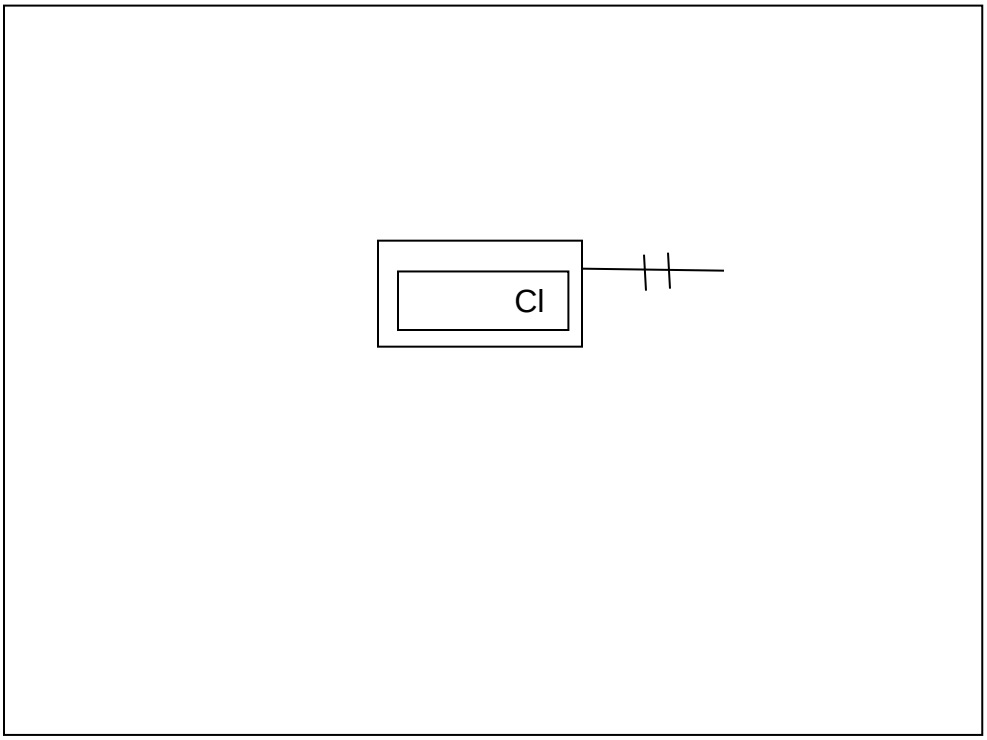
5.0 Support Equipment (SE) – Detailed Information

Support Equipment (SE)			
Name	**Model No.**	**Serial No.**	**Description**
n/a			

SE I/O Cabling				
Model No.	**Description**	**Shielded?**	**Length**	**Quantity**
n/a				

SE Software/Firmware		
Name	**Version/Revision**	**Functionality**
n/a		

6.0 Block Diagram



Important note: The product data sheet is a critical piece of documentation which is used as the basis for any test reports that NTS will generate; it must be completed *prior* to testing. It should be reviewed carefully by the client. If incorrect information is provided resulting in revisions to test reports, the client will be subject to report revision fees.

APPENDIX D: Test Log

EMI\ENV Test Log

Manufacturer:	Pro V&V	Project Number:	PR085361
Model:	Clear Ballot Group (manufacturer) Pro V&V (client)	S/N:	Unit 1
Customer Representative:	Michael Walker		
Standard Referenced:	FCC Part 15, EAC 2005 VVSG		

