FCC PART 15.225

TEST AND MEASUREMENT REPORT

For

ProteinSimple

3001 Orchard Pkwy.,

San Jose, CA 95134, USA

FCC ID: 2AHGG-MAURICE

Report Type:	Product Type:
Original Report	Laboratory Instrument

Prepared By:	Leonard Gray, Associate Engineer
Report Number:	R1601152-225
Report Date:	2016-03-09
Reviewed By:	Simon Ma, RF Leader

Bay Area Compliance Laboratories Corp.
1274 Anvilwood Avenue,
Sunnyvale, CA 94089, USA
Tel: 1 (408) 732-9162
Fax: 1 (408) 732-9164

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1601152-225	Initial	2016-03-09

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report has been compiled on behalf of *ProteinSimple,* and their product, *FCC ID: 2AHGG-MAURICE,* model number: *Maurice*, which henceforth is referred to as the EUT (Equipment under Test.) The EUT is a protein detection instrument which contains 13.56 MHz RFID function.

1.2 Mechanical Description of EUT

The EUT measures approximately 61 cm (L), 42 cm (W), 44 cm (H), and weighs approximately 46 kg.

The data gathered are from a typical production sample provided by the manufacturer with serial number: R1601152-1, assigned by BACL.

1.3 Objective

This report is prepared on behalf of *ProteinSimple,* in accordance with Part 2, Subpart J, and Part 18, Subparts B and C of the Federal Communication Commission's rules. The objective is to determine compliance with FCC Part 15.225.

1.4 Related Submittal(s)/Grant(s)

N/A

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI 63.10:2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR16-4-2:2011, The Treatment of Uncertainty in EMC Measurements, the values ranging from $\pm$2.0 dB for Conducted Emissions tests and $\pm$4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

1.7 Test Facility

Bay area compliance Laboratories Corp. (BACL) is:
1- An independent Commercial Test Laboratory accredited to **ISO 17025: 2005** by **A2LA**, in the fields of: Electromagnetic Compatibility & Telecommunications covering Emissions, Immunity, Radio, RF Exposure, Safety and Telecom. This includes NEBS (Network Equipment Building System), Wireless RF, Telecommunications Terminal Equipment (TTE); Network Equipment; Information Technology Equipment (ITE); Medical Electrical Equipment; Industrial, Commercial, and Medical Test Equipment; Professional Audio and Video Equipment; Electronic (Digital) Products; Industrial and Scientific Instruments; Cabled Distribution Systems and Energy Efficiency Lighting.

2- An ENERGY STAR Recognized Laboratory, for the LM80 Testing, a wide variety of Luminares and Computers.

3- A NIST Designated Phase-I and Phase-II CAB including: ACMA (Australian Communication and Media Authority), BSMI (Bureau of Standards, Metrology and Inspection of Taiwan), IDA (Infocomm Development Authority of Singapore), IC(Industry Canada), Korea (Ministry of Communications Radio Research Laboratory), NCC (Formerly DGT; Directorate General of Telecommunication of Chinese Taipei) OFTA (Office of the Telecommunications Authority of Hong Kong), Vietnam, VCCI - Voluntary Control Council for Interference of Japan and a designated EU CAB (Conformity Assessment Body) (Notified Body) for the EMC and R&TTE Directives.

4- A Product Certification Body accredited to **ISO Guide 65: 1996** by **A2LA** to certify:
2. Radio Standards Specifications (RSS) in the Category I Equipment Standards List and All Broadcasting Technical Standards (BETS) in Category I Equipment Standards List for Industry Canada.
3. Radio Communication Equipment for Singapore.
4. Radio Equipment Specifications, GMDSS Marine Radio Equipment Specifications, and Fixed Network Equipment Specifications for Hong Kong.
5. Japan MIC Telecommunication Business Law (A1, A2) and Radio Law (B1, B2 and B3).
6. Audio/Video, Battery Charging Systems, Computers, Displays, Enterprise Servers, Imaging Equipment, Set-Top Boxes, Telephony, Televisions, Ceiling Fans, CFLs (Including GU24s),Decorative Light Strings, Integral LED Lamps, Luminaires, Residential Ventilating Fans.

