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Test Report Number:	**ETRB41002, Rev. A**
Reference Standard:	**Hart InterCivic EMI/EMC Test Plan**
Date of Test:	**1 October 2014**
Date of Report:	**25 November 2014**
Product Name:	**Verity Touch Writer**
Model Number:	**2005352 (Touch Writer) Rev. B, 2005358 (Standard Booth), 2005359 (Accessible Booth)**
Serial Number:	**W1400006609**
Manufacturer:	**Hart InterCivic**
Representative:	**Darrick Forester (SLI Global)**
Report Type:	**Radiated and Conducted Emissions**
Test Result:	**Compliant**
Approved By:	Vincent W. Bent

FCC	BSMI	VCCI	MSIP	MIC
DN: US5316 TSRN: 735190 FRN: 0015264914	SL2-IN-E-1134R	Member #: 2649 Registration #: A-0170	US0168	US0168

Prepared for:

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Laboratory Manager

Revision	Description of Revision	Date:
Rev. -	Initial Release	18 November 2014
Rev. A	Changes per client email of 11/21/2014	25 November 2014

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LIST OF APPENDICES

1.0 TEST SUMMARY

1.1 Product Description

The unit under test (UUT) was the Verity Touch Writer. This product consisted of three components and the model numbers of these components are as follows: 2005352 (Touch Writer) Rev. B, 2005358 (Standard Booth), 2005359 (Accessible Booth). The serial number of the touch writer unit was W1400006609. It is manufactured by Hart InterCivic located in Austin, Texas. This product is a polling place ballot marking device designed for use in commercial and business environments.. The product was continually exercised during testing, as documented in the "configuration" field of the test data sheet.

Additional information regarding this product may be found in Appendix C of this report.

1.2 Purpose

This report documents the test efforts performed on the Verity Touch Writer to verify compliance to the Class B limits of FCC Part 15. This was a formal qualification test and was conducted on 1 October 2014.

1.3 Test Standards Used

Testing was performed in accordance with the Hart InterCivic EMI/EMC Test Plan. This document references the emission limits defined by CFR Title 47, FCC Parts 15.107 and 15.109. The UUT was set up as specified in ANSI C63.4: 2009.

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

CFR Title 47 FCC Part 15	ANSI C63.4: 2009

1.4 Test Results

The UUT **complied** with the Class B emission requirements defined in Table 1-1. Test data is contained in the appropriate appendices of this report.

1.5 Modifications Required for Compliance

None.

2.0 TEST ENVIRONMENT

2.1 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 ANSI C63.4. 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 an HP 8566B spectrum analyzer with an HP 85650A Quasi-Peak (QP) Adapter, via an HP 85685 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.

For emission measurements above 1 GHz, the antenna is changed to a double-ridged horn equipped with a preamplifier and run directly into the spectrum analyzer. The antenna spacing is reduced from 10 meters to 3 meters and RF absorber is placed on the floor between the antenna and the UUT such that the site VSWR requirements of CISPR 16 are achieved. The QP adapter and RF preselector are not used above 1 GHz.

Pre-scanning a product from 1-10 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.

2.2 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 uH LISNs which complied with the requirements of ANSI C63.4. These LISNs are calibrated annually for both complex impedance and insertion loss. Measurement equipment used was an HP 8566B spectrum analyzer with an HP 85650A 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.

2.3 Measurement Uncertainty

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

Table 2-1

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

3.0 Radiated Emissions

3.1 Summary of Test Results

Radiated electric field emissions were measured on the UUT over the frequency range from 30 MHz to 10 GHz. The UUT was powered from 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 all signals (minimum of six) used in the final data table. Average detection was performed for all signals that were maximized above 1 GHz.

Test result: Compliant
Margin: 4.07 dB @ 408.000 MHz

3.2 Test Setup

The UUT was set up in accordance with ANSI C63.4 and tested to the Class B limits specified for unintentional transmitters in FCC 15.109.

3.3 Special Configurations

Not applicable.

3.4 Deviations from Test Procedures

Not applicable.

3.5 Test Data

See APPENDIX A for all test data sheets, test setup pictures and test equipment used.

4.0 Conducted Emissions

4.1 Summary of Test Results

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 both the UUT and the support equipment was run through standard 50 Ω/50 uH line impedance stabilization networks (LISNs) which complied with the requirements of ANSI C63.4. Emissions were compared to both quasi-peak (QP) and average limits, with QP detection and averaging performed on the six highest signals.

Test result: Compliant
Margin: 15.57 dB @ 12.073 MHz

4.2 Test Setup

The UUT was set up in accordance with ANSI C63.4 and tested to the Class B limits specified for unintentional transmitters in FCC 15.107.

4.3 Special Configurations

Not applicable.

4.4 Deviations from Test Procedures

Not applicable.

4.5 Test Data

See APPENDIX B for all test data sheets, test setup pictures and test equipment used.

APPENDIX A

Radiated Emissions Test Data

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Radiated Emissions, FCC Part 15

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	10M #1
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	FCC Part 15	Date:	November 7, 2014
Temperature:	21˚C Humidity: 31%	Pressure:	836 mb
Input Voltage:	120Vac/60Hz		
Configuration of Unit:	Writing to V Drive, Play Audio, Printing to thermal Printer and OKI B431d Printer		
Test Engineer:	Mike Tidquist		

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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	31.990	28.8	19.7	-28.0	20.5	46/V-Pole/2.59	9.08
QP	48.084	44.2	8.8	-27.5	25.4	20/V-Pole/1.00	4.12
QP	149.358	41.1	12.3	-27.3	26.1	92/H-Pole/3.19	6.93
QP	311.999	44.6	13.6	-26.9	31.3	28/H-Pole/2.28	4.22
QP	360.000	41.0	14.9	-26.8	29.1	129/H-Pole/1.89	6.42
QP	408.000	42.3	15.9	-26.7	31.5	93/H-Pole/1.98	4.07
QP	455.999	40.6	16.8	-26.5	31.0	71/V-Pole/3.68	4.59
QP	491.006	34.7	17.6	-26.4	25.8	112/V-Pole/3.16	9.70
QP	531.804	35.5	18.3	-26.1	27.7	350/V-Pole/2.60	7.84
QP	647.575	27.2	19.6	-25.8	21.0	142/H-Pole/1.04	14.56
QP	719.893	36.0	20.3	-25.4	30.9	351/V-Pole/2.19	4.63
QP	734.375	27.5	20.2	-25.4	22.3	62/H-Pole/1.00	13.21
QP	816.001	28.9	21.5	-24.9	25.5	88/V-Pole/1.51	10.09
QP	929.940	31.6	22.1	-24.3	29.4	360/V-Pole/3.00	6.12
QP	985.625	24.4	22.9	-24.2	23.1	222/H-Pole/1.04	20.34

Radiated Emissions, FCC Part 15

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	10M #1
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	FCC Part 15	Date:	November 7, 2014

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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 >1GHz PK (dB)	Margin: FCC Class B >1GHz AV (dB)
AV	1597.349	91.2	25.9	-74.1	42.9	160/H-Pole/1.10	-	11.06
PK	1597.349	106.9	25.9	-74.1	58.6	160/H-Pole/1.10	15.31	-
AV	1709.326	86.7	26.9	-74.4	39.1	157/H-Pole/1.00	-	14.86
PK	1709.326	102.7	26.9	-74.4	55.1	157/H-Pole/1.00	18.81	-
AV	1859.050	80.7	27.9	-74.0	34.5	303/V-Pole/1.00	-	19.44
PK	1859.050	97.1	27.9	-74.0	51.0	303/V-Pole/1.00	22.99	-
AV	2654.120	77.1	29.9	-72.0	35.0	202/V-Pole/2.02	-	18.95
PK	2654.120	98.5	29.9	-72.0	56.4	202/V-Pole/2.02	17.55	-
AV	6849.050	71.0	37.5	-72.2	36.4	308/V-Pole/2.26	-	17.55
PK	6849.050	84.3	37.5	-72.2	49.7	308/V-Pole/2.26	24.30	-
AV	9848.452	69.3	38.1	-73.0	34.4	77/V-Pole/1.19	-	19.54
PK	9848.452	81.7	38.1	-73.0	46.8	77/V-Pole/1.19	27.14	-

The highest emission measured was at **408.000 MHz,** which was **4.07 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 "Final" emissions level is attained by taking the "Level" and adding the "Transducer" factor and the "Gain/Loss" factor. 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 = 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:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	10M #2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	FCC Part 15	Date:	November 7, 2014

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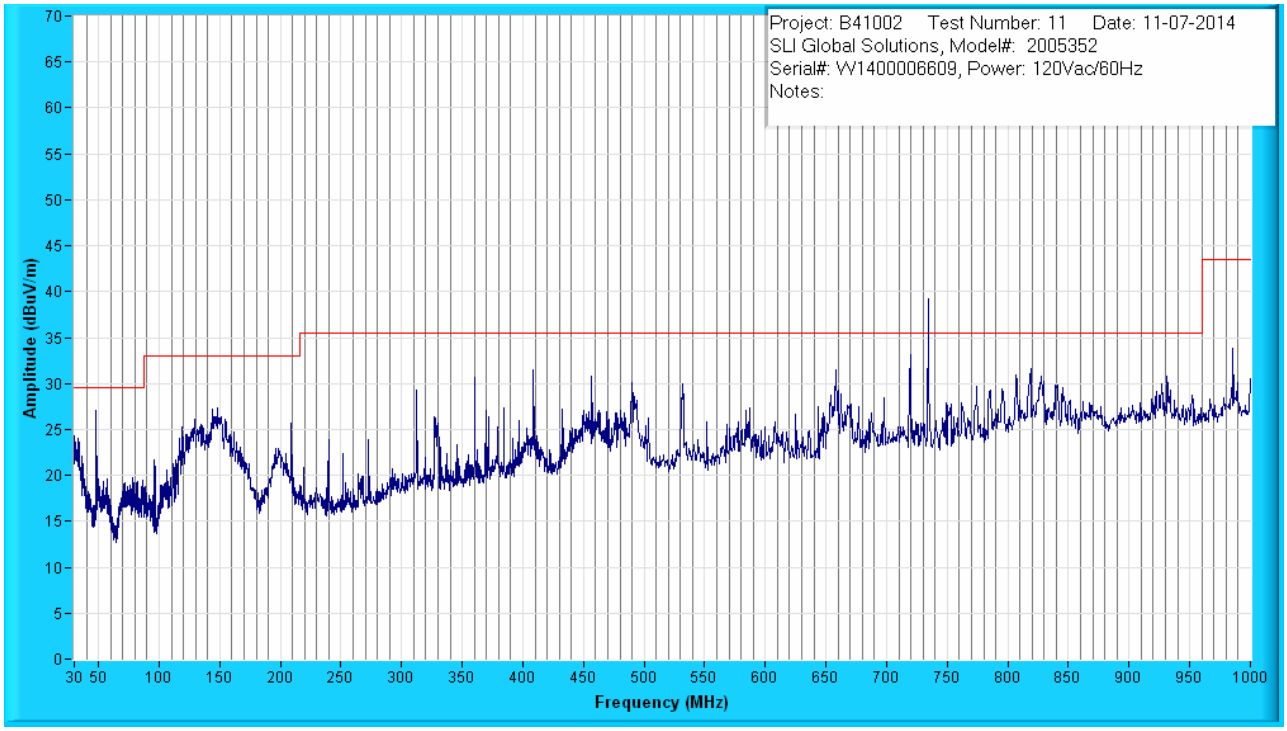

Figure A1: Radiated Emissions Prescan, 30MHz to 1000MHz, Peak Measurements at 10m Distance

Radiated Emissions, FCC Part 15

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	10M #2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	FCC Part 15	Date:	November 7, 2014

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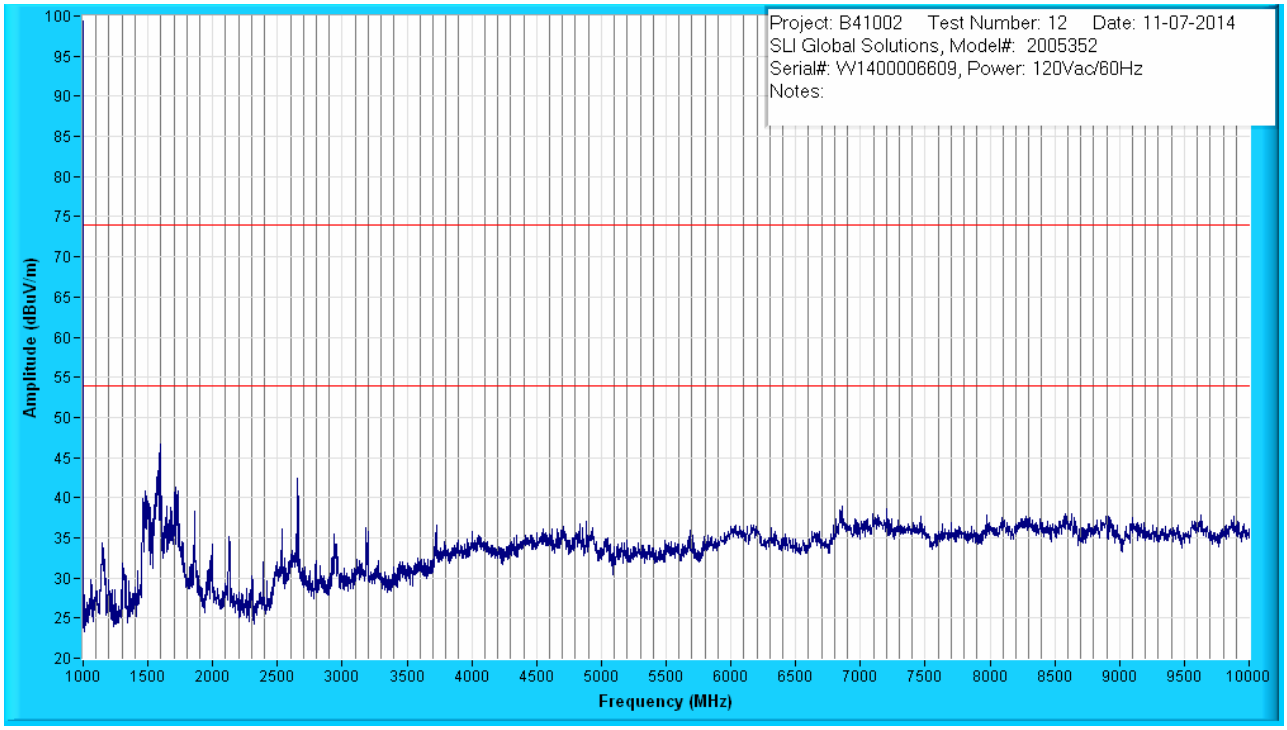

Figure A2: Radiated Emissions Prescan, 1GHz to 10GHz, Peak Measurements at 3m Distance

Radiated Emissions, FCC Part 15

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	10M #2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	FCC Part 15	Date:	November 7, 2014

