FreeWire Technologies Inc.

REVISED EMC TEST REPORT TO 103944-6

Boost Charger*
Model: 160kW*
(*See Appendix A for Manufacturer Declaration)

Tested to The Following Standards:

FCC Part 15 Subpart B Section 15.107 & 15.109

Report No.: 103944-6A

Date of issue: September 28, 2020

This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

Test Certificate # 803.01

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Testing the Future
CKC LABORATORIES, INC.

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:	REPORT PREPARED BY:
FreeWire Technologies Inc. 1933 Davis St. Suite 301A San Leandro, CA 94577	Kim Romero CKC Laboratories, Inc. 5046 Sierra Pines Drive Mariposa, CA 95338
Representative: Shawn Sullivan	Project Number: 103944

DATE OF EQUIPMENT RECEIPT:	March 23, 2020
DATE(S) OF TESTING:	March 23, 2020 and April 2-3, 2020

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the equipment provided by the client, tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.

Revision History

Original: Testing of Boost Charger, Model: 160kW to FCC Part 15 Subpart B Section 15.107 & 15.109.
Revision A: Added statement to Conditions Under Test table for clarification of testing setup.

Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

Test Facility Information

Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.12
EMITest Immunity	5.03.10

Site Registration & Accreditation Information

Location	*NIST CB #	FCC	Japan
Canyon Park, Bothell, WA	US0081	US1022	A-0136
Brea, CA	US0060	US1025	A-0136
Fremont, CA	US0082	US1023	A-0136
Mariposa, CA	US0103	US1024	A-0136

*CKC's list of NIST designated countries can be found at: https://standards.gov/cabs/designations.html

SUMMARY OF RESULTS

Standard / Specification: FCC Part 15 Subpart B

Test Procedure	Description	Modifications	Results
15.107 Class A	Conducted Emissions	Mod. #'s 1, 2, 3 and 4	Pass
15.109 Class A	Radiated Emissions	Mod. #'s 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 and 16	Pass

ISO/IEC 17025 Decision Rule
The declaration of pass or fail herein is based upon assessment to the specification(s) listed above, including where applicable, assessment of measurement uncertainties. For performance related tests, equipment was monitored for specified criteria identified in that section of testing.

Modifications During Testing

This list is a summary of the modifications made to the equipment during testing.

Summary of Conditions
Modification 1: Added 2 capacitors (cap value for 1 = 2.2µF) model 2E225 in parallel, which were installed from the AC input filter on all 4 phases Line to Ground. (for a total of 8 caps total, two on each line.) Ferrites installed during time of test **Modification 2:** Heat exchanger fan cable had ferrite (KGS Model: KRFC-9) installed directly against the power output connector. **Modification 3:** High voltage sense line had 2 ferrites installed 1" away from each end with both ends having a double wrap around the core of the ferrite. (KGS Model: KRFC-9) **Modification 4:** Display power cable had a single ferrite installed directly up against the connector under the display. This ferrite had a double wrap around the core of the ferrite. (KGS Model: KRFC-9) **Modification 5:** DC to DC converter Input lines had one on each right near the connector. (KGS Model: RFC-20) **Modification 6:** Top shelf main harness has three ferrites installed on the DC power lines, one installed around the whole bundle about four inches back from the connector, one on the positive lines next to the connector and one on the negative lines connecting to the board. (Wurth Electronics Model: 742 712 11) **Modification 7:** Circulating fans connector had a double wrap of Ferrite placed as close to the end connector as possible. (KGS Model: KRFC-9)

Modification 8: Battery power lines had 4 (KGS Model: RFC-20) ferrites installed. Ferrites were installed 1 inch from both ends of each cable. **Modification 9:** Shielded charge output cables connecting the shield to the chassis ground. Both ends of the shield were tied to the chassis. This shielded section of cable went from the DC to DC filter output and was routed as far away from the DC to DC filter input lines as possible. The shield did not extend outside the EUT. Grounding straps were added from **Modification 10:** Power Cube to Battery Cube **Modification 11:** Power Cube to Door **Modification 12:** Power Cube to Side Panels **Modification 13**: Power Cube to Filter Plate **Modification 14:** Chassis of the EUT has to be earth grounded. **Modification 15:** Filter plate was replaced from one that was anodized with black paint to one that was clear coated. **Modification 16:** EUT display was removed and the black anodized paint was masked/removed around the bezel and mounting hardware to ground to the chassis.

Modifications listed above must be incorporated into all production units.

Conditions During Testing

This list is a summary of the conditions noted to the equipment during testing.

Summary of Conditions
E-stop and Ethernet cables were installed as intended for final installation during testing.

EQUIPMENT UNDER TEST (EUT)

During testing, numerous configurations may have been utilized. The configurations listed below support compliance to the standard(s) listed in the Summary of Results section.

Configuration 1

Equipment Tested:

Device	Manufacturer	Model #	S/N
Boost EV Charger	FreeWire Technologies, Inc.	11	3

Support Equipment:

Device	Manufacturer	Model #	S/N
Load Bank	Power House Manufacturing	250-20-480VDC	250-20-480VDC-001-191025
Power Adapter (Laptop)	Apple Inc.	A1424	None
MacBook Pro (Laptop	Apple Inc.	Retena, 15 inch	C02RH1BTG8WM

FCC PART 15 SUBPART B

15.107 AC Conducted Emissions

Test Notes: Conducted Disturbances at Mains Terminals, LISN method.

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • (209) 966-5240		
Customer:	**FreeWire Technologies Inc.**		
Specification:	**15.107 AC Mains Class A - Average**		
Work Order #:	**103944**	Date:	3/23/2020
Test Type:	**Conducted Emissions**	Time:	4:50:32 PM
Tested By:	Michael Rauch Jr.	Sequence#:	59
Software:	EMITest 5.03.12		208V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range of Interest: 150kHz-30MHz
RBW = 9kHz; VBW > RBW

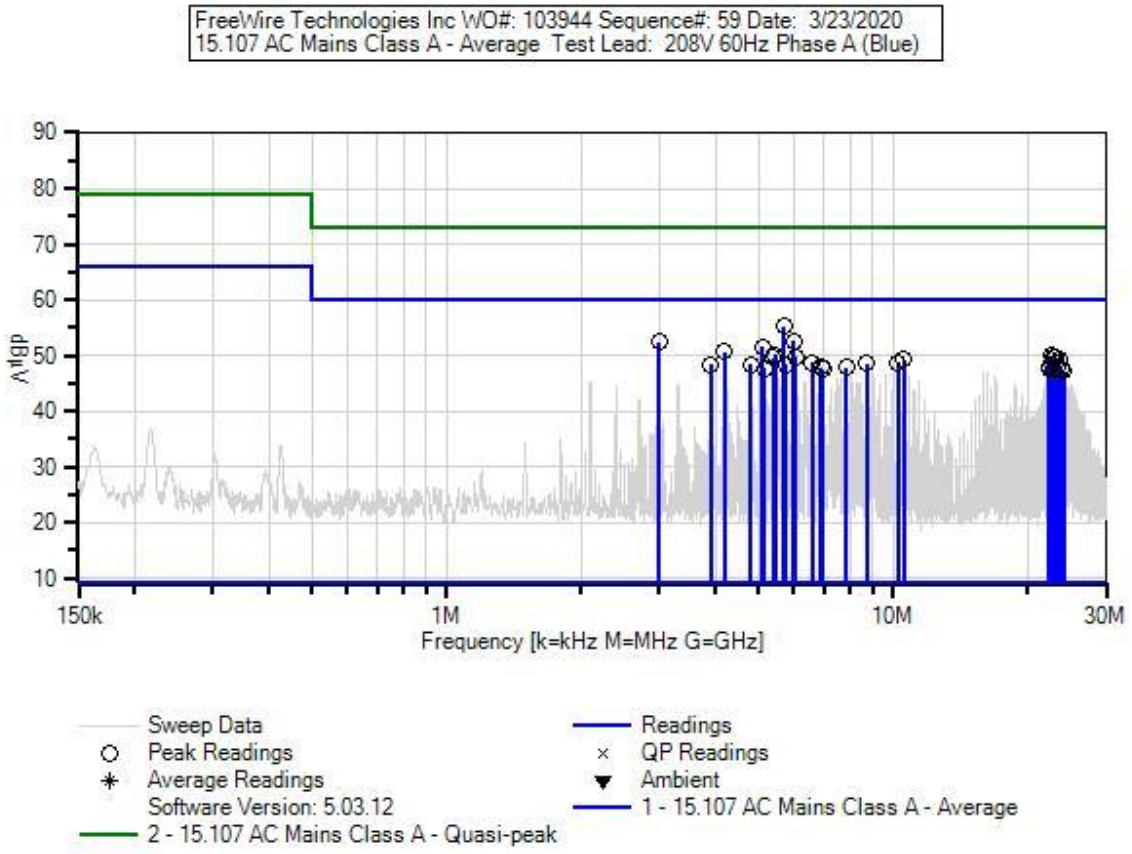
Environmental Conditions:
Temperature: 15.9°C
Relative Humidity: 61.3%
Atmospheric Pressure: 101.2kPa

Highest Internal Clock frequency: 800MHz

The EUT is a battery-integrated DC charger. It has two identical DC output power circuits which support CCS and CHADeMO. During testing the CHADeMO charger was holstered, the POS terminal was bypassed. For the purpose of this test, the boost charger is connected to a 208VAC 4 Wire power source. The CCS output is connected into the load bank. The CCS output is programmed to deliver 150A at 400V.