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997, and Article 8 of the VCCI regulations on December 25, 1997. The test site also complies with the test methods and procedures set forth in CISPR 22:2008 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz as well as ANSI C63.10-2013, ANSI C63.4-2014, TIA/EIA-603 & CISPR 24:2010.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: A-0027. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL Corp. is an American Association for Laboratory Accreditation (A2LA) accredited laboratory (Lab Code 3297-02). The current scope of accreditations can be found at

http://www.a2la.org/scopepdf/3297-02.pdf?CFID=1132286&CFTOKEN=e42a3240dac3f6ba-6DE17DCB-1851-9E57-477422F667031258&jsessionid=8430d44f1f47cf2996124343c704b367816b

2 System Test Configuration

2.1 Justification

The EUT was configured for testing according to ANSI 63.10:2013.

2.2 EUT Exercise Software

N/A

2.3 Equipment Modifications

N/A

2.4 Local Support Equipment

Manufacturer	Description	Model No.	Serial No.
ProteinSimple	RFID Test Cartridge	-	-

2.5 EUT Internal Configuration Details

Manufacturer	Description	Model No.	Serial No.
SCM Microsystems	RFID Reader	SCM3712 Rev 0.1	21121229200169

2.6 Power Supply and Line Filter

N/A

2.7 Interface Ports and Cabling

Cable Description	Length (m)	To	From
AC Power	2	Wall Power Outlet	EUT

3 Summary of Test Results

Results reported relate only to the product tested.

FCC Rules	Description of Test	Results
§15.203	Antenna Requirement	Compliant
§15.207	AC Line Conducted Emissions	Compliant
§15.225 (a) (b) (c) (d) §15.209	Radiated Field Strength (9 kHz-30 MHz, 30 MHz-1 GHz)	Compliant
§15.225 (e)	Frequency Tolerance	Compliant
§15.215 (c)	20 dB Bandwidth	Complaint

4 FCC §15.203 - Antenna Requirements

4.1 Applicable Standards

According to FCC §15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

4.2 Antenna List and Details

Antenna Type	Frequency Range (MHz)	Result
Integral Antenna	13.56	Compliant

5 FCC §15.207 - AC Line Conducted Emissions

5.1 Applicable Standards

As per FCC §15.207:

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

5.2 Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.4-2014. The specification used was FCC §15.207

External I/O cables were draped along the edge of the test table and bundle when necessary.
The EUT was connected with LISN-1 which provided 120 V/ 60 Hz AC power.

5.3 Test Procedure

During the conducted emission test, the power cord of the EUT host system was connected to the mains outlet of the LISN-1 and the power cord of the support equipment was connected to LISN-2.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the peak detection mode, quasi-peak and average. Quasi-Peak readings are distinguished with a “QP”. Average reading is distinguished with an “Ave”.

5.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to indicated Amplitude (Ai) reading. The basic equation is as follows:

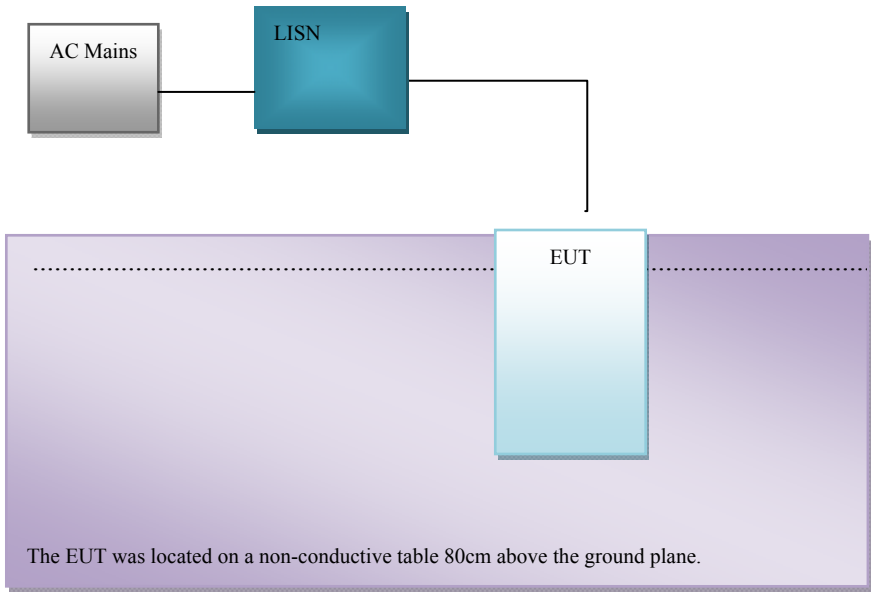
CA = Ai + AF + CL + Atten – Ga

For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Corrected Amplitude – Limit

5.5 Test Setup Block Diagram



5.6 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2015-09-28	1 year
FCC	LISN	FCC-LISN-50-25-2-10-CISPR16	160129	2015-04-17	1 year
Solar Electronics Company	High Pass Filter	Type 7930-100	7930150202	2015-03-06	1 year
Suirong	30 ft conductive emission cable	LMR 400	-	2015-03-05	1 year
Hewlett-Packard	5 ft RF cable	-	1268	2015-07-29	1 year
Rohde & Schwarz	Impulse Limiter	ESH3-Z2	101963	2015-07-15	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.*

5.7 Test Environmental Conditions

Temperature:	25 ºC
Relative Humidity:	42 %
ATM Pressure:	101.6 kPa

The testing was performed by Leonard Gray on 2016-02-18 in chamber 5m3.

5.8 Summary of Test Results

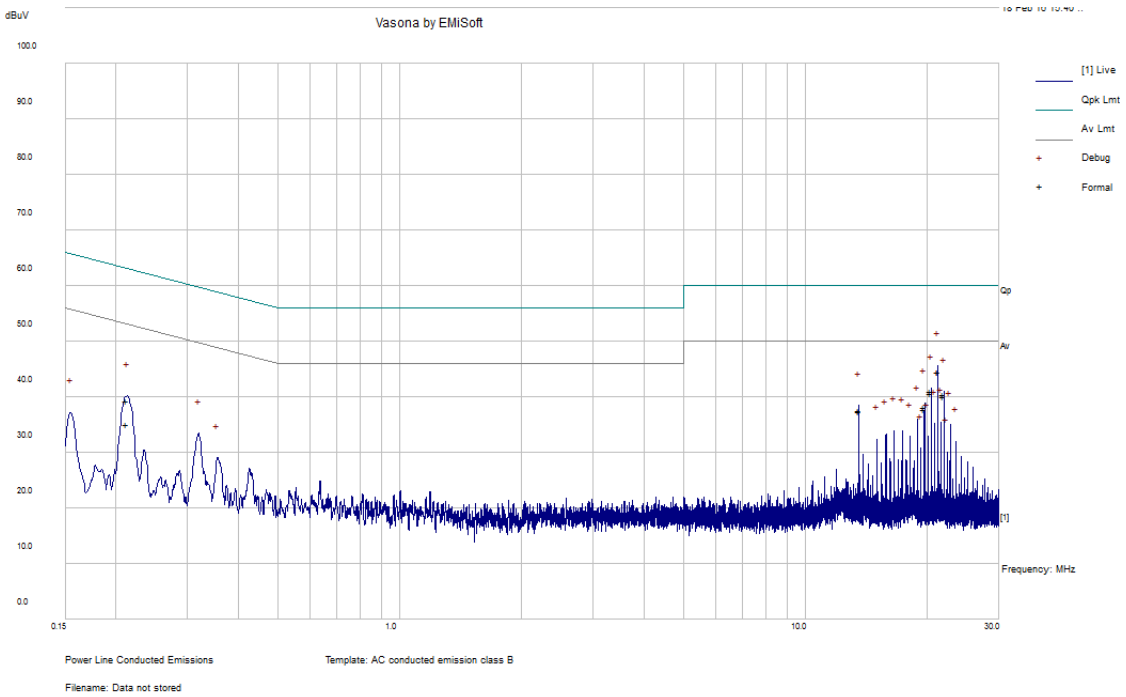
According to the data hereinafter, the EUT complied with the FCC 15C standard's radiated emissions limits, and had the worst margin of:

Connection: 120 V/ 60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-5.55	21.18429	Line	0.15-30

Please refer to the following table and plots for specific test result details

5.9 Conducted Emissions Test Plots and Data

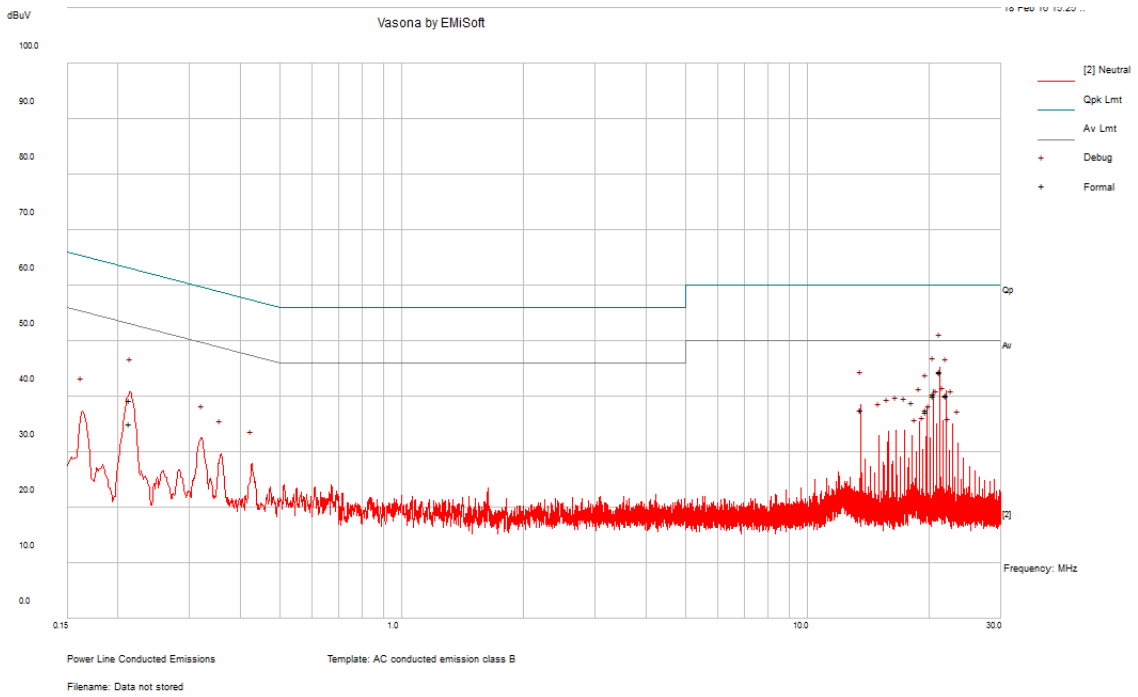
120VAC/60Hz Line



Frequency (MHz)	Cord. Reading (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
21.18429	44.6	Line	60	-15.4	QP
20.41195	40.69	Line	60	-19.31	QP
21.95136	40.19	Line	60	-19.81	QP
19.63991	37.88	Line	60	-22.12	QP
13.56029	37.53	Line	60	-22.47	QP
0.212274	39.28	Line	63.12	-23.83	QP

Frequency (MHz)	Cord. Reading (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
21.18429	44.45	Line	50	-5.55	Ave.
20.41195	41.01	Line	50	-8.99	Ave.
21.95136	40.53	Line	50	-9.47	Ave.
19.63991	38.2	Line	50	-11.8	Ave.
13.56029	37.62	Line	50	-12.38	Ave.
0.212274	35.12	Line	53.12	-17.99	Ave.