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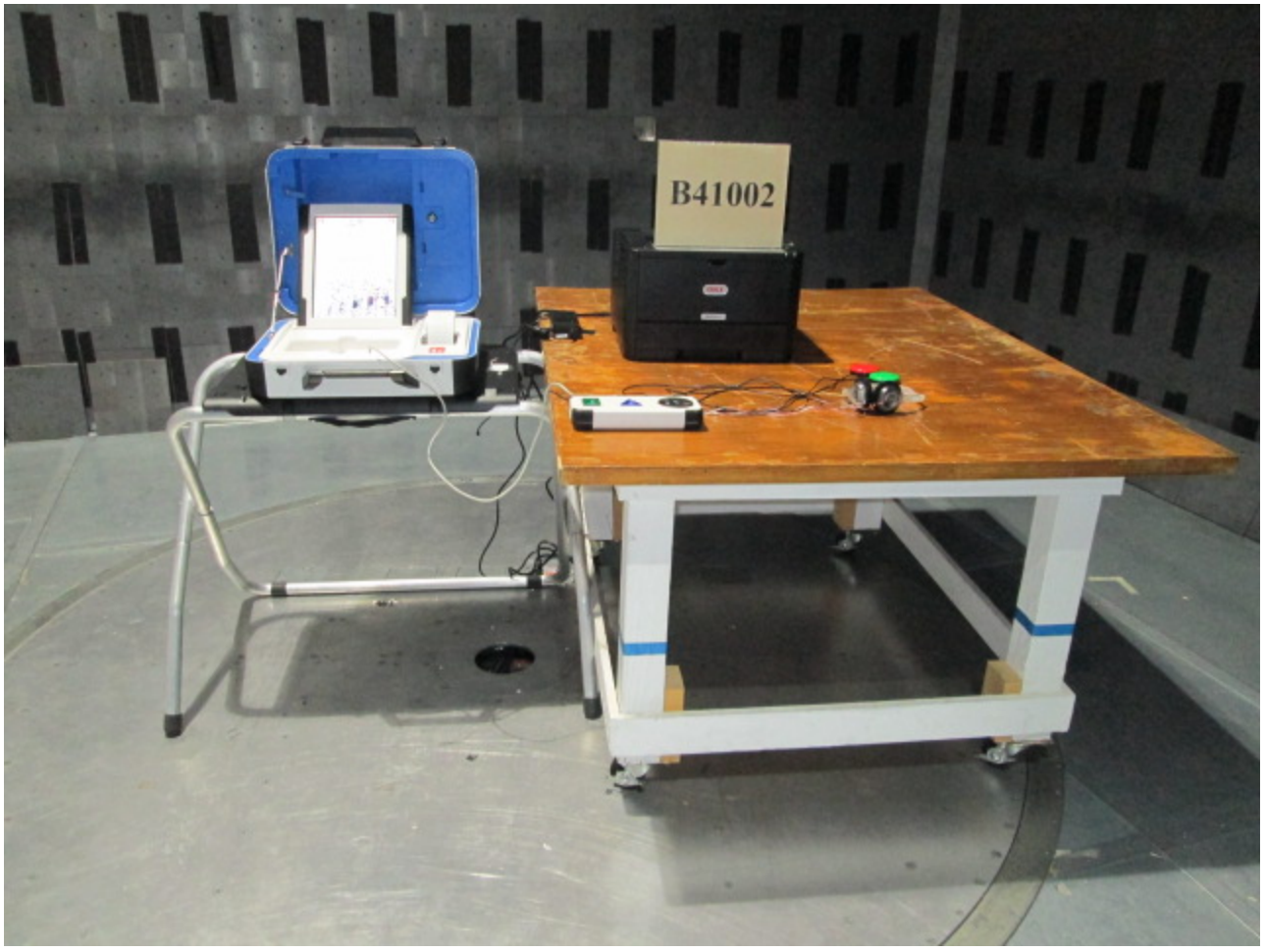

Figure A3: Radiated Emissions Test Setup – Front Side

Radiated Emissions, FCC Part 15

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	10M #2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	FCC Part 15	Date:	November 7, 2014

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Figure A4: Radiated Emissions Test Setup – Right Side

Radiated Emissions, FCC Part 15

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	10M #2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	FCC Part 15	Date:	November 7, 2014

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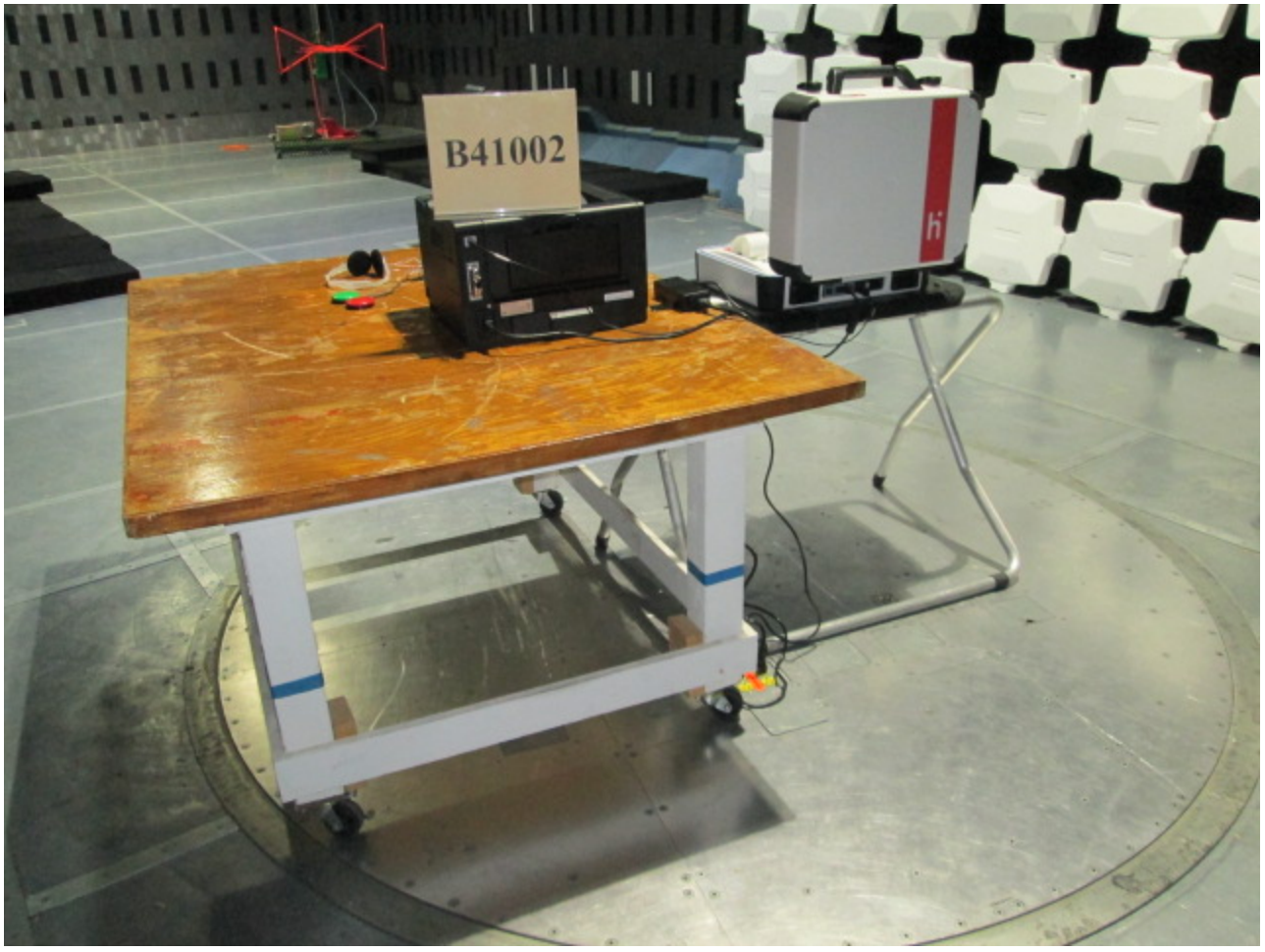

Figure A5: Radiated Emissions Test Setup – Back Side

Radiated Emissions, FCC Part 15

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	10M #2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	FCC Part 15	Date:	November 7, 2014

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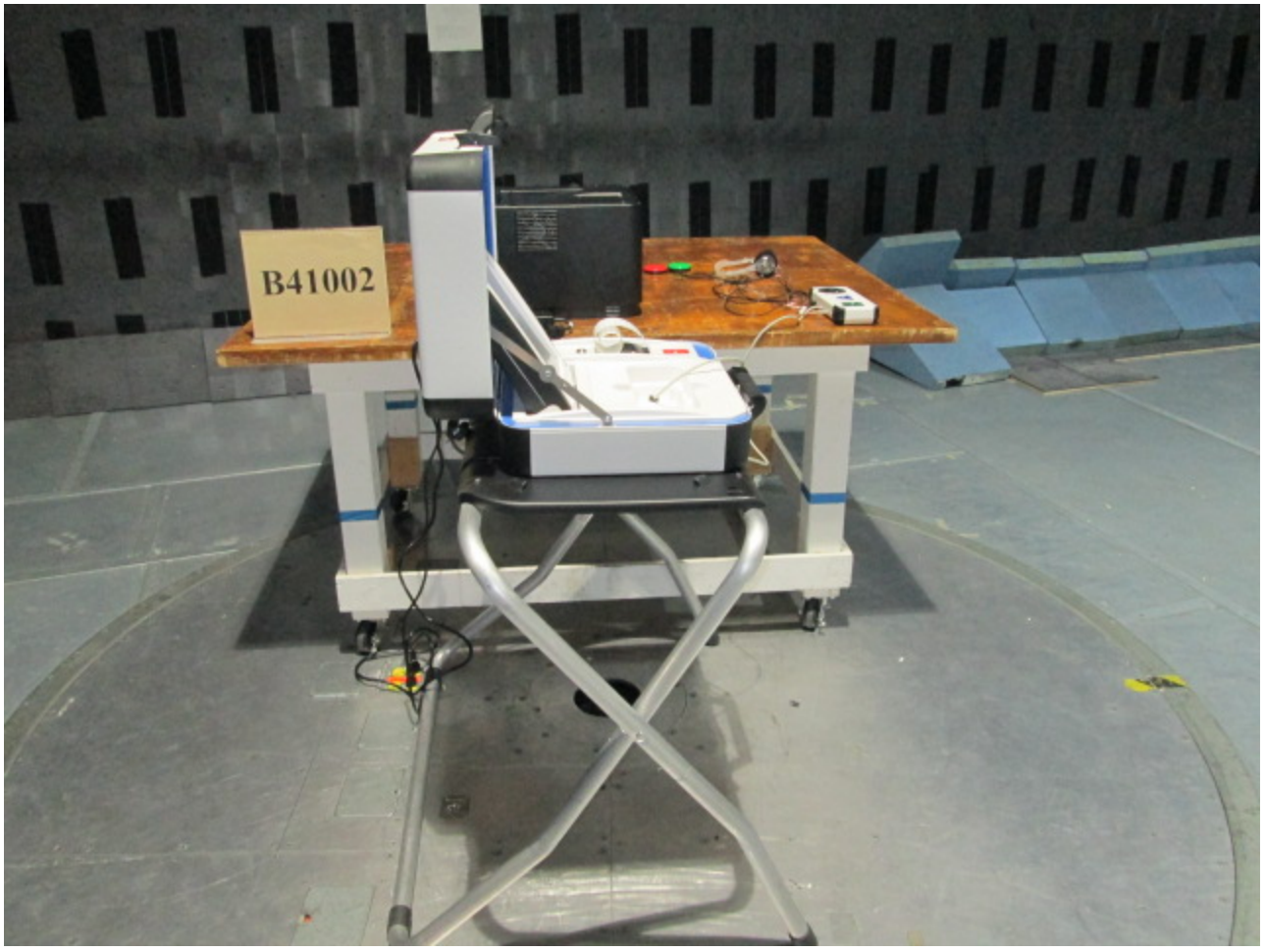

Figure A6: Radiated Emissions Test Setup – Left Side

Radiated Emissions, FCC Part 15

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	10M #2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	FCC Part 15	Date:	November 7, 2014

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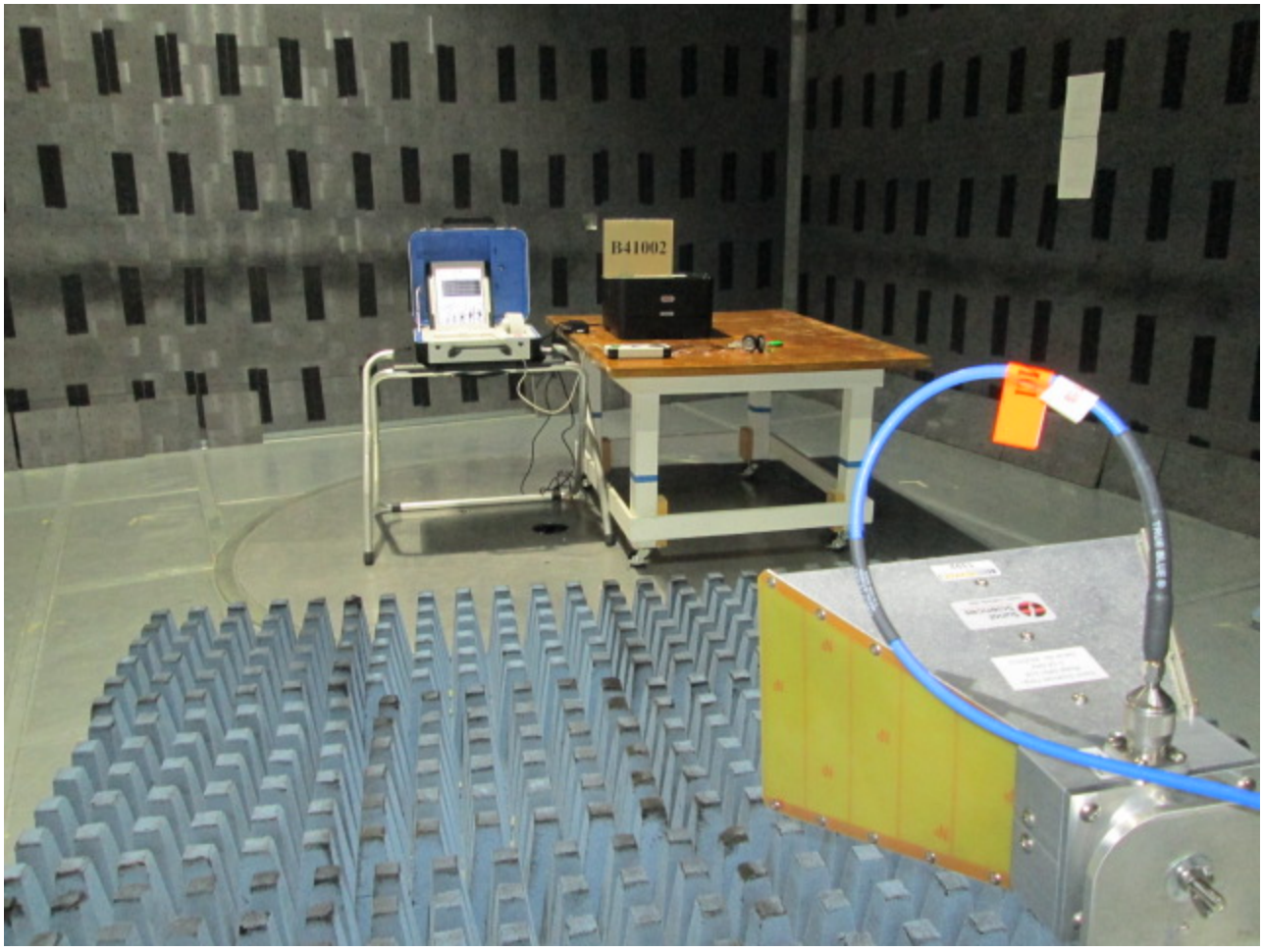

Figure A7: Radiated Emissions Test Setup – Front Side @ 3M

Radiated Emissions, FCC Part 15

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	10M #1
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	FCC Part 15	Date:	November 7, 2014

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Test Equipment List

ID Number	Manufacturer	Model #	Serial #	Description	Cal Date	Cal Due
1219	Mini-Circuits	ZKL-2	062905	Preamp, 10 - 2000 MHz, 30 dB	01/22/2014	01/22/2015
1229	Hewlett Packard	85685A	3010A01077	RF Preselector	01/07/2014	01/07/2015
1231	Sunol Sciences	JB1	A071605-1	Bilog Antenna, 30 MHz to 2.0 GHz	11/27/2013	11/27/2014
1233	Sunol Sciences	SC104V	110305-1	Positioning Controller	NA	NA
1234	CIR Enterprises	10m Chamber	001	10m Chamber with 2.5m turntable	11/17/2013	11/17/2014
1238	Sunol Sciences	TWR95-4	110305-3	Antenna Mast	NA	NA
1239	Sunol Sciences	FM2522VS	110305-2	Turn Table, 2.5m Diameter	08/18/2014	08/18/2015
1263	Hewlett Packard	8566B	3014A06873	Spectrum Analyzer, 100 Hz to 22 GHz	01/07/2014	01/07/2015
1264	Hewlett Packard	85662A	2848A18247	Spectrum Analyzer Display	01/07/2014	01/07/2015
1265	Hewlett Packard	85650A	2521A00641	Quasi-Peak Adapter	01/07/2014	01/07/2015
1266	California Instruments	MX15-1	57961	AC Power Source, 0 - 300 VAC / 16 - 819 Hz / 15kVA	NA	NA
1276	Narda	DBL-0218N308	037-038	1GHz to 18GHz Preamplifier, 60dB gain nominal	05/09/2014	05/09/2015
1392	Sunol	DRH-118	A020311	1-18 GHz Double-Ridged Horn Antenna	01/08/2014	01/08/2015
1539	Extech Instruments	445715	Z316007	Hygro-Thermometer	03/21/2014	03/21/2015