Test Method: ANSI C63.4: 2014

Modifications 1, 2, 3 and 4 were in place during testing.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05624	Attenuator	PE7010-10	2/2/2019	2/2/2021
T2	AN02609	High Pass Filter	HE9615-150K-50-720B	2/1/2019	2/1/2021
	AN02668	Spectrum Analyzer	E4446A	12/17/2019	12/17/2020
T3	AN01780	50uH LISN-Phase A Loss (dB)	8616-50-TS-200-N	7/8/2019	7/8/2021
	AN01780	50uH LISN-Phase B Loss (dB)	8616-50-TS-200-N	7/8/2019	7/8/2021
	AN01780	50uH LISN-Phase C Loss (dB)	8616-50-TS-200-N	7/8/2019	7/8/2021
T4	ANP06847	Cable	LMR195-FR-6	8/16/2019	8/16/2021
T5	ANP07584	Cable	RG214	7/10/2019	7/10/2021
T6	ANP06231	Cable	CXTA04A-70	3/10/2020	3/10/2022
	AN00936A	50uH LISN	8616-50-TS-200-N	3/17/2020	3/17/2022

Measurement Data: Reading listed by margin. Test Lead: Phase A (Blue)

#	Freq MHz	Rdng dBµV	T1 T5 dB	T2 T6 dB	T3 dB	T4 dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	5.697M	44.2	+9.9 +0.5	+0.1 +0.3	+0.1	+0.1	+0.0	55.2	60.0	-4.8	Phase
2	5.995M	41.5	+9.9 +0.5	+0.1 +0.3	+0.1	+0.1	+0.0	52.5	60.0	-7.5	Phase
3	2.999M	41.7	+9.9 +0.3	+0.1 +0.2	+0.1	+0.1	+0.0	52.4	60.0	-7.6	Phase
4	5.100M	40.7	+9.9 +0.4	+0.1 +0.3	+0.1	+0.1	+0.0	51.6	60.0	-8.4	Phase
5	4.199M	39.8	+9.9 +0.4	+0.1 +0.3	+0.1	+0.1	+0.0	50.7	60.0	-9.3	Phase
6	5.454M	39.2	+9.9 +0.4	+0.1 +0.3	+0.1	+0.1	+0.0	50.1	60.0	-9.9	Phase
7	22.598M	37.9	+9.9 +1.1	+0.2 +0.7	+0.0	+0.2	+0.0	50.0	60.0	-10.0	Phase
8	22.896M	37.7	+9.9 +1.1	+0.2 +0.7	+0.0	+0.2	+0.0	49.8	60.0	-10.2	Phase
9	6.049M	38.7	+9.9 +0.5	+0.1 +0.3	+0.1	+0.1	+0.0	49.7	60.0	-10.3	Phase
10	5.400M	38.7	+9.9 +0.4	+0.1 +0.3	+0.1	+0.1	+0.0	49.6	60.0	-10.4	Phase
11	23.203M	37.4	+9.9 +1.1	+0.2 +0.7	+0.0	+0.2	+0.0	49.5	60.0	-10.5	Phase
12	23.497M	37.3	+9.9 +1.1	+0.2 +0.7	+0.0	+0.2	+0.0	49.4	60.0	-10.6	Phase
13	10.553M	38.0	+9.9 +0.7	+0.1 +0.5	+0.0	+0.1	+0.0	49.3	60.0	-10.7	Phase
14	23.004M	36.6	+9.9 +1.1	+0.2 +0.7	+0.0	+0.2	+0.0	48.7	60.0	-11.3	Phase
15	10.247M	37.4	+9.9 +0.7	+0.1 +0.5	+0.0	+0.1	+0.0	48.7	60.0	-11.3	Phase
16	6.598M	37.6	+9.9 +0.5	+0.1 +0.4	+0.1	+0.1	+0.0	48.7	60.0	-11.3	Phase
17	8.752M	37.4	+9.9 +0.6	+0.1 +0.4	+0.1	+0.1	+0.0	48.6	60.0	-11.4	Phase
18	3.901M	37.5	+9.9 +0.4	+0.1 +0.3	+0.1	+0.1	+0.0	48.4	60.0	-11.6	Phase
19	5.752M	37.4	+9.9 +0.5	+0.1 +0.3	+0.1	+0.1	+0.0	48.4	60.0	-11.6	Phase
20	4.798M	37.4	+9.9 +0.4	+0.1 +0.3	+0.1	+0.1	+0.0	48.3	60.0	-11.7	Phase
21	22.400M	35.9	+9.9 +1.1	+0.2 +0.7	+0.0	+0.2	+0.0	48.0	60.0	-12.0	Phase
22	23.299M	35.9	+9.9 +1.1	+0.2 +0.7	+0.0	+0.2	+0.0	48.0	60.0	-12.0	Phase
23	6.905M	36.8	+9.9 +0.5	+0.1 +0.4	+0.1	+0.1	+0.0	47.9	60.0	-12.1	Phase

24	7.851M	36.6	+9.9 +0.6	+0.1 +0.4	+0.1	+0.1	+0.0	47.8	60.0	-12.2	Phase
25	5.148M	36.8	+9.9 +0.4	+0.1 +0.3	+0.1	+0.1	+0.0	47.7	60.0	-12.3	Phase
26	23.799M	35.4	+9.9 +1.1	+0.2 +0.7	+0.1	+0.2	+0.0	47.6	60.0	-12.4	Phase
27	22.301M	35.4	+9.9 +1.1	+0.2 +0.7	+0.0	+0.2	+0.0	47.5	60.0	-12.5	Phase
28	22.797M	35.4	+9.9 +1.1	+0.2 +0.7	+0.0	+0.2	+0.0	47.5	60.0	-12.5	Phase
29	6.950M	36.3	+9.9 +0.5	+0.1 +0.4	+0.1	+0.1	+0.0	47.4	60.0	-12.6	Phase
30	24.100M	35.0	+9.9 +1.1	+0.2 +0.7	+0.1	+0.2	+0.0	47.2	60.0	-12.8	Phase

Test Location:	CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • (209) 966-5240		
Customer:	**FreeWire Technologies Inc.**		
Specification:	**15.107 AC Mains Class A - Average**		
Work Order #:	**103944**	Date:	3/23/2020
Test Type:	**Conducted Emissions**	Time:	16:28:20
Tested By:	Michael Rauch Jr.	Sequence#:	57
Software:	EMITest 5.03.12		208V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range of Interest: 150kHz-30MHz
RBW = 9kHz; VBW > RBW

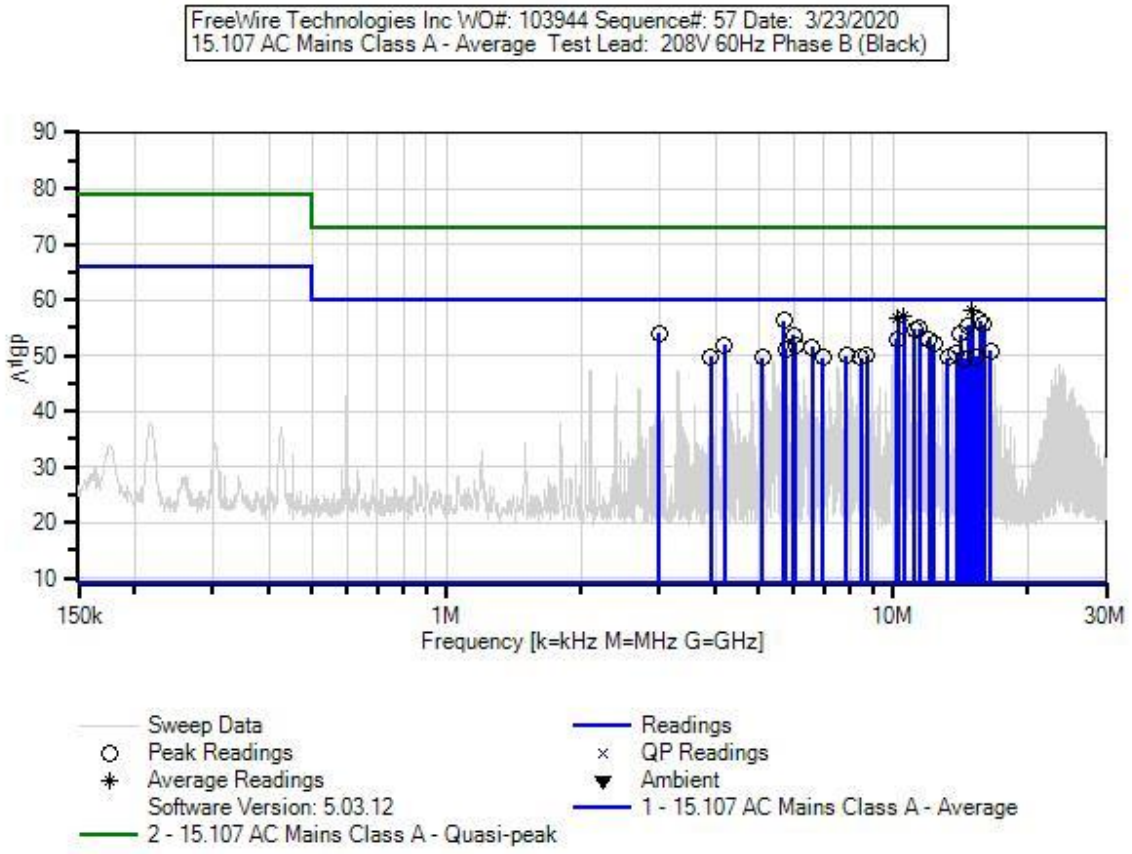
Environmental Conditions:
Temperature: 15.9°C
Relative Humidity: 61.3%
Atmospheric Pressure: 101.2kPa

Highest Internal Clock frequency: 800MHz

The EUT is a battery-integrated DC charger. It has two identical DC output power circuits which support CCS and CHADeMO. During testing the CHADeMO charger was holstered, the POS terminal was bypassed. For the purpose of this test, the boost charger is connected to a 208VAC 4 Wire power source. The CCS output is connected into the load bank. The CCS output is programmed to deliver 150A at 400V.