120VAC/60Hz Neutral



Frequency (MHz)	Cord. Reading (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
21.18928	44.37	Neutral	60	-15.63	QP
20.41803	40.14	Neutral	60	-19.86	QP
21.95774	40.08	Neutral	60	-19.92	QP
13.5602	37.56	Neutral	60	-22.44	QP
19.64557	37.23	Neutral	60	-22.77	QP
0.213747	39.29	Neutral	63.06	-23.77	QP

Frequency (MHz)	Cord. Reading (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
21.18928	44.45	Neutral	50	-5.55	Ave.
20.41803	40.43	Neutral	50	-9.57	Ave.
21.95774	40.4	Neutral	50	-9.6	Ave.
13.5602	37.66	Neutral	50	-12.34	Ave.
19.64557	37.56	Neutral	50	-12.44	Ave.
0.213747	35.07	Neutral	53.06	-17.98	Ave.

6 FCC §15.225 & §15.209 - Radiated Field Strength

6.1 Applicable Standards

As per FCC §15.225 Operation within the band 13.110-14.010 MHz

(a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

(b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

6.2 Test Setup

The radiated emissions tests were performed in the 5-meter Chamber, using the setup in accordance with ANSI C63.4-2014. The specification utilized was the FCC §15.225, §15.209 limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

6.3 Test Procedure

For the radiated emissions test, the EUT host, and all support equipment power cords was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT is set 3 meter away from the testing antenna, which was fixed at around 2 meters, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of perpendicular and parallel.

The spectrum analyzer or receiver is set as:

Below 150 kHz:

RBW = 200 Hz / VBW = 600 kHz / Sweep = Auto / Average

From 150 kHz to 30 MHz:

RBW = 9 kHz / VBW = 27 kHz / Sweep = Auto / Average

6.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + AF + CL + Atten – Ga

For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Corrected Amplitude – Limit

6.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2015-09-28	1 year
Sunol Science Corp	System Controller	SC99V	011003-1	N/R	N/R
EMCO	Antenna, Loop Passive	6512	34167	2014-04-30	2 years
Suirong	30 ft conductive emission cable	LMR 400	-	2015-03-05	1 year
Sonoma Instrument	Amplifier	315	303125	2015-07-23	1 year
Sunol Sciences	Antenna, Biconi-Log	JB1	A013105-3	2015-07-11	2 years
HP	Pre-Amplifier	8447D	2944A06639	2015-06-08	1 year

Statement of Traceability: BACL *attests that all calibrations have been performed per the A2LA requirements, traceable to NIST.*

6.6 Test Environmental Conditions

Temperature:	22 ºC
Relative Humidity:	42 %
ATM Pressure:	102.7 kPa

The testing was performed by Leonard Gray on 2016-02-05 in 5m3.

6.7 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Part 15C standard's radiated emissions limits, and had the worst margin of:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization**	**Range**
-4.71	99.54775	Vertical	30 - 1000 MHz

Please refer to the following table and plots for specific test result details

6.8 Radiated Field Strength Test Data and Plots

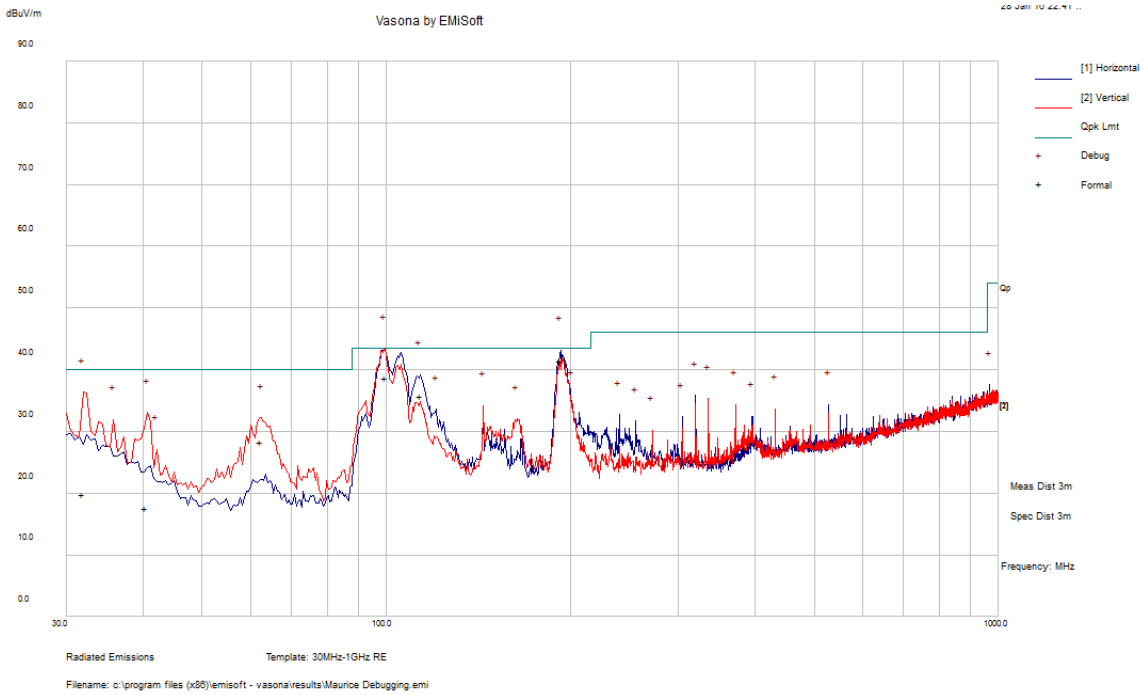
1) 9 kHz to 30 MHz:

Frequency (kHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
13.56	71.5	232	100	Perp.	34.500	0.18	51.66	54.52	123.99	-69.47	QP
13.56	68.83	304	103	Parallel	34.500	0.18	51.66	51.85	123.99	-72.14	QP
13.553	58.78	232	100	Perp.	34.500	0.18	51.66	41.80	90.48	-48.68	QP
13.553	56.14	304	103	Parallel	34.500	0.18	51.66	39.16	90.48	-51.32	QP
13.567	54.93	232	100	Perp.	34.500	0.18	51.66	37.95	90.48	-52.53	QP
13.567	52.3	304	103	Parallel	34.500	0.18	51.66	35.32	90.48	-55.16	QP
13.347	40.64	232	100	Perp.	34.500	0.18	51.66	23.66	80.50	-56.84	QP
13.349	37.13	304	103	Parallel	34.500	0.18	51.66	20.15	80.50	-60.35	QP
13.7712	40.62	232	100	Perp.	34.500	0.18	51.66	23.64	80.50	-56.86	QP
13.7724	36.46	304	103	Parallel	34.500	0.18	51.66	19.48	80.50	-61.02	QP
12.2	48.17	9	100	Perp.	34.500	0.18	51.66	31.19	70.00	-38.81	QP
12.2	44.22	138	103	Parallel	34.500	0.18	51.66	27.24	70.00	-42.76	QP
21.95	53.69	9	100	Perp.	34.500	0.18	51.66	36.71	70.00	-33.29	QP
21.95	62.7	190	100	Parallel	34.500	0.18	51.66	45.72	70.00	-24.28	QP

Note: The measurement was made at 3 meter while the FCC limit was made at 30 meter.

*Limit in dBµV/m @ 3 meter = Limit in dBµV/m @ 30 meter + 40*log (30/3)*

2) 30 MHz to 1 GHz:



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comments (PK/QP/Ave.)
99.54775	38.79	286	V	294	43.5	-4.71	QP
192.5563*	41.41	103	H	282	43.5	-2.09	QP
31.92025	19.79	273	V	22	40	-20.21	QP
113.535	35.73	218	H	203	43.5	-7.77	QP
40.434	17.55	256	V	100	40	-22.45	QP
62.39075	28.32	154	V	341	40	-11.68	QP

**Note: Emissions with frequencies greater than 135.6 MHz are greater than the 10th Harmonic and thus can be ignored (§15.33: Frequency Range of Radiated Measurement).*

7 FCC §15.225(e) - Frequency Tolerance

7.1 Applicable Standards

As per FCC §15.225(e): Operation within the band 13.110-14.010 MHz

(e) The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of −20 degrees to + 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

7.2 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Interval
Agilent	Analyzer, Spectrum	E4440A	MY44303352	2015-06-22	1 year
EMCO	Antenna, Loop Passive	6512	34167	2014-04-30	2 years
Suirong	30 ft conductive emission cable	LMR 400	-	2015-03-05	1 year
Fluke Corp	Multimeter, Digital	233	23790031	2015-07-06	1 year
Espec	Chamber, Humidity	ESL-4CA	18010	2015-02-27	1 year
Interpower	International Power Source	85510510	39711 Rev B	Cal. Not Required	N/A
Valhalla	Analyzer, Digital Power	2101	3-3428	2015-09-17	1 year

Statement of Traceability: BACL Corp. attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.