APPENDIX B

Conducted Emissions Test Data

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Conducted Emissions, FCC Part 15

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	10M #2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	FCC Part 15	Date:	October 1, 2014
Temperature:	21˚C Humidity: 36%	Pressure:	839 mb
Input Voltage:	120Vac/60Hz		
Configuration of Unit:	Writing to V Drive, Play Audio, Printing to thermal Printer and OKI B431d Printer		
Test Engineer:	Mike Tidquist		

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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	0.195	17.4	-1.1	16.1	32.4	Line 1	22.36	-
QP	0.195	23.2	-1.1	16.1	38.2	Line 1	-	26.52
AV	0.369	10.8	-0.6	16.1	26.3	Line 1	23.47	-
QP	0.369	16.4	-0.6	16.1	31.9	Line 1	-	27.86
AV	0.618	9.0	-0.4	16.2	24.8	Line 1	21.21	-
QP	0.618	18.7	-0.4	16.2	34.5	Line 1	-	21.52
AV	0.883	10.1	-0.4	16.2	25.9	Line 1	20.06	-
QP	0.883	22.8	-0.4	16.2	38.6	Line 1	-	17.36
AV	1.132	8.5	-0.3	16.2	24.4	Line 1	21.63	-
QP	1.132	23.5	-0.3	16.2	39.4	Line 1	-	16.65
AV	1.592	8.3	-0.3	16.2	24.2	Line 1	21.82	-
QP	1.592	22.5	-0.3	16.2	38.4	Line 1	-	17.63
AV	11.711	16.5	-0.3	15.9	32.1	Line 1	17.91	-
QP	11.711	19.7	-0.3	15.9	35.3	Line 1	-	24.68
AV	0.199	22.1	-1.1	16.1	37.1	Neutral	17.51	-
QP	0.199	30.5	-1.1	16.1	45.6	Neutral	-	19.02
AV	0.258	8.7	-0.8	16.1	23.9	Neutral	29.00	-
QP	0.258	12.8	-0.8	16.1	28.1	Neutral	-	34.83
AV	0.878	9.2	-0.4	16.2	25.1	Neutral	20.91	-
QP	0.878	23.0	-0.4	16.2	38.8	Neutral	-	17.18
AV	1.129	8.7	-0.3	16.2	24.5	Neutral	21.48	-
QP	1.129	23.8	-0.3	16.2	39.7	Neutral	-	16.30
AV	1.399	8.1	-0.3	16.2	23.9	Neutral	22.07	-
QP	1.399	23.6	-0.3	16.2	39.5	Neutral	-	16.48
AV	1.650	8.2	-0.3	16.2	24.0	Neutral	21.96	-
QP	1.650	23.4	-0.3	16.2	39.3	Neutral	-	16.68
AV	12.073	18.9	-0.3	15.9	34.4	Neutral	15.57	-
QP	12.073	23.8	-0.3	15.9	39.3	Neutral	-	20.67

The highest emission measured was at **12.073 MHz,** which was **15.57 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 "Final" emissions level is attained by taking the "Level" and adding the "Transducer" factor and the "Gain/Loss" factor. (Sample Calculation: 40.2 dBuV + 1.6 dB + 16.3 dB = 58.1 dBuV. **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:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	10M #2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	FCC Part 15	Date:	October 1, 2014

B41002-22-CE.doc FR0100

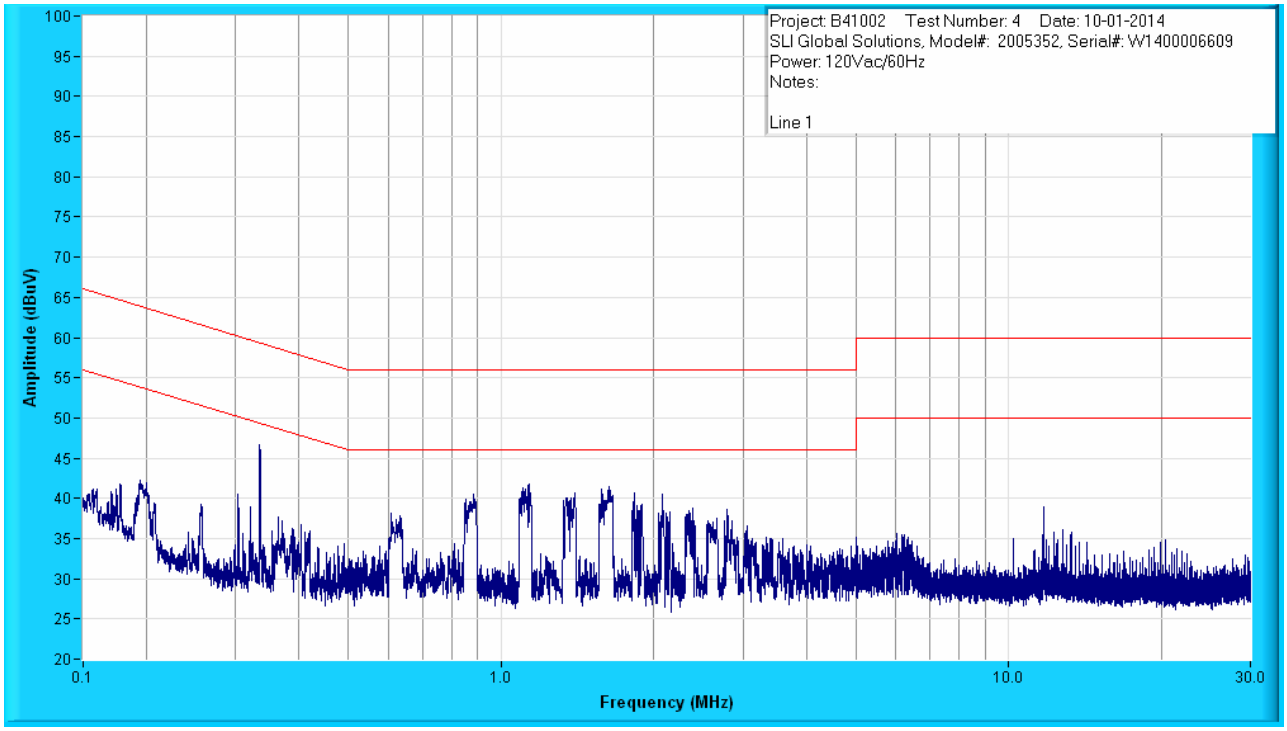


Figure B1: Conducted Emissions Prescan, Line 1, 0.150MHz to 30MHz, Peak Measurements

Conducted Emissions, FCC Part 15

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	10M #2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	FCC Part 15	Date:	October 1, 2014

B41002-22-CE.doc FR0100

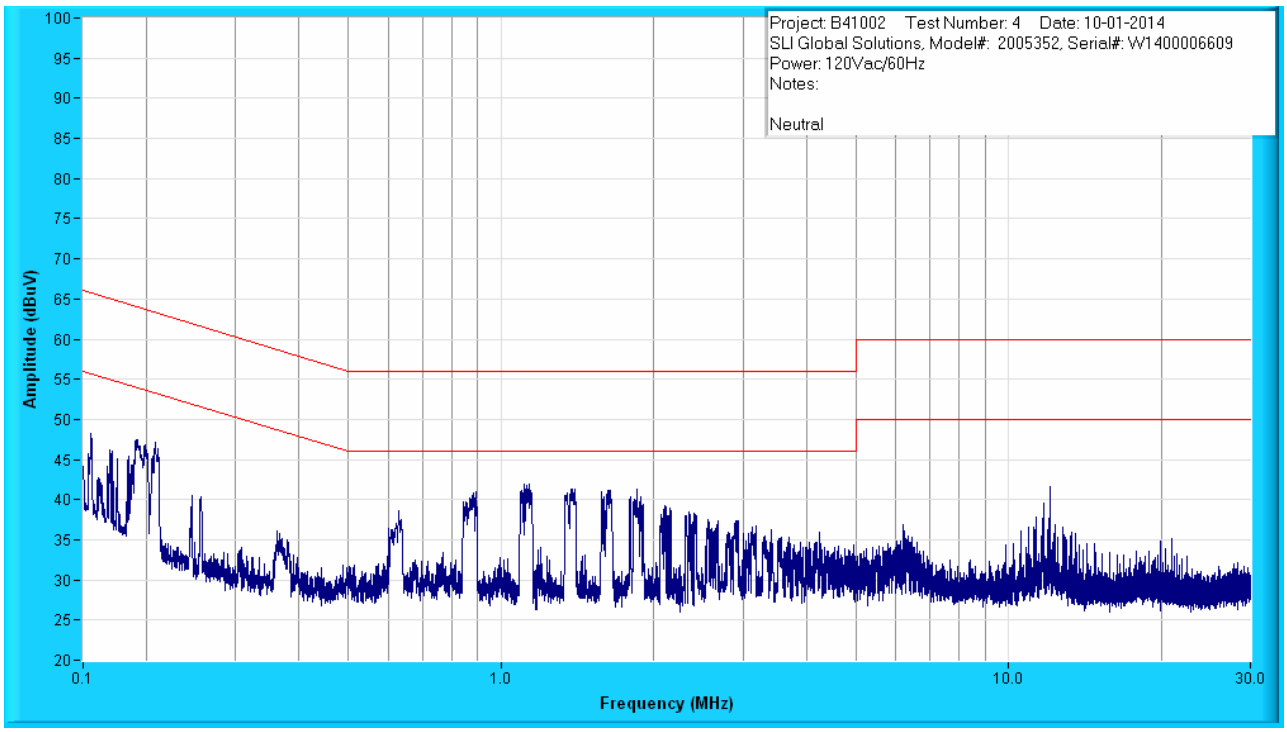


Figure B2: Conducted Emissions Prescan, Neutral, 0.150MHz to 30MHz, Peak Measurements

Conducted Emissions, FCC Part 15

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	10M #2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	FCC Part 15	Date:	October 1, 2014

B41002-22-CE.doc FR0100

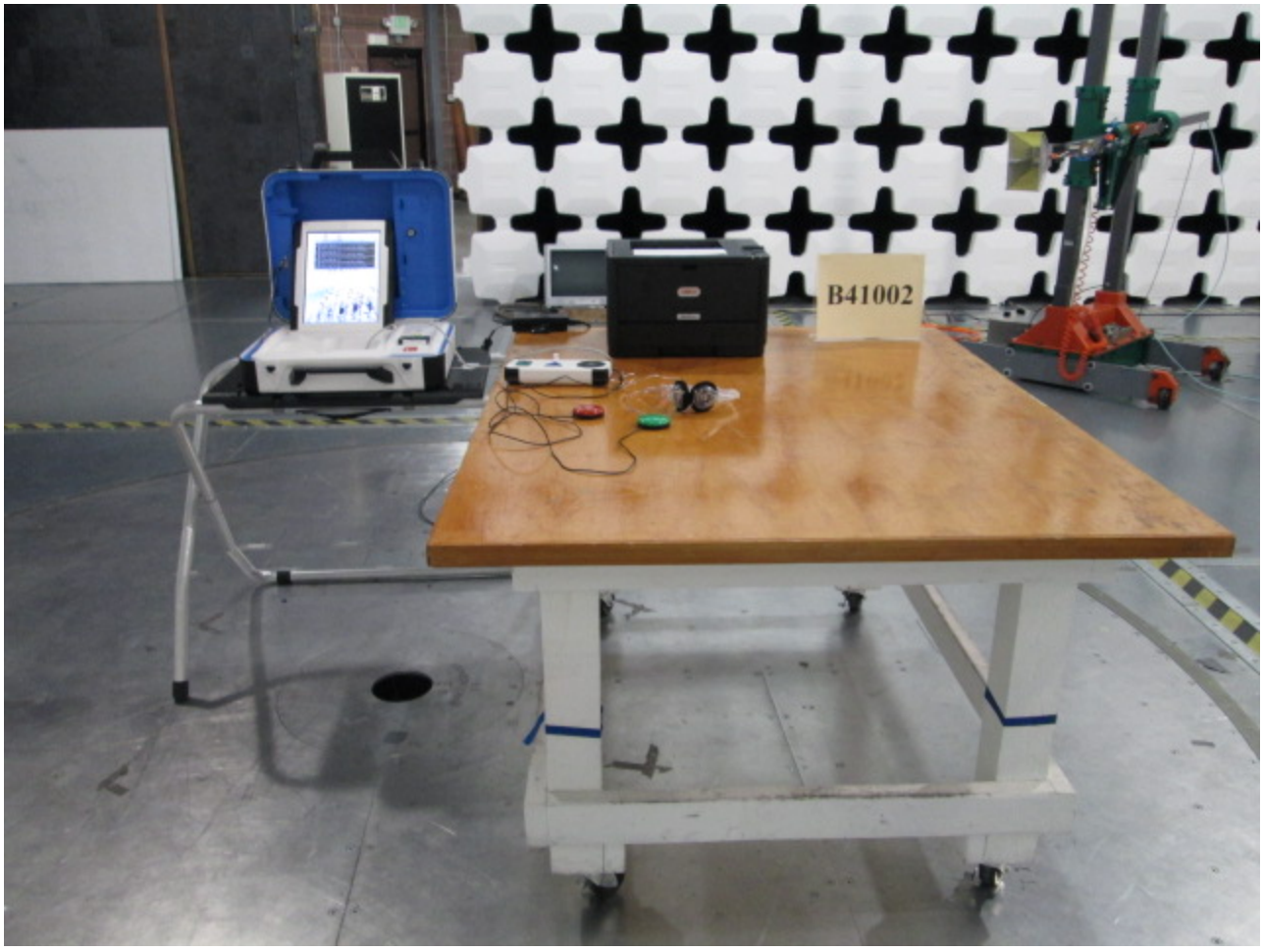


Figure B3: Conducted Emissions Test Setup – Front Side

Conducted Emissions, FCC Part 15

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	10M #2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	FCC Part 15	Date:	October 1, 2014

B41002-22-CE.doc FR0100

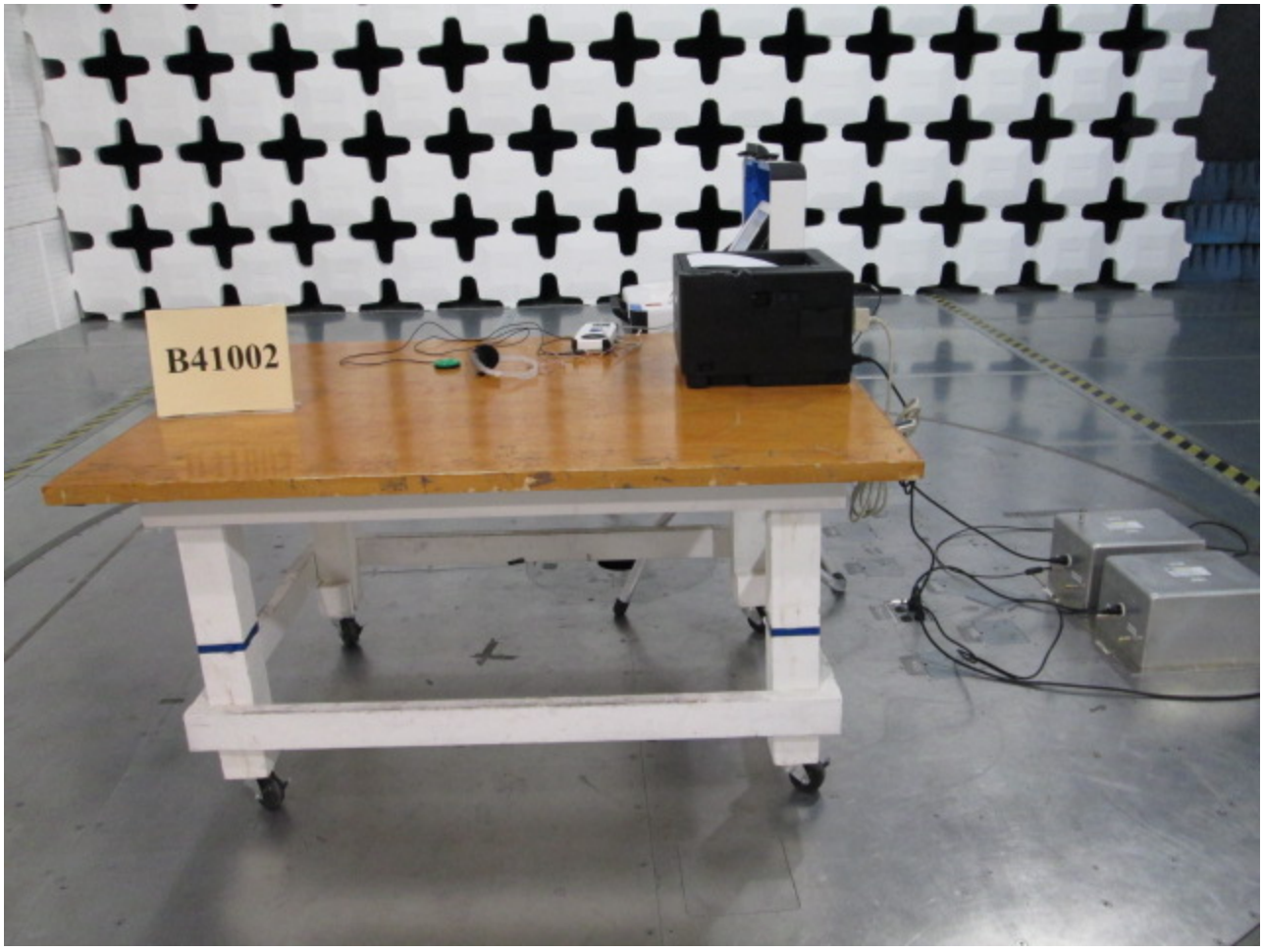


Figure B4: Conducted Emissions Test Setup – Right Side

Conducted Emissions, FCC Part 15

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	10M #2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	FCC Part 15	Date:	October 1, 2014