Test Method: ANSI C63.4: 2014

Modifications 1, 2, 3 and 4 were in place during testing.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05624	Attenuator	PE7010-10	2/2/2019	2/2/2021
T2	AN02609	High Pass Filter	HE9615-150K-50-720B	2/1/2019	2/1/2021
	AN02668	Spectrum Analyzer	E4446A	12/17/2019	12/17/2020
	AN01780	50uH LISN-Phase A Loss (dB)	8616-50-TS-200-N	7/8/2019	7/8/2021
T3	AN01780	50uH LISN-Phase B Loss (dB)	8616-50-TS-200-N	7/8/2019	7/8/2021
	AN01780	50uH LISN-Phase C Loss (dB)	8616-50-TS-200-N	7/8/2019	7/8/2021
T4	ANP06847	Cable	LMR195-FR-6	8/16/2019	8/16/2021
T5	ANP07584	Cable	RG214	7/10/2019	7/10/2021
T6	ANP06231	Cable	CXTA04A-70	3/10/2020	3/10/2022
	AN00936A	50uH LISN	8616-50-TS-200-N	3/17/2020	3/17/2022

Measurement Data: Reading listed by margin. Test Lead: Phase B (Black)

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	15.049M Ave	46.4	+9.9 +0.8	+0.2 +0.6	+0.0	+0.2	+0.0	58.1	60.0	-1.9	Phase
^	15.049M	46.9	+9.9 +0.8	+0.2 +0.6	+0.0	+0.2	+0.0	58.6	60.0	-1.4	Phase
3	10.549M Ave	45.8	+9.9 +0.7	+0.1 +0.5	+0.0	+0.1	+0.0	57.1	60.0	-2.9	Phase
^	10.553M	46.1	+9.9 +0.7	+0.1 +0.5	+0.0	+0.1	+0.0	57.4	60.0	-2.6	Phase
5	10.250M Ave	45.5	+9.9 +0.7	+0.1 +0.5	+0.0	+0.1	+0.0	56.8	60.0	-3.2	Phase
^	10.247M	47.1	+9.9 +0.7	+0.1 +0.5	+0.0	+0.1	+0.0	58.4	60.0	-1.6	Phase
7	5.697M	45.2	+9.9 +0.5	+0.1 +0.3	+0.1	+0.1	+0.0	56.2	60.0	-3.8	Phase
8	15.652M	44.4	+9.9 +0.9	+0.2 +0.6	+0.0	+0.2	+0.0	56.2	60.0	-3.8	Phase
9	15.950M	43.7	+9.9 +0.9	+0.2 +0.6	+0.0	+0.2	+0.0	55.5	60.0	-4.5	Phase
10	14.752M	43.8	+9.9 +0.8	+0.2 +0.5	+0.0	+0.2	+0.0	55.4	60.0	-4.6	Phase
11	11.445M	43.5	+9.9 +0.7	+0.1 +0.5	+0.0	+0.1	+0.0	54.8	60.0	-5.2	Phase
12	11.148M	43.4	+9.9 +0.7	+0.1 +0.5	+0.0	+0.1	+0.0	54.7	60.0	-5.3	Phase
13	2.999M	43.2	+9.9 +0.3	+0.1 +0.2	+0.1	+0.1	+0.0	53.9	60.0	-6.1	Phase
14	14.148M	42.3	+9.9 +0.8	+0.1 +0.5	+0.0	+0.2	+0.0	53.8	60.0	-6.2	Phase
15	6.004M	42.6	+9.9 +0.5	+0.1 +0.3	+0.1	+0.1	+0.0	53.6	60.0	-6.4	Phase
16	12.049M	41.6	+9.9 +0.7	+0.1 +0.5	+0.0	+0.2	+0.0	53.0	60.0	-7.0	Phase
17	10.202M	41.7	+9.9 +0.7	+0.1 +0.4	+0.0	+0.1	+0.0	52.9	60.0	-7.1	Phase
18	12.346M	40.7	+9.9 +0.7	+0.1 +0.5	+0.0	+0.2	+0.0	52.1	60.0	-7.9	Phase
19	6.049M	40.9	+9.9 +0.5	+0.1 +0.3	+0.1	+0.1	+0.0	51.9	60.0	-8.1	Phase
20	4.199M	41.0	+9.9 +0.4	+0.1 +0.3	+0.1	+0.1	+0.0	51.9	60.0	-8.1	Phase
21	6.598M	40.5	+9.9 +0.5	+0.1 +0.4	+0.1	+0.1	+0.0	51.6	60.0	-8.4	Phase
22	5.752M	40.2	+9.9 +0.5	+0.1 +0.3	+0.1	+0.1	+0.0	51.2	60.0	-8.8	Phase
23	16.553M	39.0	+9.9 +0.9	+0.2 +0.6	+0.0	+0.2	+0.0	50.8	60.0	-9.2	Phase

24	13.851M	38.9	+9.9 +0.8	+0.1 +0.5	+0.0	+0.2	+0.0	50.4	60.0	-9.6	Phase
25	7.851M	38.7	+9.9 +0.6	+0.1 +0.4	+0.2	+0.1	+0.0	50.0	60.0	-10.0	Phase
26	8.752M	38.7	+9.9 +0.6	+0.1 +0.4	+0.1	+0.1	+0.0	49.9	60.0	-10.1	Phase
27	3.901M	38.8	+9.9 +0.4	+0.1 +0.3	+0.1	+0.1	+0.0	49.7	60.0	-10.3	Phase
28	15.346M	38.0	+9.9 +0.8	+0.2 +0.6	+0.0	+0.2	+0.0	49.7	60.0	-10.3	Phase
29	5.100M	38.7	+9.9 +0.4	+0.1 +0.3	+0.1	+0.1	+0.0	49.6	60.0	-10.4	Phase
30	13.247M	38.1	+9.9 +0.8	+0.1 +0.5	+0.0	+0.2	+0.0	49.6	60.0	-10.4	Phase
31	8.454M	38.4	+9.9 +0.6	+0.1 +0.4	+0.1	+0.1	+0.0	49.6	60.0	-10.4	Phase
32	6.950M	38.5	+9.9 +0.5	+0.1 +0.4	+0.1	+0.1	+0.0	49.6	60.0	-10.4	Phase
33	14.445M	37.9	+9.9 +0.8	+0.1 +0.5	+0.0	+0.2	+0.0	49.4	60.0	-10.6	Phase

Test Location:	CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • (209) 966-5240		
Customer:	**FreeWire Technologies Inc.**		
Specification:	**15.107 AC Mains Class A - Average**		
Work Order #:	**103944**	Date:	3/23/2020
Test Type:	**Conducted Emissions**	Time:	4:35:08 PM
Tested By:	Michael Rauch Jr.	Sequence#:	58
Software:	EMITest 5.03.12		208V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range of Interest: 150kHz-30MHz
RBW = 9kHz; VBW > RBW

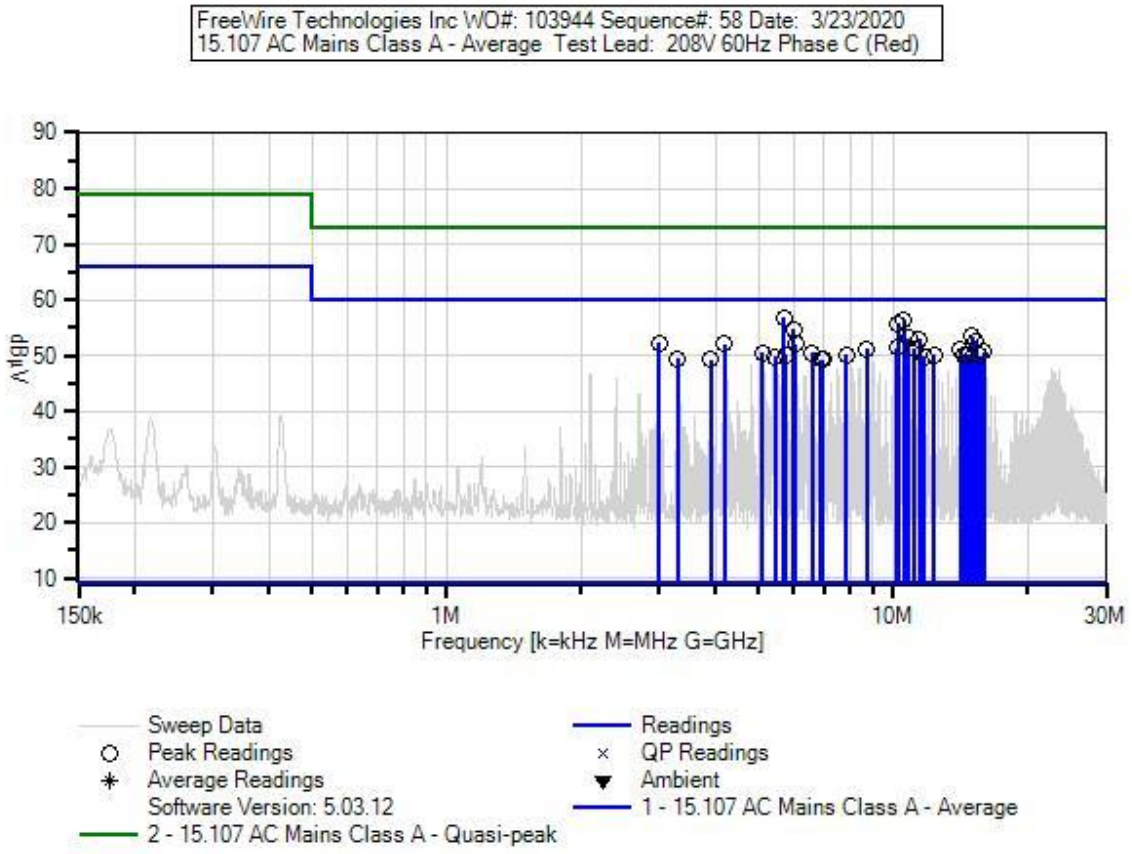
Environmental Conditions:
Temperature: 15.9°C
Relative Humidity: 61.3%
Atmospheric Pressure: 101.2kPa

Highest Internal Clock frequency: 800MHz

The EUT is a battery-integrated DC charger. It has two identical DC output power circuits which support CCS and CHADeMO. During testing the CHADeMO charger was holstered, the POS terminal was bypassed. For the purpose of this test, the boost charger is connected to a 208VAC 4 Wire power source. The CCS output is connected into the load bank. The CCS output is programmed to deliver 150A at 400V.

