

National Technical Systems Test Report for Electromagnetic Interference (EMI) Testing of the ClearCast

Prepared For

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Prepared By

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Revision History

Rev.	Description	Issue Date
0	ETR-PR127745	04/16/2021



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1.0 Introduction

This document presents the test procedures used and the results obtained during the performance of an Electromagnetic Interference test program. The test program was conducted to assess the ability of the specified Equipment Under Test (EUT) to successfully satisfy the requirements listed in Section 2.0.

2.0 References

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

- Pro V&V, Inc. Purchase Order(s) 2020-010, dated 10/26/2020
- National Technical Systems (NTS) Quote(s) OP0565143, dated 10/15/2020
- NTS Corporate Quality Policy Manual, Revision 9, dated 9/20/2018
- ISO/IEC 17025:2017(E) General Requirements for the Competence of Testing and Calibration Laboratories, dated 11/1/2017
- Test Specification: FCC Part 15

3.0 Product Selection and Description

Pro V&V, Inc. selected and provided the test sample(s) to be used as the Equipment Under Test. Details below:

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

Item	Qty.	Name/Description	Part Number	Serial Number	
1	2	ClearCast	ClearVote 2.2	CCER0401003, CCER0401002	

3.1 Security Classification

Non-classified

4.0 General Test Requirements

4.1 Test Equipment

NTS-provided equipment is calibrated according to ISO/IEC 17025:2017(E) and calibration is traceable to the National Institute of Standards and Technology (NIST). Calibration records are maintained on file at NTS.

4.2 Measurement Uncertainties

Measurement uncertainty data is available upon request.

4.3 Notice of Deviation

In accordance with NTS' quality procedures, when the EUT is observed to exceed or display susceptibility, a Notice of Deviation (NOD) document is generated by the technician performing the test. This NOD documents the requirement, how the EUT deviated from the requirement, and allows room for resolution of the deviation.

This document is reviewed and approved by the NTS Program Manager or Engineer and the NTS Quality Assurance Representative, and then forwarded to the customer contact. Once mitigated (or passed over), the steps taken to correct the deviation (or simply instruction from the customer to continue testing) are recorded in the NOD and a copy of the NOD is integrated into the body of the report, in the appropriate location.

5.0 Test Descriptions and Results

Table 5.0-1: Summary of Test Information & Results

Section	Test	Specification	Test Facility	Test Date	Part #	Serial #	Test Result*
5.1	Radiated Emissions, 30 MHz - 1 GHz	FCC Part 15	Longmont	12/04/2020 - 12/04/2020	ClearVote 2.2	CCER0401002	Complied
5.2	Conducted Emissions, 150 kHz - 30 MHz	FCC Part 15	Longmont	12/04/2020 - 12/04/2020	ClearVote 2.2	CCER0401003	Complied

^{*}The decision rule used to state compliance is in accordance with the test specification used for testing. Unless otherwise noted, testing was performed in accordance with the latest published version of test specification at time of test.



5.1 Radiated Emissions, 30 MHz - 1 GHz

Radiated Emissions, FCC Part 15

Manufacturer: Pro V&V/CBG PR127745B81007 Project Number: Customer Representative: Michael Walker Test Area: 10m2 ClearVote 2.2 (ClearCast) CCER0401002 Model: S/N: FCc Part 15 December 4, 2020 Standard Referenced: Date: Temperature: 22°C 843mb Humidity: 32% Pressure: Input Voltage: 120Vac/60Hz Configuration of Unit: Normal operating mode Test Engineer: Kevin Johnson

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Туре	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	30.583	23.9	24.8	-25.9	22.8	317/H-Pole/1.91	6.77
QP	192.321	25.2	15.5	-23.4	17.3	317/H-Pole/2.00	15.71
QP	311.977	36.2	17.8	-23.3	30.6	0/V-Pole/3.98	4.90
QP	444.195	27.9	20.7	-23.0	25.6	175/V-Pole/3.89	9.94
QP	455.971	33.5	20.9	-23.0	31.4	178/V-Pole/3.90	4.17
QP	467.960	32.3	21.3	-22.9	30.8	173/V-Pole/3.82	4.78
QP	491.952	31.2	21.8	-22.7	30.3	180/V-Pole/3.00	5.25
QP	710.473	24.6	24.4	-21.6	27.4	225/V-Pole/1.00	8.13
QP	733.101	28.8	24.5	-21.7	31.7	271/H-Pole/1.01	3.89
QP	779.796	24.7	25.3	-21.6	28.4	315/V-Pole/1.01	7.16
QP	894.995	25.1	26.3	-21.0	30.4	90/V-Pole/1.01	5.10