FR0105

10m Emissions

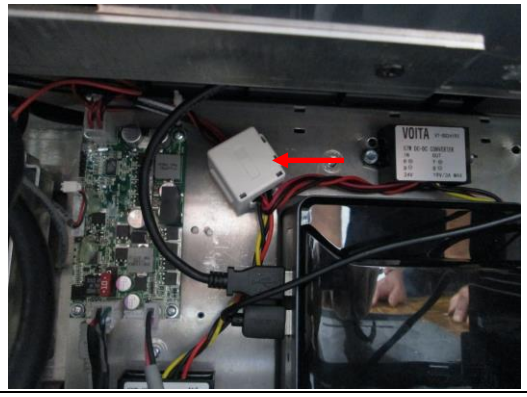
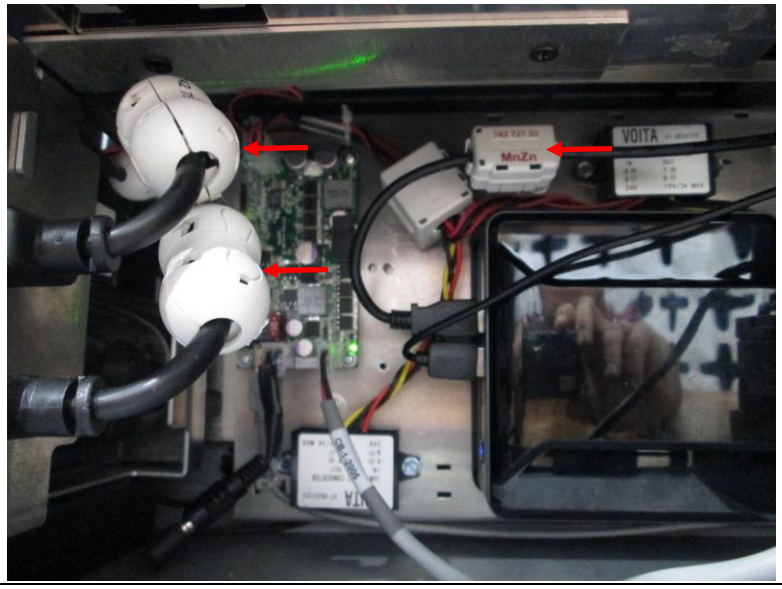
Test	Test Code	Date	Event	O T	Time (hrs)	Result	Initials
RE	6001	September 6, 2018 0800-0900	Setup for RE		1.0	Complete	KJ
RE	1342	0900-1000	Test#1: 30MHz – 1GHz, 8 rads, 4 heights, 3 second dwell, ref level = 80dB, 10 meter test distance. 120Vac/60Hz FCC Class B Unit failing multiple frequencies		1.0	Fail	KJ
		1000-1100	Test#2: 30MHz – 1GHz, 8 rads, 4 heights, 3 second dwell, ref level = 80dB, 10 meter test distance. 120Vac/60Hz FCC Class B RE Troubleshooting **Ferrite on the HDMI cable and internal power cable.**		1.0	Fail	KJ

EMI\ENV Test Log

Manufacturer:	Pro V&V	Project Number:	PR085361
Model:	Clear Ballot Group (manufacturer) Pro V&V (client)	S/N:	Unit 1
Customer Representative:	Michael Walker		
Standard Referenced:	FCC Part 15, EAC 2005 VVSG		

FR0105

10m Emissions

Test	Test Code	Date	Event	O T	Time (hrs)	Result	Initials
							
		1100-1200	Test#3: 30MHz – 1GHz, 8 rads, 4 heights, 3 second dwell, ref level = 80dB, 10 meter test distance. 120Vac/60Hz FCC Class B RE Troubleshooting Ferrite on the HDMI cable and internal power cable. **Ferrite on 3 USB cables**		1.0	Fail	KJ
							

EMI\ENV Test Log

Manufacturer:	Pro V&V	Project Number:	PR085361
Model:	Clear Ballot Group (manufacturer) Pro V&V (client)	S/N:	Unit 1
Customer Representative:	Michael Walker		
Standard Referenced:	FCC Part 15, EAC 2005 VVSG		