Test Method: ANSI C63.4: 2014

Modifications 1, 2, 3 and 4 were in place during testing.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05624	Attenuator	PE7010-10	2/2/2019	2/2/2021
T2	AN02609	High Pass Filter	HE9615-150K-50-720B	2/1/2019	2/1/2021
	AN02668	Spectrum Analyzer	E4446A	12/17/2019	12/17/2020
	AN01780	50uH LISN-Phase A Loss (dB)	8616-50-TS-200-N	7/8/2019	7/8/2021
	AN01780	50uH LISN-Phase B Loss (dB)	8616-50-TS-200-N	7/8/2019	7/8/2021
T3	AN01780	50uH LISN-Phase C Loss (dB)	8616-50-TS-200-N	7/8/2019	7/8/2021
T4	ANP06847	Cable	LMR195-FR-6	8/16/2019	8/16/2021
T5	ANP07584	Cable	RG214	7/10/2019	7/10/2021
	AN00936A	50uH LISN	8616-50-TS-200-N	3/17/2020	3/17/2022
T6	ANP06231	Cable	CXTA04A-70	3/10/2020	3/10/2022

Measurement Data: Reading listed by margin. Test Lead: Phase C (Red)

#	Freq MHz	Rdng dBµV	T1 T5 dB	T2 T6 dB	T3 dB	T4 dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	5.697M	45.8	+9.9 +0.5	+0.1 +0.3	+0.0	+0.1	+0.0	56.7	60.0	-3.3	Phase
2	10.553M	45.2	+9.9 +0.7	+0.1 +0.5	+0.0	+0.1	+0.0	56.5	60.0	-3.5	Phase
3	10.247M	44.4	+9.9 +0.7	+0.1 +0.5	+0.0	+0.1	+0.0	55.7	60.0	-4.3	Phase
4	6.004M	43.7	+9.9 +0.5	+0.1 +0.3	+0.0	+0.1	+0.0	54.6	60.0	-5.4	Phase
5	15.049M	41.8	+9.9 +0.8	+0.2 +0.6	+0.0	+0.2	+0.0	53.5	60.0	-6.5	Phase
6	10.851M	41.8	+9.9 +0.7	+0.1 +0.5	+0.0	+0.1	+0.0	53.1	60.0	-6.9	Phase
7	11.445M	41.6	+9.9 +0.7	+0.1 +0.5	+0.0	+0.1	+0.0	52.9	60.0	-7.1	Phase
8	15.346M	40.8	+9.9 +0.8	+0.2 +0.6	+0.0	+0.2	+0.0	52.5	60.0	-7.5	Phase
9	2.999M	41.5	+9.9 +0.3	+0.1 +0.2	+0.1	+0.1	+0.0	52.2	60.0	-7.8	Phase
10	4.199M	41.2	+9.9 +0.4	+0.1 +0.3	+0.1	+0.1	+0.0	52.1	60.0	-7.9	Phase
11	6.049M	41.1	+9.9 +0.5	+0.1 +0.3	+0.0	+0.1	+0.0	52.0	60.0	-8.0	Phase
12	10.202M	40.2	+9.9 +0.7	+0.1 +0.4	+0.0	+0.1	+0.0	51.4	60.0	-8.6	Phase
13	8.752M	40.1	+9.9 +0.6	+0.1 +0.4	+0.0	+0.1	+0.0	51.2	60.0	-8.8	Phase
14	11.148M	39.8	+9.9 +0.7	+0.1 +0.5	+0.0	+0.1	+0.0	51.1	60.0	-8.9	Phase
15	14.148M	39.6	+9.9 +0.8	+0.1 +0.5	+0.0	+0.2	+0.0	51.1	60.0	-8.9	Phase
16	15.950M	38.8	+9.9 +0.9	+0.2 +0.6	+0.0	+0.2	+0.0	50.6	60.0	-9.4	Phase
17	5.100M	39.7	+9.9 +0.4	+0.1 +0.3	+0.0	+0.1	+0.0	50.5	60.0	-9.5	Phase
18	6.598M	39.5	+9.9 +0.5	+0.1 +0.4	+0.0	+0.1	+0.0	50.5	60.0	-9.5	Phase
19	12.346M	38.8	+9.9 +0.7	+0.1 +0.5	+0.0	+0.2	+0.0	50.2	60.0	-9.8	Phase
20	14.752M	38.6	+9.9 +0.8	+0.2 +0.5	+0.0	+0.2	+0.0	50.2	60.0	-9.8	Phase
21	7.851M	38.9	+9.9 +0.6	+0.1 +0.4	+0.1	+0.1	+0.0	50.1	60.0	-9.9	Phase
22	5.752M	39.2	+9.9 +0.5	+0.1 +0.3	+0.0	+0.1	+0.0	50.1	60.0	-9.9	Phase
23	14.454M	38.5	+9.9 +0.8	+0.1 +0.5	+0.0	+0.2	+0.0	50.0	60.0	-10.0	Phase

24	15.652M	38.1	+9.9 +0.9	+0.2 +0.6	+0.0	+0.2	+0.0	49.9	60.0	-10.1	Phase
25	5.454M	39.0	+9.9 +0.4	+0.1 +0.3	+0.0	+0.1	+0.0	49.8	60.0	-10.2	Phase
26	11.752M	38.5	+9.9 +0.7	+0.1 +0.5	+0.0	+0.1	+0.0	49.8	60.0	-10.2	Phase
27	3.301M	38.6	+9.9 +0.3	+0.1 +0.3	+0.1	+0.1	+0.0	49.4	60.0	-10.6	Phase
28	3.901M	38.3	+9.9 +0.4	+0.1 +0.3	+0.1	+0.1	+0.0	49.2	60.0	-10.8	Phase
29	6.896M	38.2	+9.9 +0.5	+0.1 +0.4	+0.0	+0.1	+0.0	49.2	60.0	-10.8	Phase
30	6.950M	38.2	+9.9 +0.5	+0.1 +0.4	+0.0	+0.1	+0.0	49.2	60.0	-10.8	Phase

Test Location:	CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • (209) 966-5240		
Customer:	**FreeWire Technologies Inc.**		
Specification:	**15.107 AC Mains Class A - Average**		
Work Order #:	**103944**	Date:	3/23/2020
Test Type:	**Conducted Emissions**	Time:	4:14:14 PM
Tested By:	Michael Rauch Jr.	Sequence#:	56
Software:	EMITest 5.03.12		208V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range of Interest: 150kHz-30MHz
RBW = 9kHz; VBW > RBW

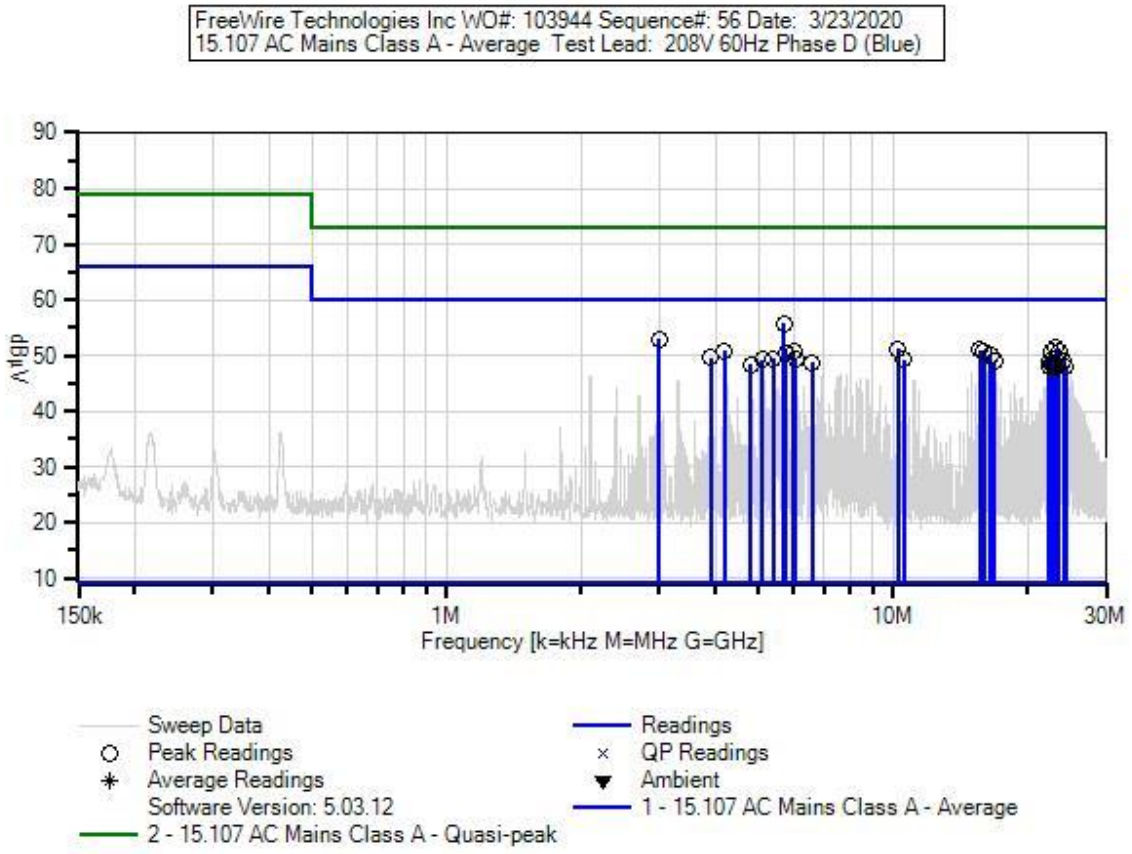
Environmental Conditions:
Temperature: 15.9°C
Relative Humidity: 61.3%
Atmospheric Pressure: 101.2kPa

Highest Internal Clock frequency: 800MHz

The EUT is a battery-integrated DC charger. It has two identical DC output power circuits which support CCS and CHADeMO. During testing the CHADeMO charger was holstered, the POS terminal was bypassed. For the purpose of this test, the boost charger is connected to a 208VAC 4 Wire power source. The CCS output is connected into the load bank. The CCS output is programmed to deliver 150A at 400V.