The highest emission measured was at 733.101 MHz, which was 3.89 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 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: Pro V&V/CBG Project Number: PR129 Customer Representative: Michael Walker Test Area: 10m2 ClearVote 2.2 (ClearCast) S/N: CCER0401002 Model: Standard Referenced: FCC Part 15 Date: December 4, 2020 B80802-22-RE.doc FR0100

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



Radiated Emissions, FCC Part 15

Manufacturer:Pro V & V/CBGProject Number:PR 129Customer Representative:Michael WalkerTest Area:10m2Model:Clear Vote 2.2 (Clear Cast)S/N:CCER 040 1002

Standard Referenced: FCC Part 15 Date: December 4, 2020
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Figure A1: Radiated Emissions Test Setup – Front Side

FR0100



Radiated Emissions, FCC Part 15

 Manufacturer:
 Pro V & V/CBG
 Project Number:
 PR129

 Customer Representative:
 Michael Walker
 Test Area:
 10m2

 Model:
 ClearVote 2.2 (ClearCast)
 S/N:
 CCER0401002

Standard Referenced: FCC Part 15 Date: December 4, 2020

B80802-22-RE.doc

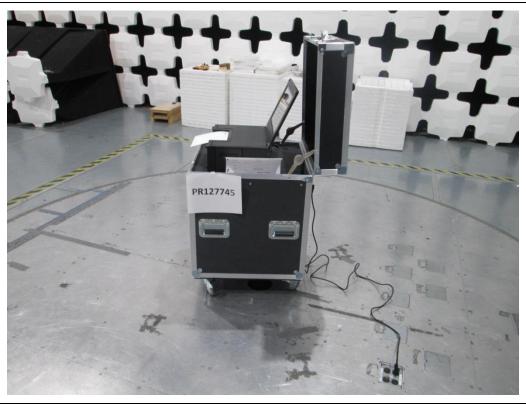


Figure A2: Radiated Emissions Test Setup – Right Side



Radiated Emissions, FCC Part 15

 Manufacturer:
 Pro V & V/CBG
 Project Number:
 PR129

 Customer Representative:
 Michael Walker
 Test Area:
 10m2

 Model:
 ClearVote 2.2 (ClearCast)
 S/N:
 CCER0401002

Standard Referenced: FCC Part 15 Date: December 4, 2020

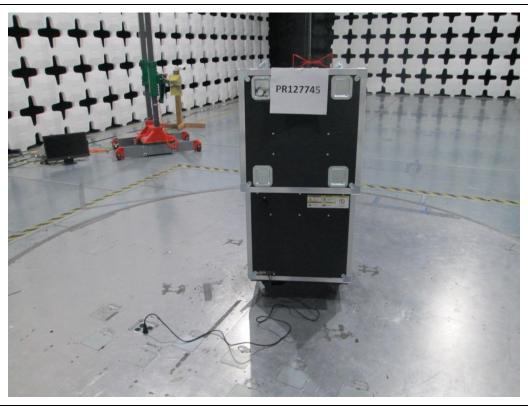


Figure A3: Radiated Emissions Test Setup – Back Side

FR0100



Radiated Emissions, FCC Part 15

Manufacturer:Pro V&V/CBGProject Number:PR129Customer Representative:Michael WalkerTest Area:10m2Model:ClearVote 2.2 (ClearCast)S/N:CCER0401002

Standard Referenced: FCC Part 15 Date: December 4, 2020

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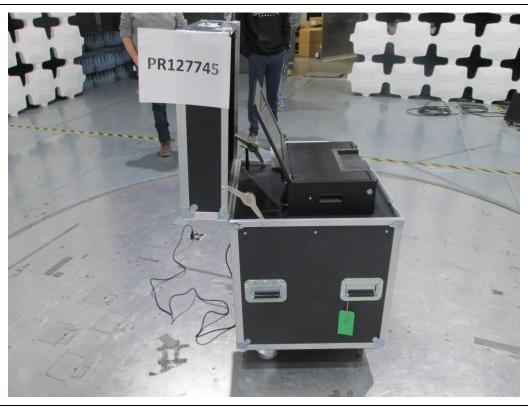


Figure A1: Radiated Emissions Test Setup – Left Side



Radiated Emissions, FCC Part 15

Manufacturer:	Pro V&V/CBG	Project Number:	PR127745
Customer Representative:	Michael Walker	Test Area:	10m2
Model:	ClearVote 2.2 (ClearCast)	S/N:	CCER0401002
Standard Referenced:	FCC Part 15	Date:	December 4, 2020
B80802-22-RE.doc			FR0100