FR0105

10m Emissions

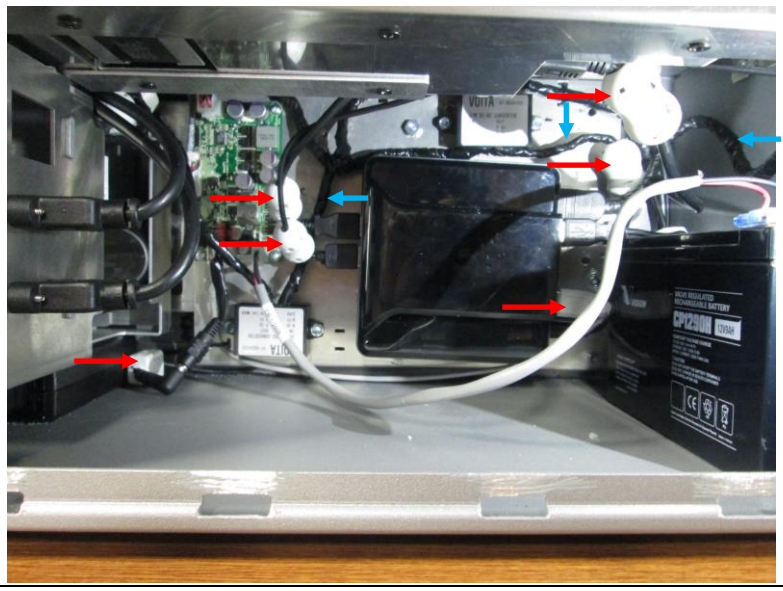
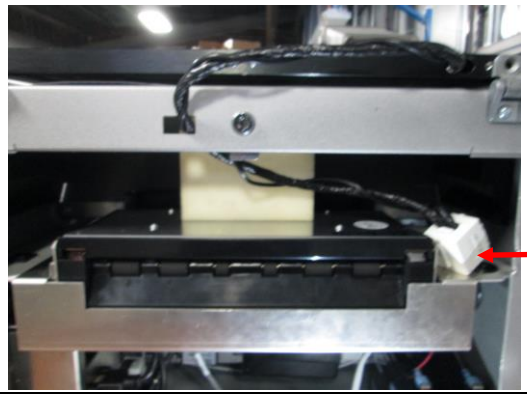
Test	Test Code	Date	Event	OT	Time (hrs)	Result	Initials
RE	1351	1230-1330	Test#4: 1GHz – 18GHz, 16 rads, 2 heights, 3 second dwell, ref level = 107dB, 3 meter test distance. 120Vac/60Hz FCC Class B Client does not want to measure any signals.		1.0	Complete	KJ
CE	2341	1330-1430	Test#5: 150KHz – 30MHz 120Vac/60Hz FCC Class B		1.0	Pass	KJ
RI	4398	1430-1630	Radiated RF Immunity (4.1.2.10) 10V/m, 80 - 1000 MHz, 1% Step, 80% AM, 1kHz sine, 3s dwell 120 VAC / 60 Hz EAC 2005 VVSG Did the back side V-pole		2.0	Complete	KJ
RI		September 7, 2018 0800-1200	Finishing Radiated RF Immunity Unit stopped at 239MHz, V-pole, left side. Did not repeat.		4.0	Pass	KJ
RE		1230-1300	Test#6: 30MHz – 1GHz, 8 rads, 4 heights, 3 second dwell, ref level = 80dB, 10 meter test distance. 120Vac/60Hz Cable re-positioning, cable management and ferrites Unit failed at 668MHz by .5dB		0.5	Fail	KJ
RE		1330-1430	Test#7: 30MHz – 1GHz, 8 rads, 4 heights, 3 second dwell, ref level = 80dB, 10 meter test distance. 120Vac/60Hz HDMI cable shielded with foil with ferrites Output power cable shielded		1.0	Pass	KJ

EMI\ENV Test Log

Manufacturer:	Pro V&V	Project Number:	PR085361
Model:	Clear Ballot Group (manufacturer) Pro V&V (client)	S/N:	Unit 1
Customer Representative:	Michael Walker		
Standard Referenced:	FCC Part 15, EAC 2005 VVSG		

FR0105

10m Emissions

Test	Test Code	Date	Event	OT	Time (hrs)	Result	Initials
							
							
			NOTE: Client says that they do not need to finish 1GHz to 18GHz Radiated emissions.				