B41002-22-CE.doc FR0100

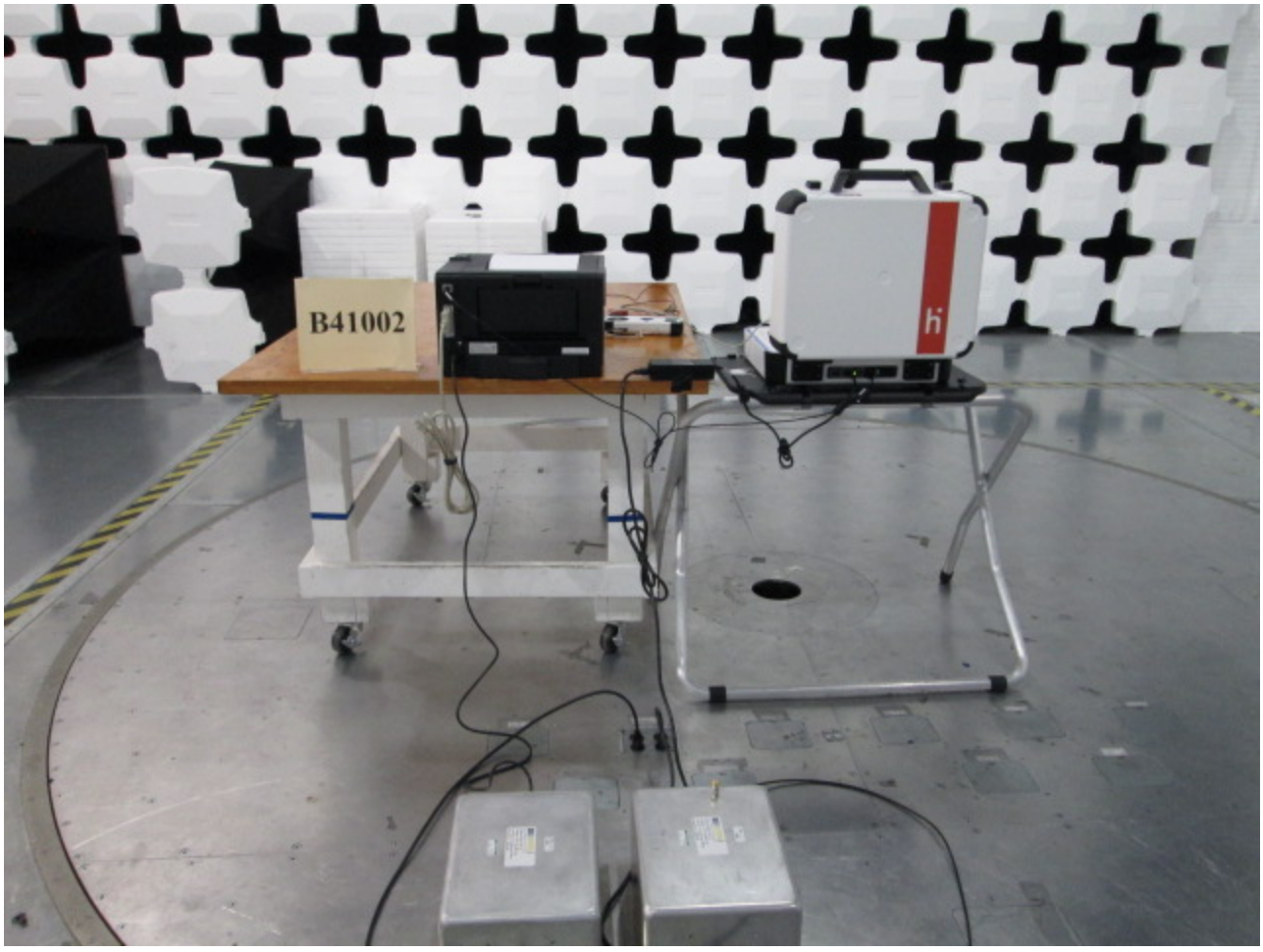


Figure B5: Conducted Emissions Test Setup – Back Side

Conducted Emissions, FCC Part 15

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	10M #2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	FCC Part 15	Date:	October 1, 2014

B41002-22-CE.doc FR0100

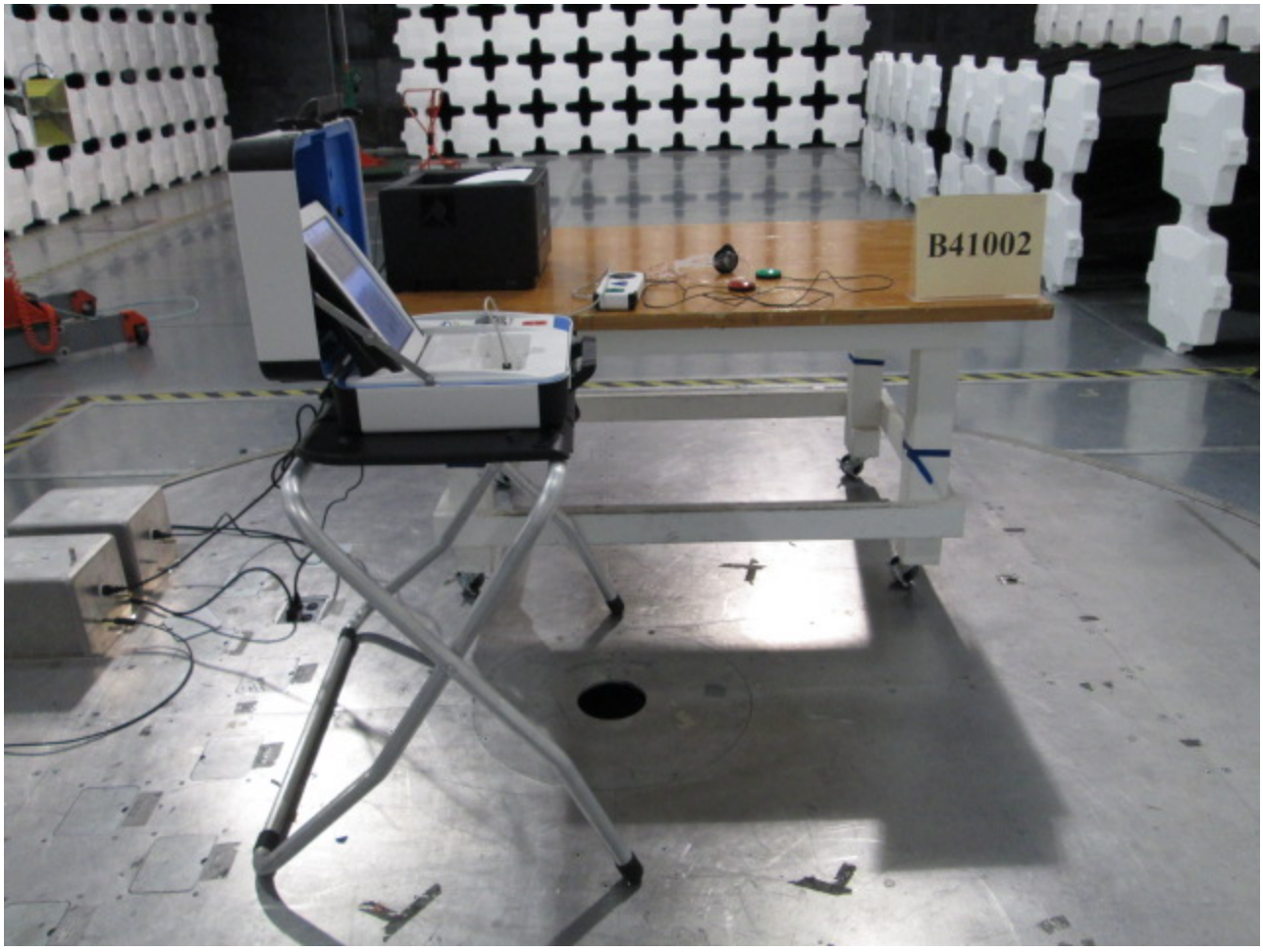


Figure B6: Conducted Emissions Test Setup – Left Side

Conducted Emissions, FCC Part 15

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	10M #2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	FCC Part 15	Date:	October 1, 2014

B41002-22-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	01/28/2014	01/28/2015
1213	Solar	7930-100	885210	High Pass Filter, fc: 100kHz, -100dB @ 33kHz	05/12/2014	05/12/2015
1229	Hewlett Packard	85685A	3010A01077	RF Preselector	01/07/2014	01/07/2015
1263	Hewlett Packard	8566B	3014A06873	Spectrum Analyzer, 100 Hz to 22 GHz	01/07/2014	01/07/2015
1264	Hewlett Packard	85662A	2848A18247	Spectrum Analyzer Display	01/07/2014	01/07/2015
1265	Hewlett Packard	85650A	2521A00641	Quasi-Peak Adapter	01/07/2014	01/07/2015
1332	Com-Power	CGC-510	311636	Conducted Comb Generator	NA	NA
1396	CIR Enterprises	10m Chamber #2	002	10m Chamber with 4m turntable	07/22/2014	07/22/2015
1538	Extech Instruments	445715	Z315812	Hygro-Thermometer	03/21/2014	03/21/2015
1558	EMCI	EMCI, 2 Phase LISN	12	150 kHz to 30 MHz, 277 Vac/400 Vdc, 50/60 Hz, 16 A	09/04/2014	09/04/2015
1559	EMCI	EMCI, 2 Phase LISN	13	150 kHz to 30 MHz, 277 Vac/400 Vdc, 50/60 Hz, 16 A	09/11/2014	09/11/2015

APPENDIX C

EMI/EMC Test Plan

Hart InterCivic
Verity Scan, Verity Touch Writer, Ballot Box, Standard and Accessible Booths
EMC / EMI Test Plan for compliance with the 2005 Voluntary Voting System Guidelines (VVSG)

By

216 16th St, Suite 700
Denver, CO 80202
303-575-6881
www.SLIglobalsolutions.com

Revision History:

Version	Date	Comments	Contributors
0.9	1/29/14	Initial Release	D. Forester
1.0	3/7/14	Updates based on review	D. Forester
2.0	3/20/14	Update serial numbers and Table 1. Added RFI 2007-05 (COTS)	D. Forester
3.0	4/3/14	Added RFI 2008-10 (EFT)	D. Forester
4.0	10/23/14	Update FCC Class B 10m spec. provide maximum flexibility in testing ,updated exit criteria and added section 4.1	D. Forester
5.0	11/3/14	Add ESD Limit Statement	D. Forester

Table of Contents

List of Tables

List of Figures

1.0 Introduction

1.1 Overview

This test plan covers the EMC (Electromagnetic Compatibility) and EMI (Electromagnetic Interference) test requirements and methods for the Hart InterCivic Verity 1.0 Scan and Touch Writer, Ballot Box, and Standard / Accessible Booths hereafter known as the Unit Under Test (UUT), to the requirements as stated in Election Assistance Commission 2005 Voluntary Voting System Guidelines (VVSG).

1.2 Qualifications

The UUT supplied by Hart InterCivic is representative of product produced in their volume manufacturing process.

1.3 Client

Hart InterCivic
15500 Wells Port Drive
Austin, TX 78728

1.4 Company Restricted Information

This document contains confidential and restricted information and shall not be reproduced outside of SLI Global Solutions without written consent.

This document must be reproduced in whole unless written consent has been attained from SLI Global Solutions.

1.5 Reference Documents

- Election Assistance Commission 2005 Voluntary Voting System Guidelines Vol I Version 1.0
- Election Assistance Commission 2005 Voluntary Voting System Guidelines Vol II Version 1.0
- NIST Handbook 150-22, 2008 Edition: National Voluntary Laboratory Accreditation Program – Voting System Testing. May 2008
- EAC Decision on Request for Interpretation 2007-05 (COTS)
- EAC Decision on Request for Interpretation 2008-02 Battery Back Up for Op Scan
- EAC Decision on Request for Interpretation 2008-10 (EFT)
- EAC Decision on Request for Interpretation 2009-03 Battery Back Up for Central Count
- EAC Decision on Request for Interpretation 2010-01 Voltage Levels and ESD Test
- EAC: NOC 07-05: Voting System Test Laboratory (VSTL) responsibilities in the management and oversight of third party testing.
- EAC: NOC 08-001: Validity of Prior Non-Core Hardware Environmental and EMC Testing.
- SLI Standard Lab Procedure SLP-VC-23: Hardware Test Management
- SLI Standard Lab Procedure SLP-VC-24: Subcontractor Laboratory Management
- Hart InterCivic Verity: EMC/EMI, Environmental, Safety Test Plan, Document Number: 4005516, Rev. A.03

2.0 EMC / EMI Test Summary

Table 1: EMC / EMI Test Requirements Summary for Hart InterCivic Verity Scan and Verity Touch Writer

Required	Test	Test Spec.	VVSG Reference	Requirement	Comments
Electromagnetic Emissions Tests					
X	Radiated Electromagnetic Emissions	FCC, Part 15 ANSI C63.4	V1, 4.1.2.9 V1, 4.1.7.1 V1, 2.1.4 (b) V2, 4.8	Class B	Internal Battery Not Connected
X	Conducted Electromagnetic Emissions	FCC, Part 15 ANSI C63.4	V1, 4.1.2.9 V1, 4.1.7.1 V1, 2.1.4 (b) V2, 4.8	Class B	Internal Battery Not Connected
Electromagnetic Immunity Tests					
X	Electrostatic Disruption	IEC 61000-4-2 (2008) Ed.2.0	V1, 4.1.2.8 V1, 4.1.7.1 V1, 2.1.4 (b) V2, 4.8	Vote scanning and counting equipment for paper-based systems, and all DRE equipment, shall be able to withstand ±15 kV air discharge and ±8 kV contact discharge without damage or loss of data. The equipment may reset or have momentary interruption so long as normal operation is resumed without human intervention or loss of data. Loss of data means votes that have been completed and confirmed to the voter.	Voting systems are required to be immune to ESD up to the limits of 8 KV, contact discharge, and 15 KV, air discharge. During exploratory pre-testing investigation of the possibility of windowing effects should be explored. If there are indications that a unit has sensitivity at a lower voltage but not at a higher voltage, test levels shall be added to evaluate the immunity at lower voltage levels. (RFI 2010-01) The test levels stated in IEC 61000-4-2, Edition 2.0, contact discharge, are the test method and shall be applied at the specified test level only, 8 kV. Air discharge shall be used where contact discharge cannot be applied and all test levels shall be used (2, 4, 8, 15 kV). (RFI 2010-01)
X	Electromagnetic Susceptibility	IEC 61000-4-3 (1996)	V14.1.2.10 V1, 4.1.7.1 V1, 2.1.4 (b) V2, 4.8	A field of 10 V/m modulated by a 1 kHz 80% AM modulation over the frequency range of 80 MHz to 1000 MHz	1 GHz
X	Electrical Fast Transient	IEC 61000-4-4 (2004-07) Ed. 2.0	V1, 4.1.2.6 V1, 4.1.7.1 V1, 2.1.4 (b) V2, 4.8	±2kV AC & DC external power lines ±1kV on Input / Output lines (signal, data, control lines) longer than 3 meters(signal, data, control lines) longer than 3 meters Repetition Rate for all transient pulses will be 100 kHz	Internal Battery Connected The Standard specified in Volume II Section 4.8 is mistakenly cited as IEC 61000-4-4 (1995-01), and should instead properly be cited as IEC 61000-4-4 (2004-07) Ed. 2.0 which supports the 100 kHz repetition rate for all transient pulses specified in Volume I, Section 4.1.2.6(c). (RFI 2008-10)
X	Lightning Surge	IEC 61000-4-5 (1995-02)	V1, 4.1.2.7 V1, 4.1.7.1 V1, 2.1.4 (b) V2, 4.8	±2 kV AC line to line; ±2 kV AC line to earth; ±0.5 kV DC line to line >10m; ±0.5 kV DC line to earth >10m; and ±1 kV I/O sig/control >30m.	Internal Battery Connected
X	Conducted RF Immunity	IEC 61000-4-6 (1996-04)	V1, 4.1.2.11 V1, 4.1.7.1	10V rms,150 KHz to 80 MHz with an 80% AM with a 1 KHz sine wave AC & DC	Internal Battery Connected