Test Method: ANSI C63.4: 2014

Modifications 1, 2, 3 and 4 were in place during testing.



Test Equipment:

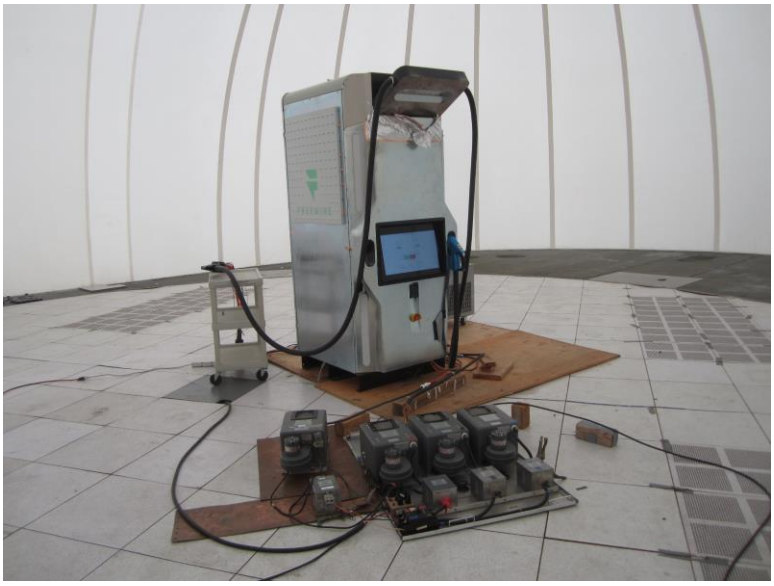
ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05624	Attenuator	PE7010-10	2/2/2019	2/2/2021
T2	AN02609	High Pass Filter	HE9615-150K-50-720B	2/1/2019	2/1/2021
	AN02668	Spectrum Analyzer	E4446A	12/17/2019	12/17/2020
T3	AN01780	50uH LISN-Phase A Loss (dB)	8616-50-TS-200-N	7/8/2019	7/8/2021
	AN01780	50uH LISN-Phase B Loss (dB)	8616-50-TS-200-N	7/8/2019	7/8/2021
	AN01780	50uH LISN-Phase C Loss (dB)	8616-50-TS-200-N	7/8/2019	7/8/2021
T4	ANP06847	Cable	LMR195-FR-6	8/16/2019	8/16/2021
T5	ANP07584	Cable	RG214	7/10/2019	7/10/2021
	AN00936A	50uH LISN	8616-50-TS-200-N	3/17/2020	3/17/2022
T6	ANP06231	Cable	CXTA04A-70	3/10/2020	3/10/2022

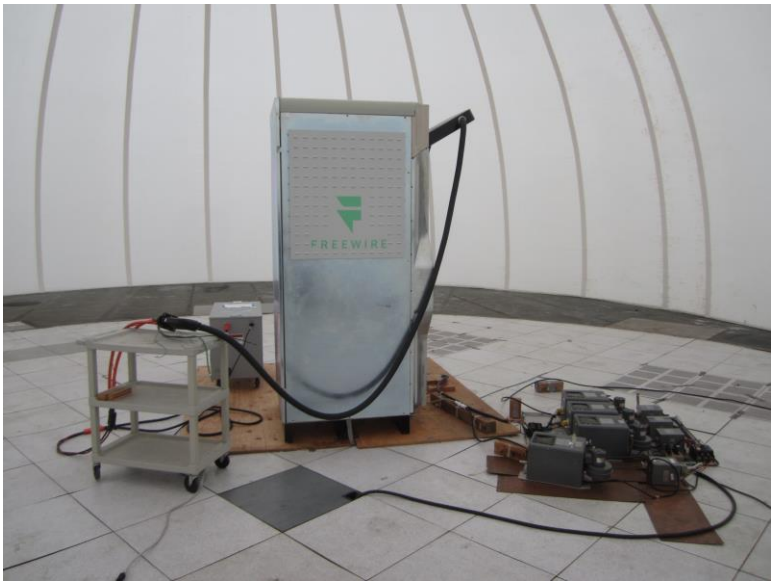
Measurement Data: Reading listed by margin. Test Lead: Phase D (Blue)

#	Freq MHz	Rdng dBµV	T1 T5 dB	T2 T6 dB	T3 dB	T4 dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	5.697M	44.7	+9.9 +0.5	+0.1 +0.3	+0.1	+0.1	+0.0	55.7	60.0	-4.3	Phase
2	2.999M	42.2	+9.9 +0.3	+0.1 +0.2	+0.1	+0.1	+0.0	52.9	60.0	-7.1	Phase
3	23.196M	39.3	+9.9 +1.1	+0.2 +0.7	+0.0	+0.2	+0.0	51.4	60.0	-8.6	Phase
4	10.247M	39.9	+9.9 +0.7	+0.1 +0.5	+0.0	+0.1	+0.0	51.2	60.0	-8.8	Phase
5	15.652M	39.2	+9.9 +0.9	+0.2 +0.6	+0.0	+0.2	+0.0	51.0	60.0	-9.0	Phase
6	6.004M	39.9	+9.9 +0.5	+0.1 +0.3	+0.1	+0.1	+0.0	50.9	60.0	-9.1	Phase
7	15.950M	39.1	+9.9 +0.9	+0.2 +0.6	+0.0	+0.2	+0.0	50.9	60.0	-9.1	Phase
8	4.199M	39.9	+9.9 +0.4	+0.1 +0.3	+0.1	+0.1	+0.0	50.8	60.0	-9.2	Phase
9	22.598M	38.7	+9.9 +1.1	+0.2 +0.7	+0.0	+0.2	+0.0	50.8	60.0	-9.2	Phase
10	23.497M	38.6	+9.9 +1.1	+0.2 +0.7	+0.0	+0.2	+0.0	50.7	60.0	-9.3	Phase
11	5.752M	39.4	+9.9 +0.5	+0.1 +0.3	+0.1	+0.1	+0.0	50.4	60.0	-9.6	Phase
12	16.553M	38.1	+9.9 +0.9	+0.2 +0.6	+0.0	+0.2	+0.0	49.9	60.0	-10.1	Phase
13	3.901M	38.6	+9.9 +0.4	+0.1 +0.3	+0.1	+0.1	+0.0	49.5	60.0	-10.5	Phase
14	5.400M	38.5	+9.9 +0.4	+0.1 +0.3	+0.1	+0.1	+0.0	49.4	60.0	-10.6	Phase
15	6.049M	38.3	+9.9 +0.5	+0.1 +0.3	+0.1	+0.1	+0.0	49.3	60.0	-10.7	Phase
16	10.553M	38.0	+9.9 +0.7	+0.1 +0.5	+0.0	+0.1	+0.0	49.3	60.0	-10.7	Phase
17	5.100M	38.3	+9.9 +0.4	+0.1 +0.3	+0.1	+0.1	+0.0	49.2	60.0	-10.8	Phase
18	22.995M	37.1	+9.9 +1.1	+0.2 +0.7	+0.0	+0.2	+0.0	49.2	60.0	-10.8	Phase
19	24.100M	36.9	+9.9 +1.1	+0.2 +0.7	+0.1	+0.2	+0.0	49.1	60.0	-10.9	Phase
20	22.301M	36.9	+9.9 +1.1	+0.2 +0.7	+0.0	+0.2	+0.0	49.0	60.0	-11.0	Phase
21	16.851M	37.0	+9.9 +0.9	+0.2 +0.6	+0.0	+0.2	+0.0	48.8	60.0	-11.2	Phase
22	6.598M	37.6	+9.9 +0.5	+0.1 +0.4	+0.1	+0.1	+0.0	48.7	60.0	-11.3	Phase
23	22.697M	36.4	+9.9 +1.1	+0.2 +0.7	+0.0	+0.2	+0.0	48.5	60.0	-11.5	Phase
24	4.798M	37.5	+9.9 +0.4	+0.1 +0.3	+0.1	+0.1	+0.0	48.4	60.0	-11.6	Phase

25	22.896M	36.1	+9.9 +1.1	+0.2 +0.7	+0.0	+0.2	+0.0	48.2	60.0	-11.8	Phase
26	23.299M	36.0	+9.9 +1.1	+0.2 +0.7	+0.0	+0.2	+0.0	48.1	60.0	-11.9	Phase
27	24.402M	35.7	+9.9 +1.1	+0.2 +0.7	+0.1	+0.2	+0.0	47.9	60.0	-12.1	Phase
28	22.797M	35.8	+9.9 +1.1	+0.2 +0.7	+0.0	+0.2	+0.0	47.9	60.0	-12.1	Phase
29	22.400M	35.7	+9.9 +1.1	+0.2 +0.7	+0.0	+0.2	+0.0	47.8	60.0	-12.2	Phase
30	23.103M	35.7	+9.9 +1.1	+0.2 +0.7	+0.0	+0.2	+0.0	47.8	60.0	-12.2	Phase

Test Setup Photo(s)





15.109 Radiated Emissions

Test Notes: Radiated disturbances emanating from enclosure.