Regular hours:	13.5
Overtime/Prem hours:	
Total hours:	13.5

Ground Planes / CALC

Test	Test Code	Date	Event	OT	Time (hrs)	Result	Initials
4-6	4622	September 10, 2018 0800 - 0900	Conducted RF Immunity (4.1.2.11) 10Vrms, 0.15 - 80 MHz, 1% Step, 80% AM, 1kHz sine, 3s dwell 120 VAC / 60 Hz		1.0	Pass	CL
4-4	4411	0900 - 0930	Electrical Fast Transient / Burst (4.1.2.6) Mains: +/- 2kV, I/O: +/- 1kV 120 VAC / 60 Hz @ 100kHz rep rate. Also ran at 5kHz rep rate.		0.5	Pass	CL
4-11	4196	0930 - 1000	Voltage Dips and Interruptions (Inc./Red. of Nom. Voltage) (4.1.2.5) Electric power increases of 7.5% and reductions of 12.5% of nominal specified power. (See Protocol) 120 VAC / 60 Hz		0.5	Pass	CL
---	---	1000 - 1300	129Vac Line Voltage Variations (+7.5% of nominal 120V) 3hrs.		3.0	Pass	CL
---	---	1300 - 1600	105Vac Line Voltage Variations (-12.5% of nominal 120V) 3 Hrs.		3.0	Pass	CL
---	---	September 11, 2018 0800 - -9000	Surges of -15% line variations of nominal voltage (102V) 1 Hrs		1.0	Pass	CL
---	---	0900 - 1000	Surges of + 15% of line variations of nominal (138Vac) 1 Hrs.		1.0	Pass	CL
4-5	4596	1000 - 1530	Surge Immunity (4.1.2.7) Mains: +/- 2kV CM, +/- 2kV DM, (0, 90, 180, 270) 120 VAC / 60 Hz **Note: Post-test verification found touch screen not responding. Will replace screen and re-test tomorrow.**		5.5	---	CL
4-8	4831	1530 - 1630	Power Frequency H-Field Immunity (4.1.2.12) 30A/m, 50 / 60 Hz, 3 axes 120 VAC / 60 Hz		1.0	Pass	CL
4-5	---	September 12, 2018 0800 - 1300	Re-test Surge Immunity (4.1.2.7) Mains: +/- 2kV CM, +/- 2kV DM, (0, 90, 180, 270) 120 VAC / 60 Hz		5.0	Pass	CL
4-2	4254	1300 - 1500	Electrostatic Discharge Note: Pre-test performed, cables are .931 and .947 (4.1.2.8) +/- 8kV Contact, +/-2, 4, 8, 15kV Air 120 VAC / 60 Hz		2.0	Pass	CL

Regular hours:	23.5
Overtime/Prem hours:	
Total hours:	23.5

Project #:PR085361 Work Order #: 2018080601 PO#:
B80857 Amount:

Company: Pro V&V
700 Boulevard South
Suite 102
Huntsville, AL 35802
Phone: 256-713-11111
Fax:

Contact: Michael Walker
Email: michael.walker@provandv.com

Model#:
Serial #:

Test Notes: Voting Machine Testing
Three (5) units for test
PQF: Increase/decrease = 3 hrs each -/+, 6 hrs total per unit
PQF: Surge = 4 hrs each
Data sheet folder for each unit
Formal test reports

Quoted Work

Date	Test Code	Description	Standard	Result		Billed
September 6, 2018	1342	Radiated Emissions, 30 MHz - 1 GHz (4.1.2.9) 30 MHz - 1 GHz 120 VAC / 60 Hz	FCC Part 15, Class B	Pass		
September 6, 2018	1351	Radiated Emissions, 1 GHz - 18 GHz (4.1.2.9) 1 GHz - 18 GHz 120 VAC / 60 Hz	FCC Part 15, Class B	Fail		
September 6, 2018	2341	Conducted Emissions, 150 kHz - 30 MHz (4.1.2.9) -- 120 VAC / 60 Hz	FCC Part 15, Class B	Pass		
September 12, 2018	4254	Electrostatic Discharge (4.1.2.8) +/- 8kV Contact, +/-2, 4, 8, 15kV Air 120 VAC / 60 Hz	EN61000-4-2	Pass		
September 6, 2018	4398	Radiated RF Immunity (4.1.2.10) 10V/m, 80 - 1000 MHz, 1% Step, 80% AM, 1kHz sine, 3s dwell 120 VAC / 60 Hz	--	Pass		
September 10, 2018	4411	Electrical Fast Transient / Burst (4.1.2.6) Mains: +/- 2kV, I/O: +/- 1kV 120 VAC / 60 Hz	EN61000-4-4	Pass		
September 11, 2018	4596	Surge Immunity (4.1.2.7) Mains: +/- 2kV CM, +/- 2kV DM, (0, 90, 180, 270) 120 VAC / 60 Hz	EN61000-4-5	Pass		