Hart InterCivic
Verity EMC / EMI Test Plan

Required	Test	Test Spec.	VVSG Reference	Requirement	Comments
			V1, 2.1.4 (b) V2, 4.8	power 10V rms sig/control >3 m, 150 KHz to 80 MHz with an 80% AM with a 1 KHz sine wave	
X	Magnetic Fields Immunity	IEC 61000-4-8 (1993-06)	V1,4.1.2.12 V1, 4.1.7.1 V1, 2.1.4 (b) V2, 4.8	30 A/m at 60 Hz	Internal Battery Connected
X	Electrical Power Disturbance	IEC 61000-4-11 (1994-06)	V1, 4.1.2.5 V1, 4.1.7.1 V1, 2.1.4 (b) V2, 4.8	Voltage dip of 30% of nominal @10 ms; Voltage dip of 60% of nominal @100 ms & 1 sec Voltage dip of >95% interrupt @5 sec Surges of +15% line variations of nominal line voltage Electric power increases of 7.5% and reductions of 12.5% of nominal specified power for a period of up to four hours at each level.	Internal Battery Connected

3.0 Product Description

3.1 Intended Use

For the Verity 1.0 refer to EMC Integrity's detailed Product Data Sheets below starting with section 3.4 Product Information. The Product Data Sheets will be used by EMC Integrity's test technicians during testing and also in writing the test reports.

3.2 Unit Under Test – Verity Scan

Part No.	Serial No.	Description	Qty	Revision No.
2005350	S1400005009 S1400005809 S1400005909	Verity Scan - is Verity's polling place scanning solution for paper ballots. Scan is paired with a purpose-built ballot box to ensure accurate, secure, and private ballot scanning and vote casting for each voter.	3	B
2005357	X14000102	Ballot Box – Used with Verity Scan.	1	A

3.3 Unit Under Test – Verity Touch Writer

Part No.	Serial No.	Description	Qty	Revision No.
2005352	W1400006609 W1400007309 W1400007409 W1400007609	Verity Touch Writer - is a polling place ballot marking device solution for paper ballots. Touch Writer is paired with a commercial off the shelf printer to allow the voter to mark then print their vote selections. Using Touch Writer reviewing and acceptance in conjunction with Verity Scan provides the voter with a reviewable paper ballot that is accurately captured through scanning, for tabulation as a voter's cast vote record (CVR).	4	B
2005358	M14000102	Standard Booth - Used with Touch Writer	1	A
2005359	L14000102	Accessible Booth - Used with Touch Writer	1	A

3.4 Product Information – Verity Scan

Product Information General	
Product Name (**as it should appear on test report**)	Verity Scan
Model Number (of UUT to be tested)	2005350 (Scan), 2005357 (Ballot Box)
Functional description of product (what is it, what does it do, etc.)	Polling Place Scanning Device – scans paper ballots
List all modes of operation	Ballot Scanner
Can modes be operated simultaneously? If so, explain.	No
What mode(s) will be used for testing?	Ballot Scanning USB Stick Write Test Thermal Printer Test

Hart InterCivic
Verity EMC / EMI Test Plan

Product type (IT, Medical, Scientific, Industrial, etc.)	IT
Is the product an intentional radiator	No
Product Dimensions	Verity Scan Storage/Shipping Carton - 21½"Wx17½"Dx19 ¾"H Device Closed – 18.8"Wx17.39"Dx7.72"H Device Open – 18.8"Wx21.41"Dx20.86"H Ballot Box Collapsed for Storage - 26"Wx5.23"Dx28.25"H Deployed for Use – 26"Wx23.25"Dx28.25"H
Product Weight	Scan - 27lbs Ballot Box - 26.5lbs
Will fork lift be required	No
Applicable Standards, if known	VVSG 2005: FCC Part 15 Class B IEC 61000-4: -2, -3, -4, -5, -6, -8, -11
Describe all environment(s) where product will be used (residential, commercial, industrial, etc.)	Business Recommended Operating Environment Temperature: +50F to +95F Humidity: 10% to 90% Recommended Storage Environment Temperature: -4F to +140F Relative Humidity: <90%
Does product consist of multiple components? (If yes, please describe each system component)	Yes, scanner attaches to ballot box in normal use – it is expected to use this configuration for EMC/EMI testing of Verity Scan
Cycle time > 3 seconds? (If yes, how long?)	Yes for shoeshine testing - ~3 second cycle time Yes for normal usage - ~420 second cycle time
Highest internally generated frequency	Tablet CPU – 1.86GHz
Product Set-up Time	<15 minutes
Boot up time in the event of an unintentional power down	Booting into Windows takes ~60 seconds, we will use simulation tools to exercise the system during testing Booting into Verity Application with polls open takes ~300 seconds

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			
Verity Scan	Polling place scanning device					1
Ballot Box	Ballot Box used with Verity Scan					1

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

3.4.1 Power

Power Requirements – Verity Scan	
Does/can product connect to AC mains? (If so, can the UUT function when connected to AC?)	Device is DC powered, there is a 85W AC/DC power supply (Yes)
Input Voltage Rating as it appears on unit, power supply, or power brick	24VDC, 2.4A
Input Current (specify @ 115 VAC/60 Hz)	XP Power AHM85PS24 - 85W, ~1.0A @ 100V – 0.4A @ 240V Power Brick Input ~1.0A
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

3.4.2 Services

Services Requested – Verity Scan		
Testing Required (Formal or Engineering)	Formal	
Special/specific test considerations (i.e. Engineering testing requested, extended range testing, etc.)		
Check all countries/economic areas in which product will be sold.	United States (FCC – emissions only)	X

	Canada (CSA – emissions only)	
	European Union (CE Mark)	
	Australia/New Zealand (C-tick)	
	Taiwan (BSMI)	
	Korea (KCC)	
	Japan (50 Hz)	
	Japan (60 Hz)	
	China (CCC)	
	Others (please specify)	
If this is for engineering, will a test report be required?	Yes	
Will you require a recommendation for product safety?	TBD	

3.5 Product Information - Verity Touch Writer

Product Information General	
Product Name (**as it should appear on test report**)	Verity Touch Writer
Model Number (of UUT to be tested)	2005352 (Touch Writer) 2005358 (Standard Booth) 2005359 (Accessible Booth)
Functional description of product (what is it, what does it do, etc.)	Polling Place Ballot Marking Device
List all modes of operation	Ballot Marking,
Can modes be operated simultaneously? If so, explain.	No
What mode(s) will be used for testing?	USB Stick Write Test Audio Playing Test USB Printer Test Thermal Printer Test Ballot Marking (Post-test)
Product type (IT, Medical, Scientific, Industrial, etc.)	IT
Is the product an intentional radiator	No
Product Dimensions	Touch Writer Storage/Shipping Carton - 21½"Wx17½"Dx19¾"H

	Device Closed – 18.8"Wx17.39"Dx7.72"H Device Open – 18.8"Wx21.41"Dx20.86"H Standard Booth Collapsed for Storage – 28.72"Wx5.57"Dx39.69"H Deployed for Use – 28.54"Wx23.17"Dx33.56"H Privacy Screen – adds 23.31" to Height Accessible Booth Collapsed for Storage 38.8"Wx5.83"Dx33"H Deployed for Use – 38.8"Wx25.45"Dx30.19"H Privacy Screen – adds 23.31" to Height
Product Weight	Touch Writer - 27lbs Standard Booth w/ storage bag - 13lbs Accessible Booth w/ storage bag - 14lbs
Will fork lift be required	No
Applicable Standards, if known	VVSG 2005: FCC Part 15 Class B IEC 61000-4: -2, -3, -4, -5, -6, -8, -11
Describe all environment(s) where product will be used (residential, commercial, industrial, etc.)	Business Recommended Operating Environment Temperature: +50F to +95F Humidity: 10% to 90% Recommended Storage Environment Temperature: -4F to +140F Relative Humidity: <90%
Does product consist of multiple components? (If yes, please describe each system component)	Yes – Touch Writer attaches to ballot booth in normal use – it is expected to use this configuration only for EMC/EMI testing of Verity Touch Writer OKI Data Printer – B431d
Cycle time > 3 seconds? (If yes, how long?)	Yes for normal usage - ~420 second cycle time
Highest internally generated frequency	Tablet CPU – 1.86GHz
Product Set-up Time	<15 minutes
Boot up time in the event of an unintentional power down	Booting into Windows takes ~60 seconds, testing with simulation applications takes ~60 seconds. Booting into Verity Application with polls open takes ~600 seconds

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			
Verity Touch Writer	Polling place scanning device	USB	USB		n/a	1
Verity Access	Audio-Tactile Interface (ATI) module	USB		2m	n/a	1
OKI B431d	Printer		USB	2m	n/a	1
Standard Booth	Standard Booth used with Verity Touch Writer				n/a	1
Accessible Booth	Accessible Booth used with Verity Touch Writer				n/a	1

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

3.5.1 Power

Power Requirements Verity Touch Writer	
Does/can product connect to AC mains? (If so, can the UUT function when connected to AC?)	Yes (Yes)
Input Voltage Rating as it appears on unit, power supply, or power brick	24VDC, 2.4A
Input Current (specify @ 120 Vac/60 Hz)	XP Power AHM85PS24 - 85W, ~1.0A @ 100V – 0.4A @ 240V Power Brick Input ~1.0A
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

3.5.2 Services

Services Requested Verity Touch Writer		
Testing Required (Formal or Engineering)	Formal	
Special/specific test considerations (i.e. Engineering testing requested, extended range testing, etc.)		
Check all countries/economic areas in which	United States (FCC – emissions	X

product will be sold.	only)	
	Canada (CSA – emissions only)	
	European Union (CE Mark)	
	Australia/New Zealand (C-tick)	
	Taiwan (BSMI)	
	Korea (KCC)	
	Japan (50 Hz)	
	Japan (60 Hz)	
	China (CCC)	
	Others (please specify)	
If this is for engineering, will a test report be required?		
Will you require a recommendation for product safety?		

3.5.3 Support Equipment (SE) – Detailed Information

Support Equipment (SE)			
Name	**Model No.**	**Serial No.**	**Description**
OKIDATA	B431d	AK43004558A0 AK46022060A0 AK46022066A0 AK47007784A0 AK47007789A0	Ballot Printer

SE I/O Cabling				
Model No.	**Description**	**Shielded?**	**Length**	**Quantity**
N/A				

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

3.6 Engineering Changes

Engineering Change (EC)#	**Description**
N/A	

3.7 Power Supplies

Manufacturer	Model	Serial No.	Input	Output and Type
XP Power	AHM85PS24 – 85W	K12460073 / 2005415	~1.0A	@ 100V – 0.4A @ 240V

3.8 Accessories

Type	Model	Function
Verity Test Ballots		
Verity Keys		Load Election
Verity vDrives (Apacer / AMP)		Write Data to vDrive
USB Drives (2 per device)		
Thermal paper (1 extra per device		
Scanner cleaning kit		

3.9 Oscillator Frequencies

Frequency	Description of Use
0.307Mhz	
12Mhz	
240Mhz	
12Mhz	ATI, Base Board
24Mhz	ATI, PDI Scanner
1.86GHz	CPU

3.10 Interconnecting Cables

Type	Description	Shielded?	Length	Quantity

3.11 Software

Type	Version	Description
Verity Scan	0.17.11.16874	For Verity Scan
Verity Touch Writer	0.17.11.16874	For Verity Touch Writer

4.0 Test Plan

4.1 Units Under Test

Multiple Units Under Test of the same model with unique serial numbers may be used throughout EMC/EMI testing meeting the following criteria:

- To maximum scheduling flexibility
- UUT are identical models
- All hardware components are list in Vendor's bill of materials

List of Units Under Test can be found in section 3.2 and 3.3 of this document.

4.2 Operating Modes and Configurations for EMC Testing

4.2.1 *Operating Mode*

Prior to and during testing, proper operation of the UUT shall be confirmed using Hart InterCivic software. An operational status check shall be performed prior to fully exercise the UUT and ensure that no damage has occurred as a result of the test.

Verity Scan and Very Touch Writer will be in a test election mode and the following Verity applications will be executed:

- Shoe Shine test application – provides a method of exercising the integrated scanner in Verity Scan. When application runs a sheet of paper is inserted into the scanner and the scanner will continuously scan the inserted paper through its paper feeder, the scanned images are not saved. To stop the scanning process the paper must be grabbed and pulled out of the scanner. The scan rate is approximately once every 15 seconds
- Audio Test application – is used to test the Audio playback in Verity Touch Writer. This requires the Verity Access audio-tactile interface device be plugged into the Access port on the Verity Touch Writer and headsets or speakers be plugged in to the audio out port on the Access device. The audio played is a file that is specified in the applications folder. The audio track should be short, less than 5 seconds long; the audio application will play the MP4 audio file every 23 seconds with 17 second delay until the application is closed.
- USB Stick Test – is an application to write data to either of the USB ports that are inside Verity Scan and Touch Writers secure device compartment. This application uses a command line to specified location of the file to write and how often to write, the data written is Date-Time; by default the Date-Time is written at an approximate once an minute rate.
- Printer Test - is an application to print to the thermal printer integrated into Verity Scan and Touch Writers, in addition it can be configured, thru a configuration file, to print data to a USB printer connected to the Touch Writers printer port. The data printed is Date-Time; by default the Date-Time is printed at an approximate once a minute rate and once a five minute rate.

4.2.2 *Device Setup*

- Touch Writer will include OKI B431d COTS printer
- Prior to each test Scan will have scanner cleaned prior to running Verity Scan application
- Run Verity Scan application:

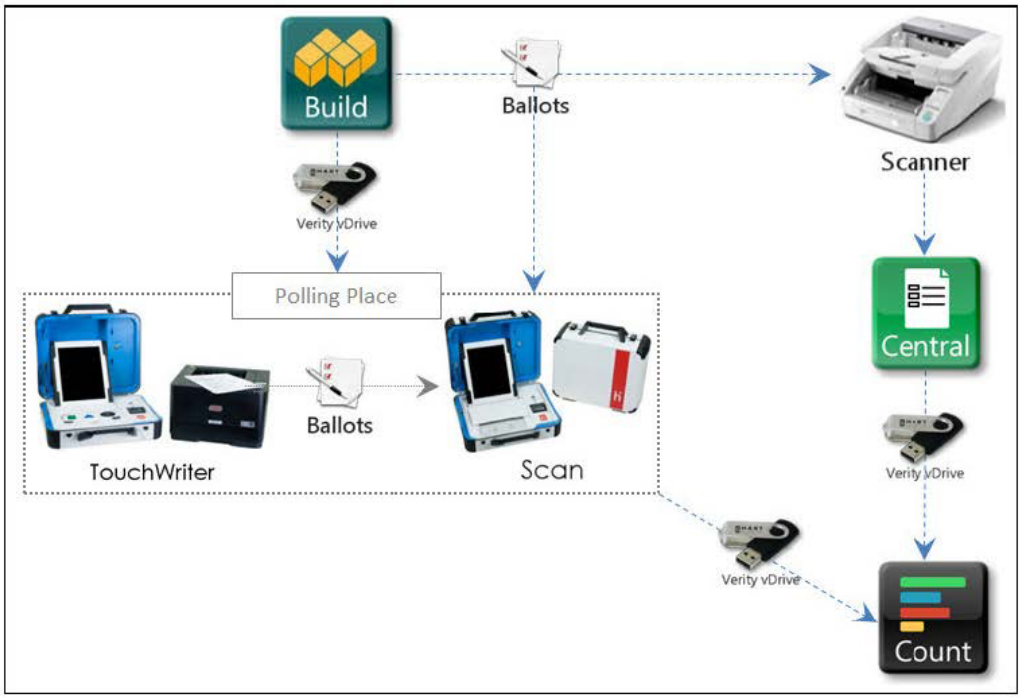
- Configure C:\Verity directory with proper database
- Load election
- Scan ballots (5 each)
- Suspend or Close election

- Run Verity Touch Writer application:
  - Load election
  - Print 1 ballot
- Run test applications:
  - Verity Scan:
    - Shoeshine (configure C:\Verity directory with proper database), USB Stick Test, Printer Test
  - Verity Touch Writer:
    - USB Stick Test, Audio Test, Printer Test, Mark / Print Ballot

4.2.3 Configurations

The following image is a general workflow of all Verity Voting system components working together.