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • (209) 966-5240		
Customer:	**FreeWire Technologies Inc.**		
Specification:	**15.109 Radiated Emissions Class A**		
Work Order #:	**103944**	Date:	4/2/2020
Test Type:	**Maximized Emissions**	Time:	10:54:21
Tested By:	Michael Rauch Jr.	Sequence#:	1
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range of Interest: 30-1000MHz
RBW = 120kHz; VBW > RBW

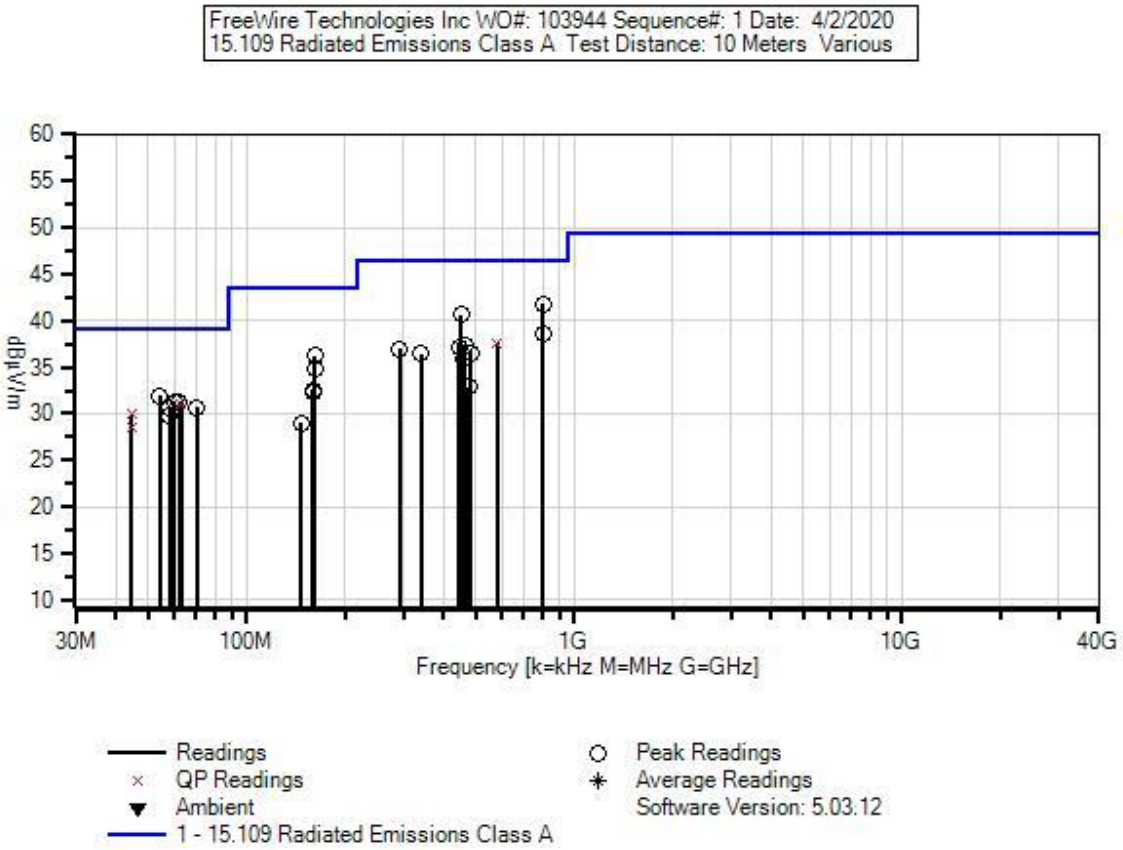
Environmental Conditions:
Temperature: 16.7°C
Relative Humidity: 39.1%
Atmospheric Pressure: 101.1kPa

Highest Internal Clock frequency: 800MHz

The EUT is a battery-integrated DC charger. It has two identical DC output power circuits which support CCS and CHADeMO. During testing the CHADeMO charger was holstered, the POS terminal was bypassed. For the purpose of this test, the boost charger is connected to a 208VAC 4 Wire power source. The CCS output is connected into the load bank. The CCS output is programmed to deliver 150A at 400V.

Test Method: ANSI C63.4: 2014

Modifications 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 and 16 were in place during testing.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02668	Spectrum Analyzer	E4446A	12/17/2019	12/17/2020
T1	AN00449	Preamp-Upper Ports (dB)	8447F	1/13/2020	1/13/2022
T2	AN01996	Biconilog Antenna	CBL6111C	6/11/2019	6/11/2021
T3	ANP05656	Attenuator	PE7004-6	2/17/2020	2/17/2022
T4	ANP06883	Cable	LMR195-FR-3	8/16/2019	8/16/2021
T5	ANP06847	Cable	LMR195-FR-6	8/16/2019	8/16/2021
T6	ANP06230	Cable-Insertion Loss (+45C to 15C)	CXTA04A-50	11/19/2018	11/19/2020
T7	ANP06231	Cable	CXTA04A-70	3/10/2020	3/10/2022
T8	ANP04249	Cable		3/12/2020	3/12/2022

Measurement Data: Reading listed by margin. Test Distance: 10 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3 T7	T4 T8	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	799.958M	29.4	-27.8 +0.8	+22.3 +3.4	+6.1 +4.7	+0.5 +2.4	+0.0	41.8	46.4	-4.6	Vert
2	451.202M	36.4	-27.5 +0.6	+17.0 +2.5	+6.0 +3.4	+0.4 +1.8	+0.0	40.6	46.4	-5.8	Vert
3	54.300M	43.2	-27.1 +0.2	+6.9 +0.8	+6.0 +1.1	+0.2 +0.6	+0.0	31.9	39.1	-7.2	Vert
4	161.175M	41.3	-26.7 +0.4	+10.5 +1.4	+6.0 +1.9	+0.3 +1.1	+0.0	36.2	43.5	-7.3	Horiz
5	799.858M	26.3	-27.8 +0.8	+22.3 +3.4	+6.1 +4.7	+0.5 +2.4	+0.0	38.7	46.4	-7.7	Horiz
6	62.161M	44.3	-27.0 +0.3	+4.9 +0.8	+6.0 +1.2	+0.2 +0.6	+0.0	31.3	39.1	-7.8	Horiz
7	60.304M	44.5	-27.0 +0.2	+4.9 +0.8	+6.0 +1.1	+0.2 +0.6	+0.0	31.3	39.1	-7.8	Horiz
8	63.134M QP	43.9	-27.0 +0.3	+4.9 +0.8	+6.0 +1.2	+0.2 +0.7	+0.0	31.0	39.1	-8.1	Vert
^	63.154M	48.7	-27.0 +0.3	+4.9 +0.8	+6.0 +1.2	+0.2 +0.7	+0.0	35.8	39.1	-3.3	Vert
10	70.211M	43.3	-27.0 +0.3	+4.9 +0.9	+6.0 +1.3	+0.2 +0.7	+0.0	30.6	39.1	-8.5	Vert
11	58.027M	43.2	-27.1 +0.2	+5.6 +0.8	+6.0 +1.1	+0.2 +0.6	+0.0	30.6	39.1	-8.5	Horiz
12	161.140M	39.8	-26.7 +0.4	+10.5 +1.4	+6.0 +1.9	+0.3 +1.1	+0.0	34.7	43.5	-8.8	Horiz
13	582.379M QP	29.8	-28.0 +0.7	+19.7 +2.9	+6.0 +4.0	+0.4 +2.1	+0.0	37.6	46.4	-8.8	Vert
^	582.400M	36.4	-28.0 +0.7	+19.7 +2.9	+6.0 +4.0	+0.4 +2.1	+0.0	44.2	46.4	-2.2	Vert
15	464.800M	33.0	-27.6 +0.6	+17.2 +2.5	+6.0 +3.5	+0.4 +1.8	+0.0	37.4	46.4	-9.0	Horiz
16	44.582M QP	38.2	-27.1 +0.2	+10.3 +0.7	+6.0 +1.0	+0.2 +0.5	+0.0	30.0	39.1	-9.1	Horiz
^	44.610M	44.8	-27.1 +0.2	+10.3 +0.7	+6.0 +1.0	+0.2 +0.5	+0.0	36.6	39.1	-2.5	Horiz
^	44.582M	43.3	-27.1 +0.2	+10.3 +0.7	+6.0 +1.0	+0.2 +0.5	+0.0	35.1	39.1	-4.0	Horiz
19	57.984M	42.4	-27.1 +0.2	+5.6 +0.8	+6.0 +1.1	+0.2 +0.6	+0.0	29.8	39.1	-9.3	Vert
20	444.677M	33.0	-27.5 +0.6	+16.9 +2.4	+6.0 +3.4	+0.4 +1.8	+0.0	37.0	46.4	-9.4	Vert
21	292.106M	37.0	-26.3 +0.5	+13.4 +1.9	+6.0 +2.7	+0.4 +1.4	+0.0	37.0	46.4	-9.4	Horiz
22	482.278M	31.8	-27.7 +0.6	+17.5 +2.6	+6.0 +3.6	+0.4 +1.8	+0.0	36.6	46.4	-9.8	Horiz
23	340.774M	34.9	-26.6 +0.5	+14.7 +2.1	+6.0 +2.9	+0.4 +1.5	+0.0	36.4	46.4	-10.0	Horiz