September 10, 2018	4622	Conducted RF Immunity (4.1.2.11) 10Vrms, 0.15 - 80 MHz, 1% Step, 80% AM, 1kHz sine, 3s dwell 120 VAC / 60 Hz	EN61000-4-6	Pass		
September 11, 2018	4831	Power Frequency H-Field Immunity (4.1.2.12) 30A/m, 50 / 60 Hz, 3 axes 120 VAC / 60 Hz	EN61000-4-8	Pass		
September 10, 2018	4196	Voltage Dips and Interruptions (Inc./Red. of Nom. Voltage) (4.1.2.5) Electric power increases of 7.5% and reductions of 12.5% of nominal specified power. (See Protocol) 120 VAC / 60 Hz	EN61000-4-11	Pass		
September 11, 2018	4194	Voltage Dips and Interruptions (Surge of +/- 15%) (4.1.2.5) Surge of +/- 15% line variation of nominal line voltage 120 VAC / 60 Hz	EN61000-4-11	Pass		
September 10, 2018	4193	Voltage Dips and Interruptions (4.1.2.5) 70% nom, 0.6 cycles / 40% nom, 6 cycles & 1 sec. / 0% nom, 300 cycles 120 VAC / 60 Hz	EN61000-4-11	Pass		
September 6, 2018	6001	Initial Product Set-up & Configuration Engineering / Trouble-Shoot ---	--			
	9010	Immunity Test Report - Soft Copy -- --	--			
	9040	Emissions Test Report - Soft Copy -- --	--			

Unquoted Work

Date	Test Code	Description	Cost	Billed

Modifications Required For Compliance

Test	Description of Modification	Client Initials
RE	(1) 742 717 22 Wurth ferrite (1) 742 711 42 Wurth ferrite (1) 742 711 32 Wurth ferrite (2) 742 758 13 Wurth ferrites (2) 742 758 12 Wurth ferrites Shielded HDMI and output power cable See photo in test log. Red arrows for ferrites and blue arrows for shielded cable	

Modifications Required For Compliance		
Test	**Description of Modification**	**Client Initials**

Shipping Instructions:		**Client Initials**

Supervisor: _____ Date: _____

Test Engineer: _____ Date: _____

I, the client, verify that all the information provided concerning the unit which was tested, support equipment, etc., was accurate. This includes, but is not limited to, information provided via EMC Test Plan and/or EMC Test Protocol, information provided to complete NTS's Product Data Sheet, etc.

Furthermore, I understand that my company may be assessed report revision fees for any report revisions resulting from inaccurate or incomplete information provided.

Client: _____ Date: _____

☐ Invoice Complete Invoice #: _____

APPENDIX E: Laboratory Accreditations

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

NATIONAL TECHNICAL SYSTEMS (NTS) - LONGMONT
1736 Vista View Drive
Longmont, CO 80504-5242
Mr. Eric Loucks Phone: 303 776 7249

ELECTRICAL

Valid To: September 30, 2018 Certificate Number: 0214.43

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following Electromagnetic Compatibility/Interference (EMC/EMI), Lightning, Transient, Surge, and Product Safety tests:

Test Technology:	Test Method(s)[1,2]:
Emissions	
Radiated and Conducted	CFR 47 FCC, Parts 15B (using ANSI C63.4: 2014), 15C (using ANSI C63.10:2013), and 18 (using MP-5:1986); CISPR 32, Ed. 1 (2012-01); EN 55032:2012/AC:2013; AS/NZS CISPR 22 (2002); AS/NZS 3548 (1997); AS/NZS CISPR 14-1 (2003); IEC/CISPR 14-1, Ed. 4 (2003); IEC 61000-3-12, Ed. 2.0 (2011); EN 61000-3-12 (2011); IEC 61000-6-1, Ed. 2 (2005-03); IEC 61000-6-2, Ed. 2.0 (2005-01); IEC 61000-6-3 (1996); EN 61000-6-3 (2001) + A1 (2004); EN 61000-6-4 (2007); KN 32:2015 (Annex 11); KN 22; KN 11
Harmonics	IEC 61000-3-2, Ed. 2.2 (2004-11); IEC 61000-3-2, Ed. 3.0 (2005) + A1 (2008) + A2 (2009); IEC 61000-3-2, Ed. 4.0 (2014-05)
Flicker	IEC 61000-3-3, Ed. 1.1 (2002-03); EN 61000-3-3 + A1 (2001); IEC 61000-3-3, Ed. 1.1 (2003) + A2 (2005); IEC 61000-3-3, Ed. 3.0 (2013-05)
Immunity	
Electrostatic Discharge (ESD)	IEC 61000-4-2 (2001); EN 61000-4-2 (2001) + A2 (2001); EN 61000-4-2 + A1 (1998) + A2 (2001); IEC 61000-4-2, Ed. 2.0 (2008-12); EN 61000-4-2 (2009-05); KN 61000-4-2; KN 61000-4-2 (2008-5); KN 61000-4-2 (Annex 1-1)
Radiated	IEC/EN 61000-4-3, Ed. 2.1 (2002) + A1 (2002); EN 61000-4-3; IEC 61000-4-3 (1995) + A1 (1998) + A2 (2000); EN 61000-4-3 (2002) + A1 (2002); IEC 61000-4-3, Ed. 3.0 (2006-02) + A1 (2007) + A2 (2010); EN 61000-4-3 (2006) + A1 (2008) + A2 (2010); KN 61000-4-3; KN 61000-4-3 (2008-5); KN 61000-4-3 (Annex 1-2)