Test Equipment List

1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1								
ID Number	Manufacturer	Model #	Serial #	Description	Cal Date	Cal Due		
1046	Hewlett Packard	8566B	2403A08106	Spectrum Analyzer Display	04/01/2020	04/01/2021		
1220	Mini-Circuits	ZKL-2	NA	Preamp, 10 - 2000 MHz, 30 dB	01/27/2020	02/27/2021		
1342	Hewlett Packard	85650A	2412A00392	Quasi-Peak Adapter	04/01/2020	04/01/2021		
1345	Hewlett Packard	85685A	2901A00865	RF Preselector	03/31/2020	07/01/2021		
1381	Sunol	JB1	A010411	0.03-2 GHz Broadband Hybrid Antenna	08/27/2019	08/27/2021		
1396	CIR Enterprises	10m Chamber #2	002	10m Chamber with 4m turntable	04/27/2020	04/27/2022		
1410	Sunol Sciences	SC110V	021611-1	System Controller 10meter #2	NA	NA		
1501	Hewlett Packard	8566B	2007A00456	Spectrum Analyzer - RF Section	04/01/2020	04/01/2021		
1592	EMCI	CEAS	V4.1.2	Commercial Emissions Automation Software - 10M # 2	NA	NA		
1902	EXTECH	445703	1218-1	Hygrometer-Thermometer (WC059900)	06/29/2020	06/29/2021		



5.2 Conducted Emissions, 150 kHz - 30 MHz

Conducted Emissions, FCC Part 15

Pro V&V/CBG Manufacturer: Project Number: PR127745/B80802 Customer Representative: Michael Walker Test Area: 10m1

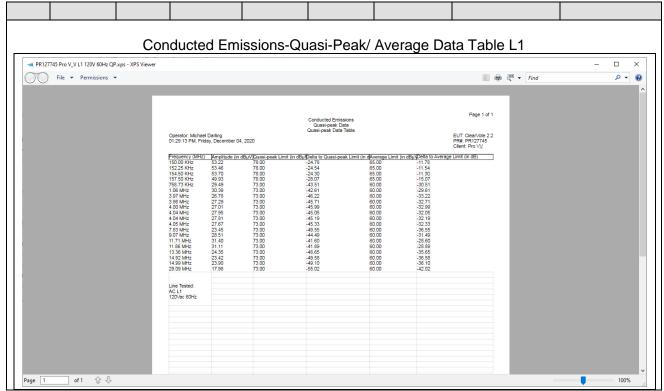
ClearVote 2.2 (ClearCast) Model: S/N: CCER0401003 Standard Referenced: FCC Part 15 Date: 12/4/2020

 $22^{\circ}\mathrm{C}$ Temperature: 833mb Humidity: 32% Pressure:

Input Voltage: 120Vac/60Hz

Configuration of Unit: Normal operating mode

> Test Engineer: Michael Darling



Pressure: 833mb



Conducted Emissions, FCC Part 15

Temperature:

Manufacturer: Pro V&V/CBG Project Number: PR127745/B80802

Customer Representative: Michael Walker Test Area: 10m1

Model: ClearVote 2.2 (ClearCast) S/N: CCER0401003

Standard Referenced: FCC Part 15 Date: 12/4/2020

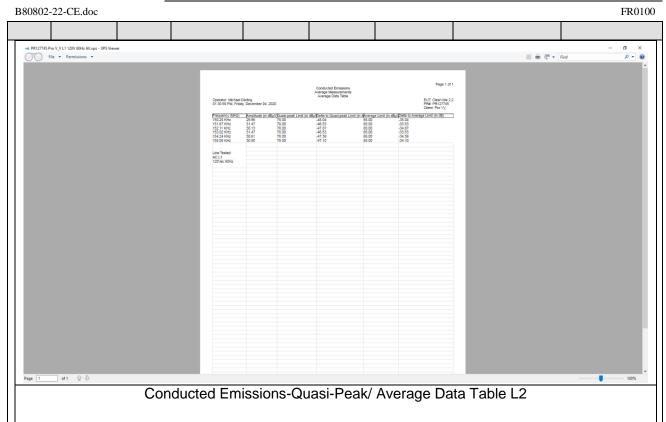
Humidity: 32%

Input Voltage: 120Vac/60Hz

Configuration of Unit: Normal operating mode

Test Engineer: Michael Darling

22°C



Pressure:

833mb



Conducted Emissions, FCC Part 15

Manufacturer: Pro V&V/CBG Project Number: PR127745/B80802

Customer Representative: Michael Walker Test Area: 10m1

Model: ClearVote 2.2 (ClearCast) S/N: CCER0401003

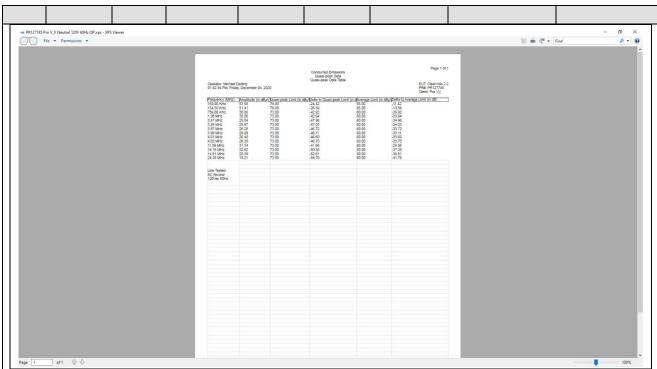
Standard Referenced: FCC Part 15 Date: 12/4/2020

Temperature: 22°C Humidity: 32%

Input Voltage: 120Vac/60Hz

Configuration of Unit: Normal operating mode

Test Engineer: Michael Darling



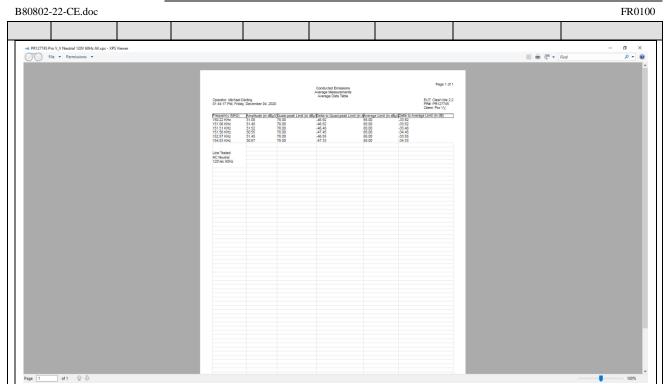


Pro V&V/CBG PR127745/B80802 Manufacturer: Project Number: Customer Representative: Michael Walker Test Area: 10m1 Model: ClearVote 2.2 (ClearCast) CCER0401003 FCC Part 15 12/4/2020 Standard Referenced: Date: Temperature: 22°C Pressure: 833mb Humidity: 32%

Input Voltage: 120Vac/60Hz

Configuration of Unit: Normal operating mode

Test Engineer: Michael Darling



The highest emission measured was at 154.5 kHz, which was -24.30 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