24	460.323M	31.5	-27.6 +0.6	+17.2 +2.5	+6.0 +3.5	+0.4 +1.8	+0.0	35.9	46.4	-10.5	Vert
25	44.593M QP	36.7	-27.1 +0.2	+10.3 +0.7	+6.0 +1.0	+0.2 +0.5	+0.0	28.5	39.1	-10.6	Vert
^	44.593M	45.7	-27.1 +0.2	+10.3 +0.7	+6.0 +1.0	+0.2 +0.5	+0.0	37.5	39.1	-1.6	Vert
27	159.518M	37.7	-26.7 +0.4	+10.6 +1.3	+6.0 +1.9	+0.3 +1.0	+0.0	32.5	43.5	-11.0	Horiz
28	160.348M	37.3	-26.7 +0.4	+10.6 +1.4	+6.0 +1.9	+0.3 +1.0	+0.0	32.2	43.5	-11.3	Horiz
29	475.007M	28.3	-27.7 +0.6	+17.4 +2.6	+6.0 +3.5	+0.4 +1.8	+0.0	32.9	46.4	-13.5	Vert
30	146.494M	33.8	-26.8 +0.4	+11.3 +1.3	+6.0 +1.8	+0.2 +1.0	+0.0	29.0	43.5	-14.5	Vert

Test Location:	CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • (209) 966-5240		
Customer:	**FreeWire Technologies Inc.**		
Specification:	**15.109 Radiated Emissions Class A**		
Work Order #:	**103906**	Date:	4/3/2020
Test Type:	**Maximized Emissions**	Time:	09:54:29
Tested By:	Michael Rauch Jr.	Sequence#:	2
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range of Interest: 1000-5000MHz
RBW = 1MHz; VBW > RBW

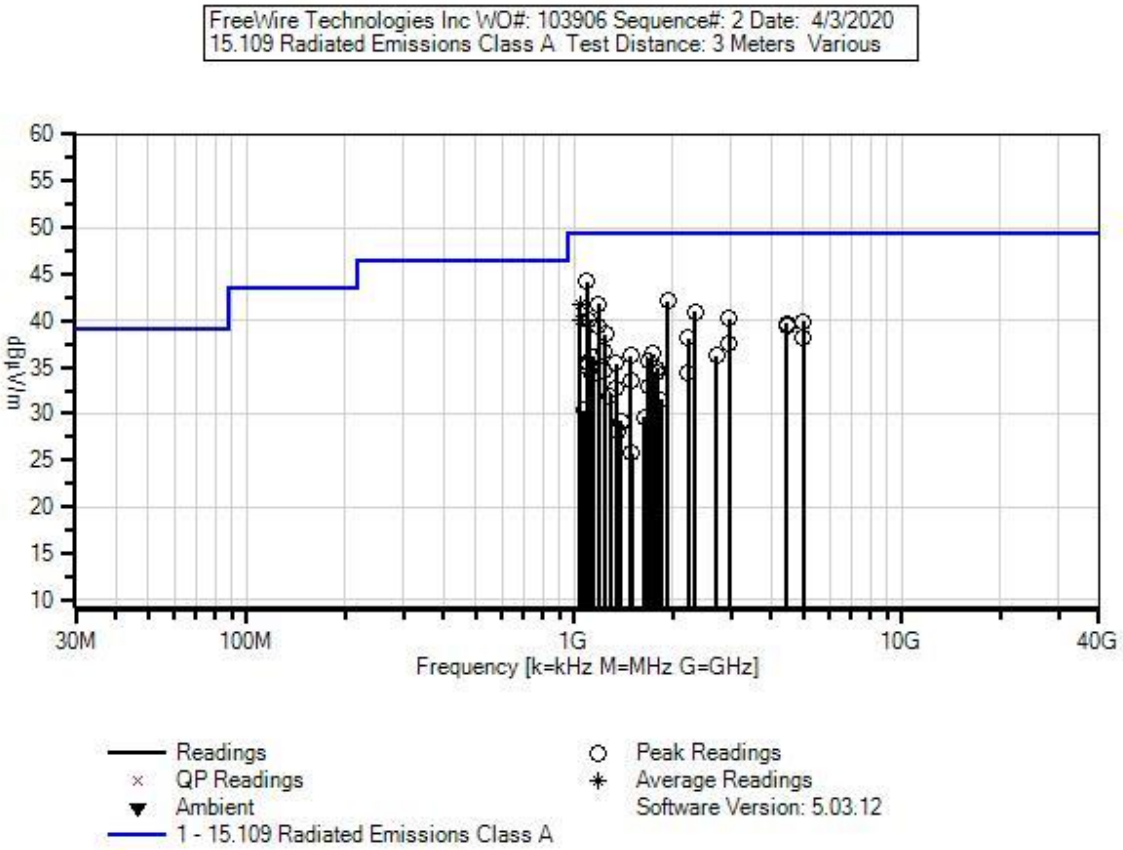
Environmental Conditions:
Temperature: 14.2°C
Relative Humidity: 47.2%
Atmospheric Pressure: 101.1kPa

Highest Internal Clock frequency: 800MHz

The EUT is a battery-integrated DC charger. It has two identical DC output power circuits which support CCS and CHADeMO. During testing the CHADeMO charger was holstered, the POS terminal was bypassed. For the purpose of this test, the boost charger is connected to a 208VAC 4 Wire power source. The CCS output is connected into the load bank. The CCS output is programmed to deliver 150A at 400V.

Test Method: ANSI C63.4: 2014

Modifications 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 and 16 were in place during testing.



Test Equipment:

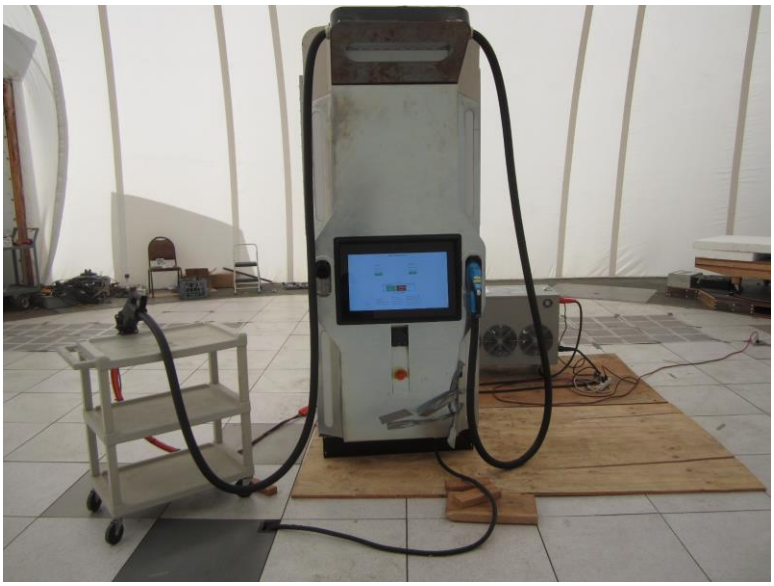
ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02668	Spectrum Analyzer	E4446A	12/17/2019	12/17/2020
T2	ANP07585	Cable	32026-2-29094K-360TC	8/26/2019	8/26/2021
T3	AN02115	Preamp	83051A	4/3/2019	4/3/2021
T4	AN03356	Cable	32026-2-29094K-48TC	3/14/2019	3/14/2021
T5	AN00327	Horn Antenna	3115	3/17/2020	3/17/2022