5202 Presidents Court, Suite 220 | Frederick, MD 21703-8398 | Phone: 301 644 3248 | Fax: 240 454 9449 | www.A2LA.org

Test Technology:	Test Method(s)[1,2]:
Immunity (cont'd)	
Electrical Fast Transient/Burst	IEC 61000-4-4, Ed. 2.0 (2004-07); EN 61000-4-4 (2004); EN 61000-4-4:2012; IEC 61000-4-4 (2012-04); KN 61000-4-4; KN 61000-4-4 (2008-5); KN 61000-4-4 (Annex 1-3)
Surge	IEC 61000-4-5, Ed. 2.0 (2005-11); EN 61000-4-5; IEC 61000-4-5, Ed. 3.0 (May 2014); BS EN 61000-4-5 (2006); EN 61000-4-5: 2014; KN 61000-4-5; KN 61000-4-5 (2008-5); KN 61000-4-5 (Annex 1-4); IEEE C62.41.1 (2002); IEEE C62.41.2 (2002); IEEE C62.25 (2002)
Conducted	IEC 61000-4-6, Ed. 2.1 (2004); EN 61000-4-6; EN 61000-4-6 (1996) + A1 (2001); IEC 61000-4-6, Ed. 2.2 (2006-05); IEC 61000-4-6, Ed. 3.0 (2008); IEC 61000-4-6, Ed. 4.0 (2013); EN 61000-4-6 (2009); EN 61000-4-6 (2014); KN 61000-4-6; KN 61000-4-6 (2008-5); KN 61000-4-6 (Annex 1-5)
Power Frequency Magnetic Field	IEC 61000-4-8 (2001) + A1 (2000); EN 61000-4-8 (2001) + A1 (2000); EN 61000-4-8 (1993) + A1 (2001); IEC 61000-4-8 (2009); EN 61000-4-8:2010; KN 61000-4-8; KN 61000-4-8 (2008-5); KN 61000-4-8 (Annex 1-6)
Voltage Dips, Short Interruptions, and Voltage Variations	IEC 61000-4-11, Ed. 2 (2004-03); EN 61000-4-11; EN 61000-4-11 (1994) + A1 (2001); EN 61000-4-11 (2004); KN 61000-4-11; KN 61000-4-11 (2008-5); KN 61000-4-11 (Annex 1-7)
Product Safety	
Medical Electrical Equipment	IEC 60601-1-2, Ed. 3.0 (2007); KN 60601-1-2 (2008-5); IEC 60601-1-2, Ed. 4, (2014-02); EN 60601-1-2 (2007); EN 60601-1-2 (2015)
Generic/Product Family Standards and Industry Standards	
Generic Standards	EN 61326-1: 2013; KN 35: 2015
Information Technology Equipment	IEC/CISPR 22 (1997); EN 55022 (1998) + A1 (2000); IEC/CISPR 22 (1993); EN 55022 (1994); IEC/CISPR 22 (1993); EN 55022 (1994) + A1 (1995) + A2 (1997); CNS 13438 (1997); IEC/CISPR 22, Ed. 4 (2003-04); EN 55022 (1998); IEC/CISPR 22, Ed. 5 (2005); EN 55022 (1998); IEC/CISPR 22, Ed. 5 (2005) + A1 (2005); EN 55022 (1998) + A1 (2000) + A2 (2003);