Figure 1: Verity Voting Configuration



4.3 Treatment of Test Failures

Failures of EMC tests or failures of the exercising software to perform shall be documented in the EMC test report.

4.4 Test Documentation

A test report shall be attained from the test lab that meets the pertinent requirements of EN45001, and ISO/IEC17025, "General Requirements of Testing and Calibration Laboratories".

4.5 Test Facility Location

EMC Integrity, 1736 Vista View Drive, Longmont CO 80504

5.0 EMC / EMI Tests

5.1 Electromagnetic Emissions

Objective: To verify that the electromagnetic emissions generated by the product under normal use and in the product's intended environment are below a level as specified by the VVSG.

5.1.1 Radiated Electromagnetic Emissions

Test Method: FCC Part 15, Radio Frequency Devices
Deviations from Test Method: None
Exit Criteria: The UUT shall meet the following emissions limits:

Frequency Band (MHz)	Class B Equipment 10m Measurement Distance (dBuV/m)
30 – 88	29.5
88-216	33.1
216 – 960	36.6
960-1000	43.5
(GHz) 1000-5000	43.5

5.1.2 Conducted Electromagnetic Emissions

Test Method: FCC Part 15, Radio Frequency Devices
Deviations from Test Method: None
Exit Criteria: The UUT shall meet the following emissions limits:

Frequency Band (MHz)	Class B Equipment	
	Quasi-Peak Measurement (dBuV)	**Average Measurement (dBuV)**
0.15 – 0.5	66 decreasing with the log of the frequency to 56	56 decreasing with the log of the frequency to 46
0.5 – 5.0	56	46
5.0 – 30	60	50

5.2 Electromagnetic Immunity

Objective: To verify that the product performs as intended when exposed to different types of electromagnetic energies that may be encountered under normal use in the product's intended environment.

5.2.1 Immunity Compliance Criteria

Criteria A: The UUT shall be able to withstand the test without disruption of normal operation or loss of data.

Criteria B: The UUT shall be able to withstand the test without damage or loss of data. The equipment may reset or have momentary interruption so long as normal operation is resumed without human intervention or loss of data. Loss of data means votes that have been completed and confirmed to the voter.

Criteria C: The COTS and support equipment may have temporary loss of function or degradation of performance, the correction of which requires operator intervention or system reset.

Electrostatic Disruption

Test Method: IEC61000-4-2, Ed. 2, Electrostatic Disruption Test, (2008)

Test Levels: Will not exceed the required ESD limits for all ESD test levels.

Test Location	Discharge Voltage +/-(kV)
Indirect Contact: HCP	2.00, 4.00, 8.00
Indirect Contact: VCP	2.00, 4.00, 8.00
Direct Contact to Metallic Surfaces	2.00, 4.00, 8.00
Air Discharges to Insulated Surfaces	2.00, 4.00, 8.00, 15.00

Deviations from Test Method: None

Exit Criteria: B

5.2.2 *Electromagnetic Susceptibility*

Test Method: IEC61000-4-3, Radiated, Radio-Frequency, Electromagnetic Field Immunity Test, (1996)

Test Levels:

Frequency Range (MHz)	Test Level (V/m)	Modulation / Sweep
80.0 to 1000.0	10	80% AM at 1.0kHz 1% steps with 3s dwell
Clock Frequencies	10	80% AM at 1.0kHz 1% steps with 3s dwell

Deviations from Test Method: None

Exit Criteria: A

5.2.3 *Electrical Fast Transient*

Test Method: IEC61000-4-4, Electrical Fast Transient Test, (1995-01)

Note: Repetition Rate for all transient pulses will be 100 kHz

Test Levels:

Coupling Mode	Test Voltage +/- kV
AC & DC Line Cord	2.0
All external wires >3m no control	1.0

Deviations from Test Method: None

Exit Criteria: B

5.2.4 *Lightning Surge*

Test Method: IEC61000-4-5, Lightning Surge Test, (1995-02)

Test Levels:

Coupling Mode	Test Voltage +/- kV
Differential Mode	2
Common Mode	2
Differential Mode >10m	0.5
Common Mode >10m	0.5
I/O sig/control >30m	1

Deviations from Test Method: None

Exit Criteria: B

5.2.5 *Conducted RF Immunity*

Test Method: IEC61000-4-6, Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields, (1996-04)

Test Levels:

Test Point	Frequency Range (MHz)	Test Level (Vrms)	Modulation / Sweep
AC & DC Power >3m in length	0.150Khz to 80Mhz	10	80% AM at 1.0Khz 1% steps with 3s dwell
I/O cables >3M in length	Clock Frequencies	10	80% AM at 1.0Khz 1% steps with 3s dwell

Deviations from Test Method: None

Exit Criteria: A

5.2.6 *Magnetic Fields Immunity*

Test Method: IEC61000-4-8, Power Frequency Magnetic Field Immunity Test, (1993-06)

Test Levels: 30 A/m at 60 Hz

Deviations from Test Method: None

Exit Criteria: A

5.2.7 *Electrical Power Disturbance*

Test Method: IEC61000-4-11, Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests, (1994-06)

Test Levels:

Electrical Power Disturbance
30% dip @ 10ms
60% dip @ 100 ms and 1 sec
> 95% interrupt @ 5 sec
Surges of ±15% line variations of nominal line voltage
Electric 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 power level

Deviations from Test Method: None

Exit Criteria: A

6.0 Handling Hardware Anomalies and Incidents

6.1 Hardware Test Anomalies

An anomaly with the subcontractor's test equipment or a procedural misstep can cause a test to fail. For any suspected test equipment issue or procedural error, analysis will be performed and the decision whether to continue testing based on the severity of the anomaly will be appropriately tracked. The subcontractor test lab will issue a corrective action to address any test equipment and/or procedure errors. This is part of the hardware test subcontractor's quality system process that allows the hardware test lab to train all personnel, repair/calibrate equipment, and prevent any recurrence.

6.2 Hardware Incident Process

For every test failure of any voting system component at the hardware test lab, the lab completes a data sheet (per their laboratory procedures and templates) and immediately informs the SLI Hardware Specialist. This can be communicated in the daily status update, with the data sheet attached.

- Failure Analysis: Once a failure has occurred, the SLI Hardware Specialist will be involved with the subcontractor test lab(s) to identify the hardware discrepancy in the device. The results of the analysis will be documented and tracked in the discrepancy reporting tool, and the ECO database under Hardware Incident. The analysis will focus on the failure, what caused the failure, the severity (minor or major), and possible impacts to other testing.
- Mitigation: The SLI Hardware Specialist monitors any work done by the manufacturer, with the full understanding of what is occurring and why.
    - The Manufacturer will document what work is done and the SLI Hardware Specialist will sign off on or can stop the work at any time.
    - The Hardware Specialist will determine the number of "minor" fixes the manufacturer can incorporate without a re-start of the test.
    - A **minor** change made by the manufacturer can include grounding the chassis or adding ferrites.
    - Any **major** component replacement is cause for failing a test and requiring a re-start. Example: Bad motherboard. Analysis: What was the cause; did the ESD test cause the motherboard to malfunction? Does this impact other hardware tests? The Manufacturer can only replace like for like components and this process must be monitored by the SLI Hardware Specialist.
    - Any modification to the equipment is followed up with the related manufacturer EC(s). All related ECs must be entered into the hardware test report and the certification test report

When issues are identified during hardware environmental testing, they result in discrepancies. Discrepancies are tracked in the ECO database under the "Hardware Test Incident" category. The incident number will be tracked along with the equipment that is taken out of testing due to the failure.

APPENDIX D

EMI Test Log

emc integrity incorporated

EMI Test Log

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609 W1400007609
Customer Representative:	Darrick Forester		
Standard Referenced:	FCC Part 15		

FR0105

10m Emissions

Test	Test Code	Date	Event	OT	Time (hrs)	Result	Initials
	6001	October 1, 2014 0800-0900	Radiated Emissions Engineering / Trouble-Shooting		1.0	Complete	MT
RE	1342	0900-0945	Test #1: Radiated Emissions, 30 MHz - 1 GHz, 8 Rads, 4 Heights, 3 sec. dwell, ref. level = 80 dBuV, 10 meter distance 120 VAC / 60 Hz Printer stopped printing will rerun scan		0.75	---	MT
		0945-1130	Test #2: Radiated Emissions, 30 MHz - 1 GHz, 8 Rads, 4 Heights, 3 sec. dwell, ref. level = 80 dBuV, 10 meter distance 120 VAC / 60 Hz		1.75	Pass	MT
Client requested testing be completed to 10 GHz not 6 GHz as quoted							
RE	1341	1130-1200	Test #3: Radiated Emissions, 1 GHz - 10 GHz, 16 Rads, 2 Heights, 3 sec. dwell, ref. level = 107 dBuV, 3 meter distance 120 VAC / 60 Hz		0.5	---	MT
		1200-1230	Lunch		---	---	MT
		1230-1300	Continue: Test #3: Radiated Emissions, 1 GHz - 10 GHz, 16 Rads, 2 Heights, 3 sec. dwell, ref. level = 107 dBuV, 3 meter distance 120 VAC / 60 Hz		0.5	Pass	MT
CE	2341	1300-1330	Test #4: Conducted Emissions, 150 kHz - 30 MHz 120 VAC / 60 Hz		0.5	Pass	MT
Client made some modifications after initial testing was completed: Wrapped 3 sides of power brick with Lexan Label Install new brick plate with clear Lexan label New EUT S/N W1400007609 Client requested to rerun scans							
RE	1341	October 22, 2014 1300-1400	Test #5: Radiated Emissions, 1 GHz - 10 GHz, 16 Rads, 2 Heights, 3 sec. dwell, ref. level = 107 dBuV, 3 meter distance 120 VAC / 60 Hz		1.0	Pass	MT

10m Emissions

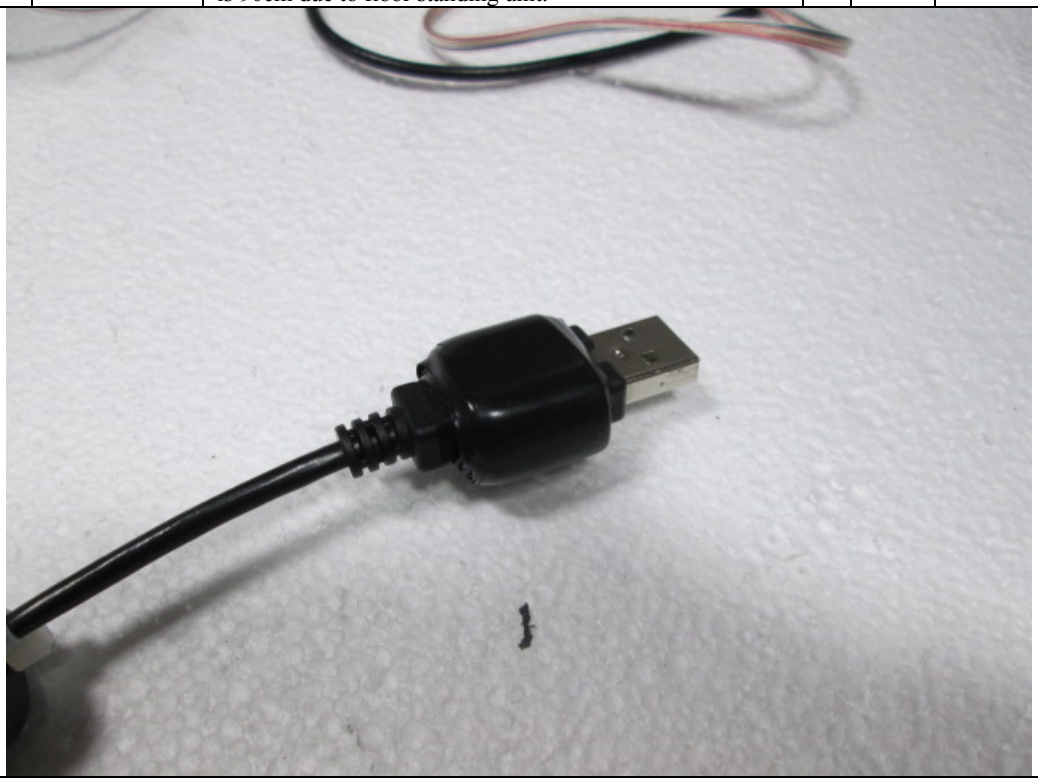
Test	Test Code	Date	Event	OT	Time (hrs)	Result	Initials
RE	6002	1400	Test #6: Radiated Emissions, 30 MHz - 1 GHz, 8 Rads, 4 Heights, 3 sec. dwell, ref. level = 80 dBuV, 10 meter distance 120 VAC / 60 Hz EUT Failed @ 960 MHz. Changed USB "V" drive will rescan		---	Fail	MT
RE		1600	Test #7: Radiated Emissions, 30 MHz - 1 GHz, 8 Rads, 4 Heights, 3 sec. dwell, ref. level = 80 dBuV, 10 meter distance 120 VAC / 60 Hz		2.0	Fail	MT
RE	1342	October 29, 2014 1100-1200	Test #8: Radiated Emissions, 30 MHz - 1 GHz, 8 Rads, 4 Heights, 3 sec. dwell, ref. level = 80 dBuV, 10 meter distance 120 VAC / 60 Hz All LEDs on. On back of device, Tied Digital ground to chassis ground.		1.0	---	MT
		1200-1230	Lunch		---	---	MT
RE		1230-1330	Continue: Test #8: Radiated Emissions, 30 MHz - 1 GHz, 8 Rads, 4 Heights, 3 sec. dwell, ref. level = 80 dBuV, 10 meter distance 120 VAC / 60 Hz All LEDs on. On back of device, Tied Digital ground to chassis ground. EUT Failed @ 840 MHz		1.0	Fail	MT
RE	6001	1330-1430	RE Trouble shooting		1.0	Complete	MT
RE	6002	1430-1500	Test #9: Radiated Emissions, 30 MHz - 1 GHz, 8 Rads, 4 Heights, 3 sec. dwell, ref. level = 80 dBuV, 10 meter distance 120 VAC / 60 Hz Replaced USB "V" drive, Reroute internal cable		0.5	Complete	MT
RE		1500-1630	Test #10: Radiated Emissions, 30 MHz - 1 GHz, 8 Rads, 4 Heights, 3 sec. dwell, ref. level = 80 dBuV, 10 meter distance 120 VAC / 60 Hz Replaced USB "V" drive and "C FAST", Not running platform manager		1.5	Fail	MT
RE	1342	November 7, 2014 1230-1400	Test #11: Radiated Emissions, 30 MHz - 1 GHz, 8 Rads, 4 Heights, 3 sec. dwell, ref. level = 80 dBuV, 10 meter distance 120 VAC / 60 Hz		1.5	Pass	MT
RE	1342	1400-1530	Test #12: Radiated Emissions, 1 GHz - 10 GHz, 16 Rads, 2 Heights, 3 sec. dwell, ref. level = 107 dBuV, 3 meter distance 120 VAC / 60 Hz		1.5	Pass	MT