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

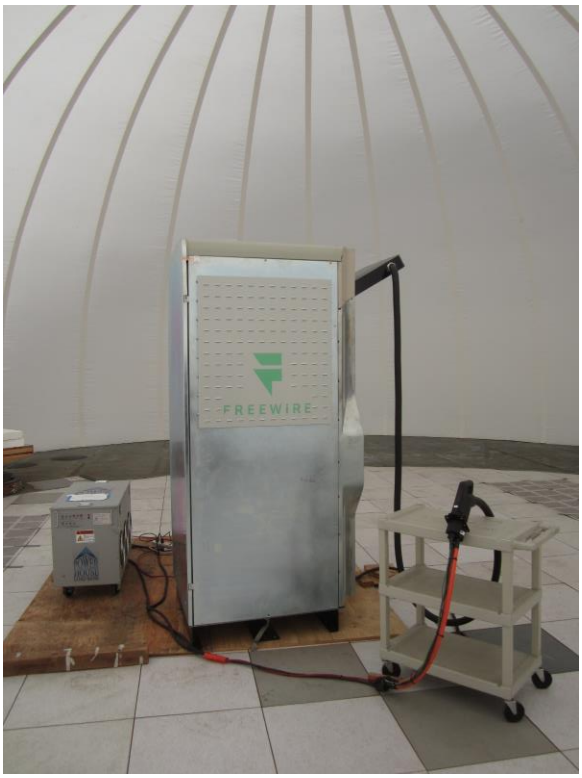
#	Freq MHz	Rdng dBµV	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	1088.996M	59.8	+0.0 +24.7	+4.2	-34.5	+0.5	-10.5	44.2	49.5	-5.3	Horiz
2	1926.580M	51.4	+0.0 +27.9	+5.6	-33.0	+0.7	-10.5	42.1	49.5	-7.4	Horiz
3	1188.108M	56.6	+0.0 +25.4	+4.4	-34.7	+0.6	-10.5	41.8	49.5	-7.7	Vert
4	1039.563M Ave	57.7	+0.0 +24.4	+4.0	-34.4	+0.5	-10.5	41.7	49.5	-7.8	Vert
^	1039.530M	61.3	+0.0 +24.4	+4.0	-34.4	+0.5	-10.5	45.3	49.5	-4.2	Vert
6	2330.550M	48.9	+0.0 +27.6	+6.7	-32.5	+0.8	-10.5	41.0	49.5	-8.5	Horiz
7	2970.010M	45.4	+0.0 +30.1	+7.0	-32.7	+0.9	-10.5	40.2	49.5	-9.3	Vert
8	1105.860M	55.5	+0.0 +24.9	+4.2	-34.6	+0.6	-10.5	40.1	49.5	-9.4	Vert
9	1039.620M Ave	56.0	+0.0 +24.4	+4.0	-34.4	+0.5	-10.5	40.0	49.5	-9.5	Horiz
^	1039.530M	61.6	+0.0 +24.4	+4.0	-34.4	+0.5	-10.5	45.6	49.5	-3.9	Horiz
11	4998.914M	38.4	+0.0 +33.6	+9.5	-32.3	+1.2	-10.5	39.9	49.5	-9.6	Horiz
12	4455.226M	40.7	+0.0 +32.4	+8.9	-32.9	+1.1	-10.5	39.7	49.5	-9.8	Vert
13	1188.016M	54.3	+0.0 +25.4	+4.4	-34.7	+0.6	-10.5	39.5	49.5	-10.0	Horiz
14	4454.892M	40.5	+0.0 +32.4	+8.9	-32.9	+1.1	-10.5	39.5	49.5	-10.0	Horiz
15	1244.385M	52.8	+0.0 +25.8	+4.6	-34.8	+0.6	-10.5	38.5	49.5	-11.0	Vert
16	4998.740M	36.6	+0.0 +33.6	+9.5	-32.3	+1.2	-10.5	38.1	49.5	-11.4	Vert
17	2227.768M	46.5	+0.0 +27.3	+6.6	-32.6	+0.8	-10.5	38.1	49.5	-11.4	Vert
18	2969.780M	42.8	+0.0 +30.1	+7.0	-32.7	+0.9	-10.5	37.6	49.5	-11.9	Horiz
19	1237.535M	51.2	+0.0 +25.7	+4.6	-34.8	+0.6	-10.5	36.8	49.5	-12.7	Vert
20	1732.362M	49.0	+0.0 +26.6	+5.3	-34.7	+0.7	-10.5	36.4	49.5	-13.1	Vert
21	1484.901M	51.5	+0.0 +25.3	+4.8	-35.5	+0.6	-10.5	36.2	49.5	-13.3	Horiz
22	2722.410M	41.4	+0.0 +29.6	+6.8	-32.0	+0.9	-10.5	36.2	49.5	-13.3	Horiz
23	1138.762M	51.1	+0.0 +25.1	+4.3	-34.6	+0.6	-10.5	36.0	49.5	-13.5	Vert

24	1682.980M	48.9	+0.0 +26.3	+5.2	-34.9	+0.7	-10.5	35.7	49.5	-13.8	Vert
25	1106.106M	50.9	+0.0 +24.9	+4.2	-34.6	+0.6	-10.5	35.5	49.5	-14.0	Horiz
26	1336.457M	50.1	+0.0 +25.6	+4.7	-35.1	+0.6	-10.5	35.4	49.5	-14.1	Horiz
27	1088.980M	50.7	+0.0 +24.7	+4.2	-34.5	+0.5	-10.5	35.1	49.5	-14.4	Horiz
28	1782.156M	46.8	+0.0 +26.9	+5.4	-34.4	+0.7	-10.5	34.9	49.5	-14.6	Vert
29	1237.606M	49.0	+0.0 +25.7	+4.6	-34.8	+0.6	-10.5	34.6	49.5	-14.9	Horiz
30	1781.814M	46.4	+0.0 +26.9	+5.4	-34.4	+0.7	-10.5	34.5	49.5	-15.0	Horiz
31	2227.508M	42.9	+0.0 +27.3	+6.6	-32.6	+0.8	-10.5	34.5	49.5	-15.0	Horiz
32	1138.556M	49.3	+0.0 +25.1	+4.3	-34.6	+0.6	-10.5	34.2	49.5	-15.3	Horiz
33	1484.943M	48.9	+0.0 +25.3	+4.8	-35.5	+0.6	-10.5	33.6	49.5	-15.9	Vert
34	1683.006M	46.2	+0.0 +26.3	+5.2	-34.9	+0.7	-10.5	33.0	49.5	-16.5	Horiz
35	1336.515M	47.4	+0.0 +25.6	+4.7	-35.1	+0.6	-10.5	32.7	49.5	-16.8	Vert
36	1287.088M	46.4	+0.0 +25.7	+4.6	-34.9	+0.6	-10.5	31.9	49.5	-17.6	Vert
37	1831.750M	42.5	+0.0 +27.3	+5.4	-33.9	+0.7	-10.5	31.5	49.5	-18.0	Horiz
38	1071.080M	46.2	+0.0 +24.6	+4.1	-34.5	+0.5	-10.5	30.4	49.5	-19.1	Horiz
39	1089.038M Ave	45.2	+0.0 +24.7	+4.2	-34.5	+0.5	-10.5	29.6	49.5	-19.9	Vert
^	1089.038M	65.0	+0.0 +24.7	+4.2	-34.5	+0.5	-10.5	49.4	49.5	-0.1	Vert
^	1089.090M	58.4	+0.0 +24.8	+4.2	-34.5	+0.5	-10.5	42.9	49.5	-6.6	Vert
42	1633.530M	43.2	+0.0 +26.1	+5.1	-35.0	+0.7	-10.5	29.6	49.5	-19.9	Horiz
43	1385.880M	44.1	+0.0 +25.5	+4.7	-35.2	+0.6	-10.5	29.2	49.5	-20.3	Horiz
44	1363.090M	43.0	+0.0 +25.6	+4.7	-35.2	+0.6	-10.5	28.2	49.5	-21.3	Vert
45	1500.080M	41.0	+0.0 +25.3	+4.8	-35.5	+0.6	-10.5	25.7	49.5	-23.8	Horiz

Test Setup Photo(s)

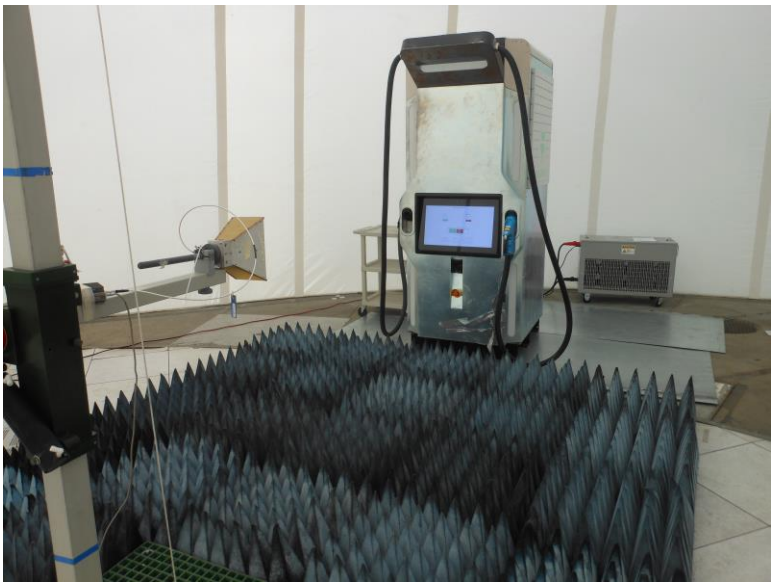


Below 1GHz

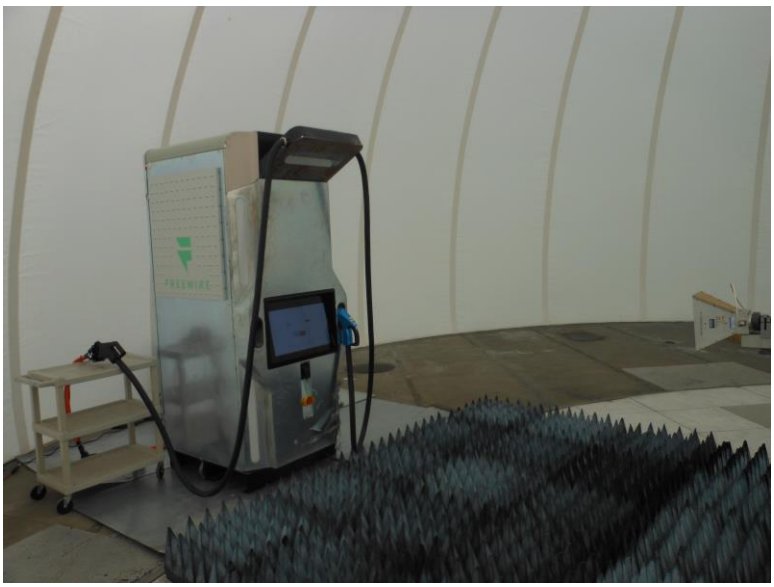


Below 1GHz

Below 1GHz, Antenna Position



Above 1GHz



Above 1GHz

Appendix A: Manufacturer Declaration

The following device/model has been tested by CKC Laboratories:
Device: Boost EV Charger
Model: 11

Since the time of testing, the manufacturer has chosen to use the following device/model name in its place.
The manufacturer declares that any differences between the names does not affect their EMC characteristics and therefore meets the level of testing equivalent to the tested model name:
Device: Boost Charger
Model: 160kW

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

Uncertainties reported are worst case for all CKC Laboratories' sites and represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2.

Emissions Test Details

TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dBµV/m, the spectrum analyzer reading in dBµV was corrected by using the following formula. This reading was then compared to the applicable specification limit. Individual measurements were compared with the displayed limit value in the margin column. The margin was calculated based on subtracting the limit value from the corrected measurement value; a positive margin represents a measurement exceeding the limit, while a negative margin represents a measurement less than the limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBµV)
+	Antenna Factor	(dB/m)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or caret ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point, the measuring device is set into the linear mode and the scan time is reduced.