Test Technology:	Test Method(s)[1,2]:
Generic/Product Family Standards and Industry Standards (cont'd)	
Information Technology Equipment (cont'd)	CNS 13438 (2006) (up to 6GHz); IEC/CISPR 22, Edition 5.2 (2006-03); EN 55022 (2006); EN 55022 (2006) + A1 (2007); EN 55022:2010; IEC/CISPR 22 (2008-09); AS/NZS CISPR 22 (2009); TCVN 7189:2009 (CISPR 22:2006); VCCI V-3 (2009.04, 2011.04, 2013.04, 2014.04, 2015.04) (up to 6 GHz); VCCI-CISPR 32:2016; CISPR 24 Ed 2.0 (2010-08); EN 55024 (2010); KN 24
Industrial, Scientific, and Medical (ISM) Equipment	AS/NZS CISPR 11 (2002); IEC/CISPR 11, Ed. 4.1 (2004-06); AS/NZS CISPR 11 (2004); IEC/CISPR 11, Ed. 4.1 (2004-06) + A1 (2004); EN 55011 (1998) + A1 (1999) + A2 (2002); IEC/CISPR 11 (2003); EN 55011 (1998) + A2(2002); EN 55011 (2009) + A1 (2010); IEC/CISPR 11 Ed. 5 (2009-05); CISPR 11 Ed. 5.1 (2010)
Measure	IEC 61326-1 Ed. 2.0 (2012)
Military/Defense	MIL-STD-461F Method CE101 (30 Hz to 10 kHz); MIL-STD-461F Method CE102 (10 kHz to 10 MHz); MIL-STD-461F Method CE106 (10 kHz to 40 GHz); MIL-STD-461F Method CS101 (30 Hz to 150 kHz); MIL-STD-461F Method CS106; MIL-STD-461F Method CS114 (10 kHz to 200 MHz); MIL-STD-461F Method CS116 (10 kHz to 100 MHz); MIL-STD-461F Method RE101 (30 Hz to 100 kHz); MIL-STD-461F Method RE102 (10 kHz to 18 GHz); MIL-STD-461F Method RE103 (10 kHz to 40 GHz); MIL-STD-461F Method RS101 (30 Hz to 100 kHz); MIL-STD-461F Method RS103 (2 MHz to 40 GHz)

[1] When the date, revision or edition of a test method standard is not identified on the scope of accreditation, the laboratory is required to be using the current version within one year of the date of publication, per part C., Section 1 of A2LA *R101 - General Requirements- Accreditation of ISO-IEC 17025 Laboratories*. If a specifier/regulator imposes a different transition period, this will supersede the A2LA one-year implementation period.

[2] The laboratory is only accredited for testing activities outlined within the test methods listed above. Reference to any other activity within these standards, such as risk management or risk assessment, does not fall within the laboratory's accredited capabilities.

On the following types of products:

Telecommunication Equipment, Network Equipment, Industrial and Commercial Equipment, Electronic (Digital) Equipment, Medical, Aerospace, Military. Information Technology Equipment, Multimedia Equipment, Scientific Equipment

Testing Activities Performed in Support of FCC Declaration of Conformity and Certification in Accordance with 47 Code of Federal Regulations and FCC KDB 974614, Appendix A, Table A.1[3]

Rule Subpart/Technology	Test Method	Maximum Frequency (MHz)
Unintentional Radiators Part 15B	ANSI C63.4:2014	40000
Industrial, Scientific, and Medical Equipment Part 18	FCC MP-5 (February 1986)	40000
Intentional Radiators Part 15C	ANSI C63.10:2013	40000

[3]Accreditation does not imply acceptance to the FCC equipment authorization program. Please see the FCC website (https://apps.fcc.gov/oetcf/eas/) for a listing of FCC approved laboratories.

Accredited Laboratory

A2LA has accredited

NATIONAL TECHNICAL SYSTEMS (NTS) - LONGMONT

Longmont, CO

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

Presented this 28th day of October 2016.

President and CEO
For the Accreditation Council
Certificate Number 0214.43
Valid to September 30, 2018
Revised August 30, 2018

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

END OF REPORT