Regular hours:	16.0
Overtime/Prem hours:	
Total hours:	16.0

Ground Planes / CALC

Test	Test Code	Date	Event	OT	Time (hrs)	Result	Initials

Ground Planes / CALC

Test	Test Code	Date	Event	OT	Time (hrs)	Result	Initials
4-3	4354	October 1, 2014 1430 - 1530	Equipment Setup		1.0	---	CL
---	---	1530 - 1630	Radiated RF Immunity 10V/m, 80 - 1000 MHz, 1% Step, 80% AM, 1kHz sine, 3s dwell 120 VAC / 60 Hz Note:.		1.0	---	CL
---	---	October 2, 2014 0800 - 1200	Radiated RF Immunity 10V/m, 80 - 1000 MHz, 1% Step, 80% AM, 1kHz sine, 3s dwell 120 VAC / 60 Hz		4.0	Pass	CL
4-6	4622	1230 - 1400	Conducted RF Immunity 10Vrms, 0.15 - 80 MHz, 1% Step, 80% AM, 1kHz sine, 3s dwell (AC main & No I/O >3m) 120 VAC / 60 Hz Note: Distance between UUT and CDN is 90cm due to floor standing unit.		1.5	Pass	CL/TW
							
Modification to UUT, added electrical tape to USB cable connector.							
4-4	4411	1400 - 1630	Electrical Fast Transient / Burst Mains: +/- 2kV, I/O: +/- 1kV, rep rate 100 kHz. (AC main & No I/O >3m) **120 VAC / 60 Hz Note: Test was re-started several times due to UUT not printing, setup changed to include support equipment on a stand and be on the left side of the UUT.**		2.5	Fail	CL/TW
---	---	---	Note: Line1 -2kV UUT stopped printing. On 100kHz waveform.			---	CL/TW
---	---	---	Note: Line2 -2kV UUT stopped printing. Running 5kv waveform			---	CL/TW

Ground Planes / CALC

Test	Test Code	Date	Event	OT	Time (hrs)	Result	Initials
---	---	---	Changed to a standard USB cable hooked from UUT to Printer.			---	CL/TW
---	---	October 3, 2014 0800 - -0930	Troubleshooting EFT failure. Ran 100 rep rate on L1,L2 & PE and failed. Switched to 5kHz rep rate on L1, L2 & PE. And failed. Switched to 1 kHz rep rate on L1, L2 & PE, failed. Switched to 2000V 100 kHz rep rate. Unit passed New UUT s/n: W1400007309		1.5	Fail	CL/MN
4-11	4191	0930 - 1330	Voltage Dips and Interruptions Electric power increases of 7.5% and reductions of 12.5% of nominal specified power. (See Protocol) TBD Completed the +7.5% of nominal 120V		4.0	Pass	CL/MN
---	---	1330 - 1400	Lunch		---	---	MN
4-11	4191	1430 -1530	Voltage Dips and Interruptions 70% nom, 0.5 cycles / 40% nom, 5 cycles / 0% nom, 250 cycles (See Protocol for Specifics) 120 VAC / 60 Hz		1.0	Pass	MN
		October 6, 2014 0800-1130	Voltage Dips and Interruptions Electric power increases of 7.5% and reductions of 12.5% of nominal specified power. (See Protocol) TBD Run -12.5% of 120VAC voltage variance (105VAC)		4.0	Pass	DW
		1130-1200	Voltage Dips and Interruptions Surges of +15% line variations of nominal line voltage. (See Protocol) TBD		0.5	Pass	DW
		1210-1230	Lunch		---	---	DW
4-8	4831	1230-1330	Power Frequency H-Field Immunity 30A/m, 50 / 60 Hz, 3 axes 120 VAC / 60 Hz		1.0	Pas	DW
4-2	4295	1330-	Electrostatic Discharge +/- 2, 4, 8kV Contact, +/-2, 4, 8, 15kV Air (See Protocol for Specifics) 120 VAC / 60 Hz		---	---	DW
			Contac discharges to UUT (unsure of test point) caused printer to stop printing. Client replaced printer, rebooted UUT and could not repeat error..		---	---	DW
		1430	-15kV to seam on side of power brick caused printer to stop printing. Could not recover. Printer fail.		---	---	DW
	5002	1430-1630	Conducted Immunity & ESD Engineering / Trouble-Shooting Engineering / Trouble-Shooting --		2.0	---	DW
		October 7, 2014 0800-	Continued ESD testing.		---	---	DW
			-15kV air to side seam of power brick passed.		---	---	DW
			-15kVair to LED on power brick caused printer error.		---	---	DW
			USB Printer Cables below		---	---	DW

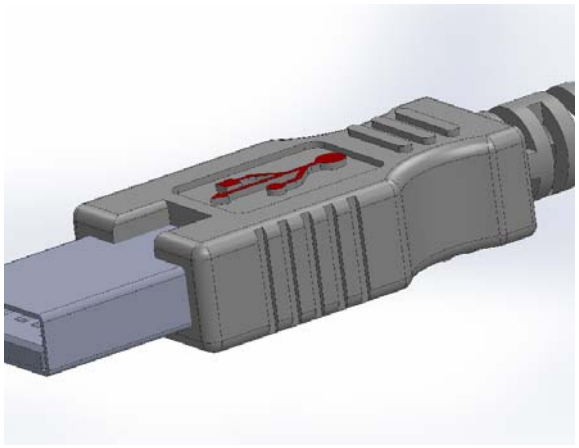
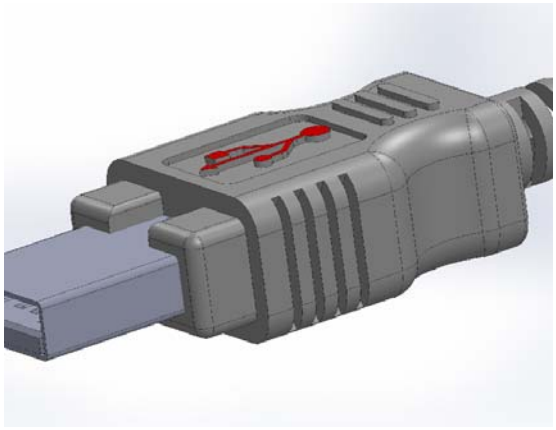
Ground Planes / CALC

Test	Test Code	Date	Event	OT	Time (hrs)	Result	Initials
					---	---	DW
			-8kV air to USB cable at UUT caused printer to fail.		---	---	DW
		0930	ESD testing/troubleshooting complete.		1.5	Fail	DW
4-5	4596	0930-	Surge Immunity Mains: +/- 2kV CM, +/- 2kV DM, (0, 90, 180, 270) (See Protocol for Specifics) 120 VAC / 60 Hz		---	---	DW
		1330	Printer failed at +2kV L1-PE 90 deg.		4.0	Fail	DW

Regular hours:	29.5
Overtime/Prem hours:	
Total hours:	29.5

Change Order #: CO2014071804_A							
4-4	4411	October 23, 2014 0800 - 1000	Electrical Fast Transient / Burst (Re-test) Mains: +/- 2kV, I/O: +/- 1kV, rep rate 100 kHz. (AC main & No I/O >3m) 120 VAC / 60 Hz		2.0	Pass	MN

					---	---	MN

---	---	---	Electrical tape on usb. New usb cables are being manufactured with a plastic shell to duplicate the thickness of the electrical tape. **This is the before and after drawings of the printer usb cable rubber for your formal test report.** **Tom Farley will simulate this with electrical tape for our testing going forward starting with Conducted RF Immunity.** **Best Regards,** **Darrick**   Only running L1,L2,PE , not individual tests.		---	---	MN
4-5	4596	October 23, 2014 1000 - 1530	Surge Immunity (Re-test) Mains: +/- 2kV CM, +/- 2kV DM, (0, 90, 180, 270) (See Protocol for Specifics) 120 VAC / 60 Hz		5.5	Pass	MN
---	---	---	EMC Pro is 110cm from UUT		---	---	MN

4-2	4295	October 24, 2014 0800 - 1130	Electrostatic Discharge (Re-test) +/- 2, 4, 8kV Contact, +/-2, 4, 8, 15kV Air (See Protocol for Specifics) 120 VAC / 60 Hz		3.5	Pass	MN
---	---	---	Pretest OK, ground cables 951 and 915 Ohms		---	---	MN

Regular hours:	11.0
Overtime/Prem hours:	
Total hours:	11.0

APPENDIX E

Laboratory Accreditations

Nemko Laboratory Authorization

Authorization: ELA 215

EMC Laboratory: **EMC Integrity, Inc.**
1736 Vista View Drive
Longmont, Colorado 80504
USA

Scope of Authorization: **All CENELEC standards [ENs] for EMC that are listed on the accompanying page, and all of the corresponding CISPR, IEC and ISO EMC standards that are listed on the accompanying page.**

Nemko has assessed the quality assurance system, the testing facilities, qualifications and testing practices of the relevant parts of the organization. The quality assurance system of the Laboratory has been validated against ISO/IEC 17025 or equivalent. The laboratory also fulfils the conditions described in Nemko Document NLA -10. During the visit by the Nemko representative it was found that the Laboratory is capable of performing tests within the Scope of the Authorisation.

Accordingly, Nemko will normally accept test results from the laboratory on a partial or complete basis for certification of the products.

In order to maintain the Authorisation, the information given in the pertinent NLA-10 must be carefully followed. Nemko is to be promptly notified about any changes in the situation at the Laboratory, which may affect the basis for this Authorisation. The Authorisation may be withdrawn at any time if the conditions are no longer considered to be fulfilled.

The Authorisation is valid through June 30, 2015.

Dallas, Texas, USA.

For and on behalf of Nemko AS:

T.B. Ketterling,

Nemko ELA Co-ordinator

Region: North America

SCOPE OF AUTHORIZATION

Capability to perform a basic test implies also that any product (family) standard calling up this basic test is also within the scope if mentioned below or not.

Generic & Product –Family Standards		
EN 55011 :1998+A1 :1999 +A2 :2002 EN 55011:2007 +A2:2007 EN 55011:2009 +A1:2010 CISPR 11:1997 (Modified) + A1:1999 + A2:2002 CISPR 11 Ed. 4.1 CISPR 11 Ed 5.1 (2010-7)	EN55014:1997 +A1:2008 EN 55014-1:2006 +A1:2009 EN 55014-1:2000 + A1:2001 + A2:2002 CISPR 14-1:2000 + A1:2001 + A2:2002 CISPR 14-1:2005 +A1:2008 CISPR 14-1 Ed. 5.0	EN 55014-2:1997 + A1:2001 CISPR 14-2:1997 + A1:2001 +A2:2008 CISPR 14-2 Ed. 1.2
EN 55022: 1998+ A1:2000, +A2:2003 CISPR 22: 2003+ A1:2004 CISPR 22:2005 (Modified) EN55022:2006 CISPR 22 Ed. 5.2 CISPR 22 Ed. 6.0 (2008-09) EN 55022 +A1: 2007 EN 55022:2010	EN 55024: 1998 +A1:2001, +A2:2003 CISPR 24: 1997 +A1:2001, +A2:2002 CISPR 24 Ed. 1.0 EN 55024:2010	EN 61000-6-1 :2007 IEC 61000-6-1 Ed. 2.0 EN 61000-6-1: 2001
EN 61000-6-2:2005 IEC 61000-6-2 Ed. 2.0	EN 61000-6-3 :2007 IEC 61000-6-3 Ed. 2.0 EN 61000-6-3: 2001 + A1 :2004	IEC 61000-6-2 Ed. 2.0 EN 61000-6-2: 2005 IEC 61000-6-2: 2005 EN 61000-6-2: 2001
EN 61326:1997 +A1:1998 + A2:2001 +A3:2003 IEC 61326:1997 + A1:1998 + A2:2000 EN 61326-1 Ed. 1.0 EN 61326-1 :2013 IEC 61326-1 Ed. 2.0 (2012-07) IEC 61326:2006	EN 60601-1-2:2001 + A1:2006 IEC 60601-1-2:2001 EN 60601-1-2:2007 IEC 60601-1-2:2007 (Ed. 3.0)	EN 55103-1:1996 EN 55103-2 :1996 EN 55103-1:2005 EN 55103-2:2005
EN 300 386 V.1.3.1 EN 300 386 V.1.3.3 EN 300 386 V.1.4.1	EN 61000-3-3: 1995, +A1:2001 +A2:2005 IEC 61000-3-3: 1994, +A1:2001 +A2:2005 EN 61000-3-3:2008	EN 61000-3-2: 2000 +A2 :2005 IEC 61000-3-2: 2000 (Modified) +A1:2001 +A2:2004 EN 61000-3-2:2006
EN 50130-4: 1995 + A1:1998 + A2:2002 EN 50130-4:2011	ETSI EN 301 489-x ETSI EN 300 220-x	ETSI EN 300 339 Ed. 1

TBKetterling

T.B. Ketterling, Nemko ELA Co-ordinator

2(3)

NLA 3 ED3

Basic Standards		
EN 61000-4-2:1995, +A1:1998, +A2:2000 IEC 61000-4-2:1995, +A1:1998, +A2:2000 EN 61000-4-2 : 2009 EN 61000-4-2 :2008 (ed. 2) IEC 61000-4-2:2001 (ed. 1.2)	EN 61000-4-3:2002, +A1:2002 IEC 61000-4-3:2002, +A1:2002 EN 61000-4-3 :2006 +A1 :2006 +A2 :2006 IEC 61000-4-3 (Ed. 3.0) +A1 :2007 +A2 :2010	EN 61000-4-4:1995, +A1:2002, +A2:2002 IEC 61000-4-4:1995, +A1:2000, +A2:2001 EN 61000-4-4:2004 IEC 61000-4-4 Ed. 2.0 IEC 61000-4-4:2012
EN 61000-4-5:1995, +A1:2001 IEC 61000-4-5:1995, +A1:2000 EN 61000-4-5 :2006 IEC 61000-4-5 Ed. 2.0	EN 61000-4-6:1996, +A1:2001 IEC 61000-4-6:1996, +A1:2000 EN 61000-4-6 : 2009 IEC 61000-4-6 Ed. 2.2 IEC 61000-4-6 :2008	EN 61000-4-8:1994,+A1:2001 IEC 61000-4-8:1994, +A1:2001 IEC 61000-4-8 Ed. 1.1 IEC 61000-4-8 :2001 IEC 61000-4-8 :2009 EN 61000-4-8 :2010
EN 61000-4-11:2004 IEC 61000-4-11 Ed. 2.0 EN 61000-4-11:1994, +A1:2000 IEC 61000-4-11:1994, +A1:2000	BLANK	BLANK

T.B. Ketterling, Nemko ELA Co-ordinator

3(3) NLA 3 ED3

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 200737-0

EMC Integrity, Inc.
Longmont, CO

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

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

2014-07-01 through 2015-06-30
Effective dates

For the National Institute of Standards and Technology

NVLAP-01C (REV. 2009-01-28)

NVLAP® National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

EMC Integrity, Inc.
1736 Vista View Drive
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Scope Revised: 2014-10-06

NVLAP Code	*Designation / Description*
Emissions Test Methods	
12/100063c	IEC 61000-6-3 (1996), EN 61000-6-3 (2001), A1 (2004): Electromagnetic Compatibility (EMC) - Part 6: Generic standards - Section 3: Emission standard for residential, commercial, and light-industrial environments.
12/610006m	EN 61000-6-4 (2007): Electromagnetic Compatibility (EMC) - Part 6-4: Generic Standards - Emission Standard for Industrial Environments
12/61326da	IEC 61326-1 Ed. 2.0 (2012): Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements
12/CIS11f	AS/NZS CISPR 11 (2002): Industrial, scientific and medical (ISM) radio frequency equipment - Electromagnetic disturbance characteristics - Limits and methods of measurement
12/CIS11g	IEC/CISPR 11, Ed. 4.1 (2004-06): Industrial, scientific and medical (ISM) radio-frequency equipment - Electromagnetic disturbance characteristics - Limits and methods of measurements
12/CIS11h	AS/NZS CISPR 11 (2004): Industrial, scientific and medical (ISM) radio frequency equipment - Electromagnetic disturbance characteristics - Limits and methods of measurement
12/CIS11i	IEC/CISPR 11, Ed. 4.1 (2004-06) + A1(2004): Industrial, scientific and medical (ISM) radio frequency equipment - Electromagnetic disturbance characteristics - Limits and methods of measurement