7.3 Test Environmental Conditions

Temperature:	20-25° C
Relative Humidity:	30-32 %
ATM Pressure:	102.1-105.1 kPa

The testing was performed by Leonard Gray from 2016-02-23 at RF Site.

7.4 Test Results

Normal Voltage

Temperature °C	Operating Frequency (MHz)	Measured Frequency (MHz)	Frequency Tolerance	Limit	Result
-20	13.56	13.559602	-0.003%	±0.01%	Pass
-10	13.56	13.559605	-0.003%	±0.01%	Pass
0	13.56	13.559605	-0.003%	±0.01%	Pass
10	13.56	13.559605	-0.003%	±0.01%	Pass
20	13.56	13.559596	-0.003%	±0.01%	Pass
30	13.56	13.559506	-0.004%	±0.01%	Pass
40	13.56	13.559506	-0.004%	±0.01%	Pass
50	13.56	13.559498	-0.004%	±0.01%	Pass

High Voltage: 115% of Normal Voltage

Temperature °C	Operating Frequency (MHz)	Measured Frequency (MHz)	Frequency Tolerance	Limit	Result
-20	13.56	13.559611	-0.003%	±0.01%	Pass
-10	13.56	13.559611	-0.003%	±0.01%	Pass
0	13.56	13.559611	-0.003%	±0.01%	Pass
10	13.56	13.559609	-0.003%	±0.01%	Pass
20	13.56	13.559608	-0.003%	±0.01%	Pass
30	13.56	13.559593	-0.003%	±0.01%	Pass
40	13.56	13.559589	-0.003%	±0.01%	Pass
50	13.56	13.559577	-0.003%	±0.01%	Pass

Low Voltage: 85% of Normal Voltage

Temperature °C	Operating Frequency (MHz)	Measured Frequency (MHz)	Frequency Tolerance	Limit	Result
-20	13.56	13.559611	-0.003%	±0.01%	Pass
-10	13.56	13.559611	-0.003%	±0.01%	Pass
0	13.56	13.559610	-0.003%	±0.01%	Pass
10	13.56	13.559609	-0.003%	±0.01%	Pass
20	13.56	13.559598	-0.003%	±0.01%	Pass
30	13.56	13.559595	-0.003%	±0.01%	Pass
40	13.56	13.559587	-0.003%	±0.01%	Pass
50	13.56	13.559580	-0.003%	±0.01%	Pass

8 FCC §15.215(c) - 20dB Bandwidth

8.1 Applicable Standards

As per FCC §15.215(c):

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

8.2 Test Setup

The radiated emissions tests were performed in the 5-meter Chamber, using the setup in accordance with ANSI 63.10:2013. The specification utilized was the FCC §15.215

8.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Analyzer, Spectrum	E4440A	MY44303352	2015-06-22	1 year
EMCO	Antenna, Loop Passive	6512	34167	2014-04-30	2 years
Suirong	30 ft conductive emission cable	LMR 400	-	2015-03-05	1 year

Statement of Traceability: BACL *attests that all calibrations have been performed per the A2LA requirements, traceable to NIST.*

8.4 Test Environmental Conditions

Temperature:	20-25° C
Relative Humidity:	30-32 %
ATM Pressure:	102.1-105.1 kPa

The testing was performed by Leonard Gray from 2016-02-18 at RF Site.

8.5 Test Results

Permitted Operating Frequency Range (MHz)	20 dB Bandwidth (Hz)	Result
13.553-13.567	936	Compliant

20 dB Bandwidth