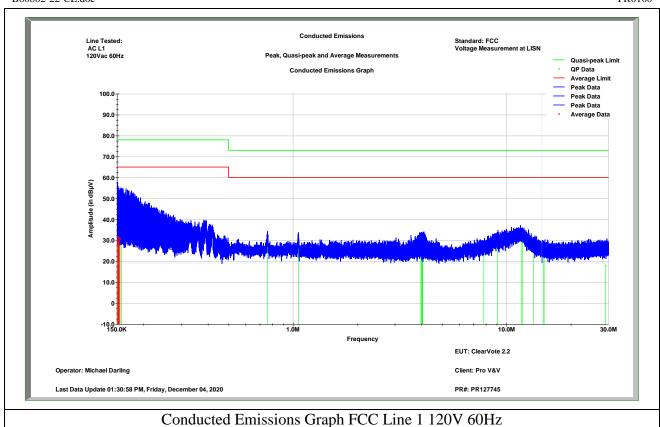


Manufacturer: Pro V&V/CBG Project Number: PR127745/B80802

Customer Representative: Michael Walker Test Area: 10m1

Model: ClearVote 2.2 (ClearCast) S/N: CCER0401003

Standard Referenced: FCC Part 15 Date: 12/4/2020



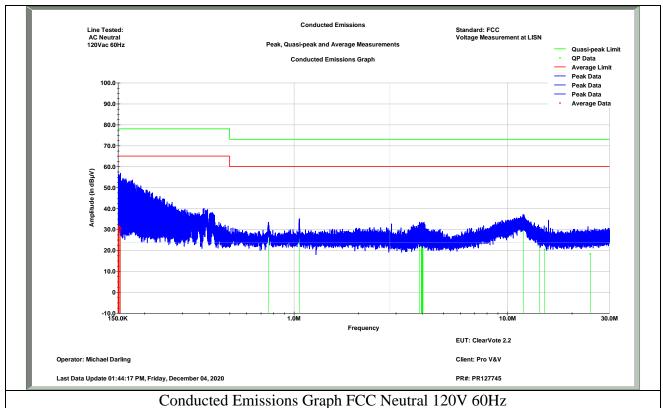


Manufacturer: Pro V&V/CBG Project Number: PR127745/B80802

Customer Representative: Michael Walker Test Area: 10m1

Model: ClearVote 2.2 (ClearCast) S/N: CCER0401003

Standard Referenced: FCC Part 15 Date: 12/4/2020



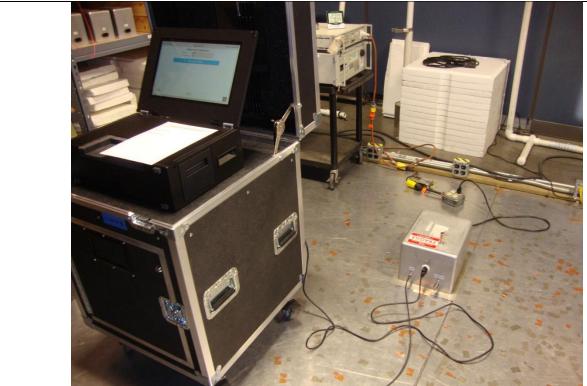


Manufacturer: Pro V&V/CBG Project Number: PR127745/B80802

Customer Representative: Michael Walker Test Area: 10m1

Model: ClearVote 2.2 (ClearCast) S/N: CCER0401003

Standard Referenced: FCC Part 15 Date: 12/4/2020



Conducted Emissions Test setup – Front Side

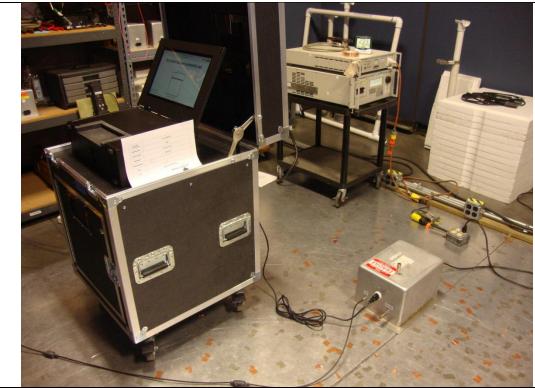


Manufacturer: Pro V&V/CBG Project Number: PR127745/B80802

Customer Representative: Michael Walker Test Area: 10m1

Model: ClearVote 2.2 (ClearCast) S/N: CCER0401003

Standard Referenced: FCC Part 15 Date: 12/4/2020



Conducted Emissions Test setup – Right Side



Manufacturer:	Pro V&V/CBG	Project Number:	PR127745/B80802
Customer Representative:	Michael Walker	Test Area:	10m1
Model:	ClearVote 2.2 (ClearCast)	S/N:	CCER0401003
Standard Referenced:	FCC Part 15	Date:	12/4/2020
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Test Equipment List

ID Number	Manufacturer	Model #	Serial #	Description	Cal Date	Cal Due
1557	EMCI	EMCI, 2 Phase LISN	11	150 kHz to 30 MHz, 277 Vac/400 Vdc, 50/60 Hz, 16 A	09/28/2020	09/28/2021
1234	CIR Enterprises	10m Chamber	001	10m Chamber with 2.5m turntable	05/28/2019	05/28/2021
1951	RHODE & SCHWARZ	ESW44	101866	EMI Test Receiver (2Hz-44GHz)	01/08/2021	01/08/2022
1200	Agilent Technology	11947A	3107A03807	Transient Limiter, 9 kHz to 200 MHz	04/24/2020	04/24/2021
1902	EXTECH	445703	1218-1	Hygrometer-Thermometer (WC059900)	06/29/2020	06/29/2021
1492	Fluke	87/5 Multimeter	23350032	True RMS Multimeter (WC059765)	12/18/2020	12/18/2021

FR0105



6.0 Test Log

EMI Test Log

Manufacturer: CBG Project Number: PR127745/B80802

Model: ClearVote 2.2 (ClearCast) S/N: CCER0401003

Ballot Box CCER0401002

Customer Representative: Michael Walker

Standard Referenced: FCC Part 15

10m Emissions

Test	Test Code	Date	Event	O T	Time (hrs)	Result	Initials
RE		December 4, 2020	Test#1: 30MHz – 1GHz, 8 rads, 4 heights, 3 second dwell, ref level = 80dBuy, 10 meter distance				KJ
		0800-1000	120Vac/60Hz				
CE		12/4/2020	Begin testing ClearVote 2.2, ClearCast, CCER0401002		0.5	Pass	MD
		1320-1345					



End of Report