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12/CIS11j	EN 55011 (1998) + A1(1999), A2(2002): Industrial, scientific and medical (ISM) radio frequency equipment - Electromagnetic disturbance characteristics - Limits and methods of measurement
12/CIS11k	IEC/CISPR 11 (2003), EN 55011 (1998), A2(2002): Limits and Methods of Measurement of Electromagnetic Disturbance Characteristics of Industrial, Scientific, and Medical Radio-Frequency Equipment
12/CIS11m2	EN 55011 (2009) + A1 (2010): Industrial, scientific and medical (ISM) radio-frequency equipment - Electromagnetic disturbance characteristics - Limits and methods of measurement
12/CIS11p	IEC/CISPR 11 Ed. 5 (2009-05): Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement
12/CIS14b1	AS/NZS CISPR 14-1 (2003): Electromagnetic Compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission
12/CIS14x	IEC/CISPR 14-1, Ed. 4 (2003): Electromagnetic Compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission
12/CIS22	IEC/CISPR 22 (1997) & EN 55022 (1998) + A1(2000): Limits and methods of measurement of radio disturbance characteristics of information technology equipment
12/CIS22a	IEC/CISPR 22 (1993) and EN 55022 (1994): Limits and methods of measurement of radio disturbance characteristics of information technology equipment, Amendment 1 (1995) and Amendment 2 (1996)
12/CIS22a4	IEC/CISPR 22 (1993) & EN 55022 (1994)+A1(1995), A2(1997): Limits and methods of measurement of radio disturbance characteristics of information technology equipment
12/CIS22b	CNS 13438 (1997): Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment
12/CIS22c	IEC/CISPR 22, Fourth Edition (2003-04) & EN 55022 (1998): Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement

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12/CIS22c1	IEC/CISPR 22, Edition 5 (2005) and EN 55022 (1998): Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
12/CIS22c3	IEC/CISPR 22, Edition 5 (2005) + A1(2005): Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
12/CIS22c4	EN 55022 (1998) + A1(2000) + A2(2003): Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
12/CIS22f	CNS 13438 (2006) (up to 6GHz): LImits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment
12/CIS22i	IEC/CISPR 22, Edition 5.2 (2006-03): Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment
12/CIS22j	EN 55022 (2006): Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
12/CIS22j1	EN 55022 (2006) + A1 (2007): Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
12/CIS22j2	EN 55022:2010: Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement
12/CIS22k	IEC/CISPR 22 (2008-09): Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment
12/CIS32a	CISPR 32, Ed. 1 (2012-01): Electromagnetic compatibility of multimedia equipment - Emission requirements
12/CIS32ba	EN 55032:2012/AC:2013: Electromagnetic compatibility of multimedia equipment. Emission requirements
12/EM02d	IEC 61000-3-2, Edition 2.2 (2004-11): Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current <= 16 A per phase)

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NVLAP Code	*Designation / Description*
12/EM02k	GB 17625.1 (2003): Electromagnetic compatibility (EMC) - Part 3: Limits - Section 2. Limits for harmonic current emissions (equipment input current <= 16A per phase)
12/EM03b	IEC 61000-3-3, Edition 1.1(2002-03) & EN 61000-3-3, A1(2001): EMC - Part 3-3: Limits - Limitations of voltage changes, voltage flucuations and flicker, in public low-voltage supply-systems, for equipment with rated current <=16 A per phase and not subject to conditional connections
12/EM03g	IEC 61000-3-3, Edition 1.1 (2003) +A2 (2005): EMC Part 3-3: Limits - Limitations of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current <= 16 A per phase and not subject to conditional connections
12/EM12c	IEC 61000-3-12 Ed. 2.0 (2011): Electromagnetic compatibility (EMC) - Part 3-12: Limits - Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current >16 A and = 75 A per phase
12/EM12d	EN 61000-3-12 (2011): Electromagnetic Compatibility (EMC) - PART 3-12: Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current greater than 16A and less than or equal to 75A
12/F18	FCC OST/MP-5 (1986): FCC Methods of Measurement of Radio Noise Emissions for ISM Equipment (cited in FCC Method 47 CFR Part 18 - Industrial, Scientific, and Medical Equipment)
12/FCC15b	ANSI C63.4 (2003) with FCC Method 47 CFR Part 15, Subpart B: Unintentional Radiators
12/FCC15bb	ANSI C63.4 (2009) with FCC Method 47 CFR Part 15, Subpart B: Unintentional Radiators
12/KN11d1	KN11 (Annex 3) with RRA Announce 2008-11 (Dec. 16, 2008): Conformity Assessment Procedure for Electromagnetic Interference; With KN 11 (Annex 3)
12/KN16	Korea RRA Notice No. 2008-11 (Dec. 16, 2008): Conformity Assessment Procedures for Electromagnetic Interference using KN 16-1-1, KN 16-1-2, KN 16-1-3, KN 16-1-4, KN 16-1-5, KN 16-2-1, KN 16-2-2, KN 16-2-3, KN 16-2-4 (2008-05)

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NVLAP Code	*Designation / Description*
12/KN22	KN22 with RRL Notice No. 2005-82 (Sept. 29, 2005): RRL Notice No. 2005-82: Technical Requirements for Electromagnetic Interference Annex 8 (KN-22), RRL Notice No. 2005-131: Conformity Assessment Procedures for Electromagnetic Interference
12/KN22e	KN22 (2008-5) with RRL Notice No. 2008-3 (May 20, 2008): Conformity Assessment Procedure for Electromagnetic Interference; With KN 22
12/KN22f	KN22 (Annex 5) with RRA Announce 2010-5 (Dec 24, 2010): Conformity Assessment Procedure for Electromagnetic Interference; With KN 22 (Annex 5)
12/RRA04a	RRA 2014-8 and RRA 2014-37 (June 23, 2014): Technical Requirements and Test Methods for Electromagnetic Interference; K only (See specific Annexes listed on scope)
12/RRA105	RRA Announce 2010-5, K only (December 24, 2010): Conformity Assessment Procedure for Electromagnetic Interference (K only)
12/RRA1118	RRA Public Notification 2011-18, K only (July 5, 2011): Technical Requirements for Electromagnetic Interference (K only)
12/T51	AS/NZS CISPR 22 (2002) and AS/NZS 3548 (1997): Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment
12/T51b1	AS/NZS CISPR 22 (2009): Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
12/TCVNa	TCVN 7189:2009 (CISPR 22:2006): Information Technology Equipment-Radio disturbance characteristics - Limits and methods of measurement
12/VCCIe	Agreement of VCCI V-3 (2009.04): Agreement of Voluntary Control Council for Interference by Information Technology Equipment - Technical Requirements: V-3/2009.04 (radiated disturbance above 1 GHz)
12/VCCIg	Agreement of VCCI V-3 (2011.04): Agreement of VCCI Council - Technical Requirements: V-3/2011.04 (including radiated disturbance above 1 GHz)

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NVLAP Code	*Designation / Description*
12/VCCIi	Agreement of VCCI V-3 (2013.04): Agreement of VCCI Council - Technical Requirements: V-3/2013.04 (including radiated disturbance above 1 GHz)

Immunity Test Methods

12/610006h	IEC 61000-6-1, 2nd edition (2005-03): Electromagnetic compatibility (EMC) - Part 6: Generic standards - Section 1: Immunity for residential, commercial and light-industrial environments
12/610006i	IEC 61000-6-2, Edition 2.0 (2005-01): Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
12/61326aa	EN 61326-1:2013: Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements
12/CIS24g	CISPR 24 ed2.0 (2010-08): Information technology equipment - Immunity characteristics - Limits and methods of measurement
12/CIS24h	EN 55024 (2010): Information technology equipment. Immunity characteristics. Limits and methods of measurement
12/I01b	IEC 61000-4-2 (2001); EN 61000-4-2 (2001), A2 (2001): Electrostatic Discharge Immunity Test
12/I01c	EN 61000-4-2 +A1(1998) +A2(2001): Electrostatic Discharge Immunity Test
12/I01d	IEC 61000-4-2, Ed. 2.0 (2008-12): Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test
12/I01f	EN 61000-4-2 (2009-05): Electromagnetic compatibility (EMC) - Part 4-2 : Testing and measurement techniques - Electrostatic discharge immunity test
12/I02b	IEC/EN 61000-4-3, Ed. 2.1 (2002), A1 (2002); EN 61000-4-3: Radiated, radio-frequency, electromagnetic field immunity test
12/I02c	IEC 61000-4-3 (1995), A1(1998), A2(2000): Radiated, radio-frequency, electromagnetic field immunity test

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NVLAP Code	*Designation / Description*
12/I02f	EN 61000-4-3 (2002) + A1(2002): Radiated, radio-frequency, electromagnetic field immunity test
12/I02ggg	IEC 61000-4-3, Ed. 3.0 (2006-02) + A1 (2007) + A2 (2010): Electromagnetic compatibility (EMC) - Part 4-3: Testing measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test
12/I02hhh	EN 61000-4-3 (2006) +A1 (2008) + A2 (2010): Electromagnetic compatibility (EMC). Testing and measurement techniques. Radiated, radio- Frequency, electromagnetic field immunity test
12/I03c	IEC 61000-4-4, Ed. 2.0 (2004-07): Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test
12/I03e	EN 61000-4-4 (2004): Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test
12/I04aa	IEC 61000-4-5, Ed. 2.0 (2005-11); EN 61000-4-5: Electromagnetic Compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test
12/I04b	IEC 61000-4-5 (2001), A1(2000); EN 61000-4-5(2001), A1(2000): Surge Immunity Test
12/I04d	BS EN 61000-4-5 (2006): Electromagnetic compatibility (EMC). Testing and measurement techniques. Surge immunity test
12/I05d	IEC 61000-4-6, Ed. 2.1 (2004); EN 61000-4-6: Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields
12/I05e	EN 61000-4-6 (1996) + A1 (2001): Immunity to Conducted Disturbances, Induced by Radio Frequency Fields
12/I05f1	IEC 61000-4-6 Ed. 3.0 (2008): Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields

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NVLAP Code	*Designation / Description*
12/I05j	EN 61000-4-6 (2009): Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields
12/I06b	IEC 61000-4-8 (2001), A1(2000); EN 61000-4-8 (2001),A1(2000): Power Frequency Magnetic Field Immunity Test
12/I06c	EN 61000-4-8 (1993) + A1 (2001): Power Frequency Magnetic Field Immunity Test
12/I06e	IEC 61000-4-8 (2009): Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test
12/I06f	EN 61000-4-8:2010: Electromagnetic compatibility (EMC). Testing and measurement techniques. Power frequency magnetic field immunity test
12/I07c	IEC 61000-4-11, Ed. 2 (2004-03) & EN 61000-4-11: Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests
12/I07e	EN 61000-4-11 (1994), A1 (2001): Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests
12/I07f	EN 61000-4-11 (2004): Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests
12/KN11a	KN 61000-4-11 with RRL Notice No. 2005-130 (Dec 27, 2005): Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests
12/KN11f	KN 61000-4-11 (2008-5); RRL Notice No. 2008-4 (May 20, 2008): Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests
12/KN11h	KN 61000-4-11 (Annex 1-7) RRA Announce 2010-6 (Dec.24, 2010): Conformity Assessment Procedure for EMS (Voltage Dips, Short Interruptions and Voltage Variations Immunity tests)

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NVLAP Code	*Designation / Description*
12/KN24	KN24 (December 2005) with RRL Notice No. 2005-83: Information Technology Equipment - immunity charateristics - limits and methods of measurements
12/KN24d	KN 24 (2008-5) with RRL Notice No. 2008-4 (May 20, 2008): Information Technology Equipment - immunity charateristics - limits and methods of measurements
12/KN24e	KN 24 (Annex 5) with RRA Announce 2010-6 (Dec. 24, 2010): Conformity Assessment Procedure for EMS (Information technology equipment - Immunity characteristics - Limits and methods of measurement)
12/KN2a	KN 61000-4-2 with RRL Notice No. 2005-130 (Dec. 27, 2005): Electrostatic Discharge Immunity Test
12/KN2c	KN 61000-4-2 (2008-5); RRL Notice No. 2008-4 (May 20, 2008): Electrostatic Discharge Immunity Test
12/KN2e	KN 61000-4-2 (Annex 1-1) RRA Announce 2010-6 (Dec. 24, 2010): Conformity Assessment Procedure for EMS (Electrostatic Discharge Immunity Test)
12/KN3a	KN 61000-4-3 with RRL Notice No. 2005-130 (Dec. 27, 2005): Radiated, radio-frequency, electromagnetic field immunity test
12/KN3c	KN 61000-4-3 (2008-5); RRL Notice No. 2008-4 (May 20, 2008): Radiated, radio-frequency, electromagnetic field immunity test
12/KN3e	KN 61000-4-3 (Annex 1-2) RRA Announce 2010-6 (Dec. 24, 2010): Radiated, radio-frequency, electromagnetic field immunity test
12/KN4a	KN 61000-4-4 with RRL Notice No. 2005-130 (Dec. 27, 2005): Electromagnetic compatibility (EMC): Testing and measurement techniques - Electrical Fast Transient/Burst Immun
12/KN4c	KN 61000-4-4 (2008-5); RRL Notice No. 2008-5 (May 20, 2008): Electromagnetic compatibility (EMC): Testing and measurement techniques - Electrical Fast Transient/Burst Immunity Test

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12/KN4e	KN 61000-4-4 (Annex 1-3) RRA Announce 2010-6 (Dec. 24, 2010): Electromagnetic compatibility (EMC): Testing and measurement techniques - Electrical Fast Transient/Burst Immunity Test
12/KN5a	KN 61000-4-5 with RRL Notice No. 2005-130 (Dec. 27, 2005): Surge Immunity Test
12/KN5c	KN 61000-4-5 (2008-5); RRL Notice No. 2008-4 (May 20, 2008): Surge Immunity Test
12/KN5e	KN 61000-4-5 (Annex 1-4) RRA Announce 2010-6 (Dec. 24, 2010): Conformity Assessment Procedure for EMS (Surge Immunity Test)
12/KN6a	KN 61000-4-6 with RRL Notice No. 2005-130 (Dec. 27, 2005): Electromagnetic compatibility (EMC): Testing and measurement techniques - Immunity to conducted disturbances,
12/KN6c	KN 61000-4-6 (2008-5); RRL Notice No. 2008-4 (May 20, 2008): Electromagnetic compatibility (EMC): Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields
12/KN6e	KN 61000-4-6 (Annex 1-5) RRA Announce 2010-6 (Dec. 24, 2010): Electromagnetic compatibility (EMC): Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields
12/KN8a	KN 61000-4-8 with RRL Notice No. 2005-130 (Dec. 27, 2005): Power Frequency Magnetic Field Immunity Test
12/KN8c	KN 61000-4-8 (2008-5); RRL Notice No. 2008-4 (May 20, 2008): Power Frequency Magnetic Field Immunity Test
12/KN8e	KN 61000-4-8 (Annex 1-6) RRA Announce 2010-6 (Dec. 24, 2010): Conformity Assessment Procedure for EMS (Power Frequency Magnetic Field Immunity Test)
12/RRA04b	RRA 2014-09 and RRA 2014-38 (June 23, 2014) K only: Technical Requirements and Test Methods for Electromagnetic Susceptibility; Korean only (See specific annexes listed on scope)

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NVLAP Code	*Designation / Description*
12/RRA106	RRA Public Notification 2010-6, December 24, 2010 (K only): Conformity Assessment Procdure for Electromagneitc Susceptibility (K only)
12/RRA1117	RRA Public Notification 2011-17, K only (July 5, 2011): Technical Requirements for Electromagnetic Susceptibility, K only
Product Safety Test Methods	
12/60601ab	IEC 60601-1-2, Ed. 3.0 (2007): Medical electrical equipment - Part 1-2: General requirements for safety - Collateral standard: Electromagnetic compatibility - Requirements and tests
12/60601ac	KN 60601-1-2 (2008-5); RRL Notice No. 2008-4 (May 20, 2008): Medical electrical equipment - Part 1-2: general requirements for safety - collateral standard: electromagnetic compatibility - requirements and tests
12/60601h1	EN 60601-1-2 (2007): Medical electrical equipment - Part 1-2: General requirements for safety - Collateral standard: EMC - Requirements and tests
MIL-STD-462 : Conducted Emissions	
12/A20	MIL-STD-461 Version F Method CE102
12/A21	MIL-STD-461 Version F Method CE106
MIL-STD-462 : Radiated Emissions	
12/D11	MIL-STD-461 Version F Method RE102
12/D12	MIL-STD-461 Version F Method RE103
MIL-STD-462 : Radiated Susceptibility	
12/E16	MIL-STD-461 Version F Method RS103

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