TÜVRheinland®
Precisely Right.

Emissions
Test Report

EUT Name: SoClean 3

Model No.: SC1400

CFR 47 Part 15.247: 2020 and RSS 247: 2017

Prepared for:

SoClean Inc.
12 Vose farm road
Petersborough, NH, 03458 U.S.A.

Prepared by:

TUV Rheinland of North America, Inc.
5015 Brandin Ct.
Fremont, CA 94538
Tel: (925) 249-9123
Fax: (925) 249-9124
http://www.tuv.com/

Report/Issue Date: July 23, 2020
Job # 234107543
Report Number: 32062982.001

Revisions

Revision No.	Date MM/DD/YYYY	Reason for Change	Author
0	7/23/20	Original Document	OC

Note: Latest revision report will replace all previous reports.

Statement of Compliance

Manufacturer:	SoClean Inc. 12 Vose farm road Petersborough, NH, 03458
Requester / Applicant:	SoClean Inc.
Name of Equipment:	SoClean 3
Model No.	SC1400
Type of Equipment:	Intentional Radiator
Application of Regulations:	CFR 47 Part 15.247: 2020 and RSS 247: 2017
Test Dates:	July 20th, 2020 to July 23rd, 2020

Guidance Documents:

Emissions: ANSI C63.10-2013, KDB 558074 D01 DTS Measurement Guidance v05r02, KDB 662911 D01 Multiple Transmitter Output v02r01

Test Methods:

Emissions: ANSI C63.10-2013, KDB 558074 D01 DTS Measurement Guidance v05r02, KDB 662911 D01 Multiple Transmitter Output v02r01

The electromagnetic compatibility test and documented data described in this report has been performed and recorded by TUV Rheinland, in accordance with the standards and procedures listed herein. As the responsible authorized agent of the EMC laboratory, I hereby declare that the equipment described above has been shown to be compliant with the EMC requirements of the stated regulations and standards based on these results. If any special accessories and/or modifications were required for compliance, they are listed in the

Executive Summary of this report.

This report must not be used to claim product endorsement by A2LA or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written authorization of TUV Rheinland of North America.

Osvaldo Casorla — Test Engineer — Date July 23, 2020

Rachana Khanduri — A2LA Signatory — Date July 23, 2020

Testing Cert #3331.02 **US1131** **2932D**

1 Executive Summary

1.1 Scope

This report is intended to document the status of conformance with the requirements of the CFR 47 Part 15.247: 2020 and RSS 247: 2017 based on the results of testing performed on July 20th, 2020 to July 23rd, 2020 on the SoClean 3 Model SC1400 manufactured by SoClean Inc.. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report. The 2402 MHz to 2480 MHz frequency band for Bluetooth, Low Energy and 13.56 MHz RFID co-location is covered in this document.

1.3 Summary of Test Results

Table 1: Summary of Test Results

Test	Test Method ANSI C 63.10 & C63.4	Worse Case (Measured)	Result
Transmitter Spurious Emissions - Colocation	CFR47 15.209, 15.247 (d), RSS 247 Sect.5.5	-8.46 dB Margin @ 0.7 MHz, QuasiPeak	**Complied**
AC Power Conducted Emission	CFR47 15.207, RSS-GEN Sect.8.8	Class B	**Complied**

Note 1: Class B limits were applied where applicable.

1.4 Special Accessories

No special accessories were necessary in order to achieve compliance.

1.5 Equipment Modifications

None

2 Laboratory Information

2.1 Accreditations & Endorsements

2.1.1 US Federal Communications Commission

TUV Rheinland of North America EMC test facilities located at 1279 Quarry Lane, Ste. A, Pleasanton, CA, 94566, and 5015 Brandin Ct, Fremont, CA 94538, are recognized by the Commission for performing testing services for the general public on a fee basis. These laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (Registration No. US1131). The laboratory Scopes of Accreditation include Title 47 CFR Parts 15, 18 and 90. The accreditations are updated every three years.

2.1.2 NIST / A2LA

TUV Rheinland of North America is accredited by the National Voluntary Laboratory Accreditation Program, which is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Guide 17025:2017. The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

2.1.3 Canada – Industry Canada

Industry Canada Industrie Canada

The Pleasanton 5-meter Semi-Anechoic Chamber, Registration No. 2932M-1, has been accepted by Industry Canada to perform testing to 3 and 5 meters based on the test procedures described in ANSI C63.4-2014. The Fremont 10-meter Semi-Anechoic Chamber, Registration No. 2932D-1, has been accepted by Industry Canada to perform testing to 3 and 10 meters based on the test procedures described in ANSI C63.4-2014.

2.1.4 Japan – VCCI

The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) is a group that consists of Information Technology Equipment (ITE) manufacturers and EMC test laboratories. The purpose of the Council is to take voluntary control measures against electromagnetic interference from Information Technology Equipment, and thereby contribute to the development of a socially beneficial and responsible state of affairs in the realm of Information Technology Equipment in Japan. TUV Rheinland of North America EMC test facilities located at 1279 Quarry Lane, Ste. A, Pleasanton, CA, 94566, and 5015 Brandin Ct, Fremont, CA 94538, have been assessed and approved in accordance with the Regulations for Voluntary Control Measures.

VCCI Registration No. for Pleasanton: A-0326

VCCI Registration No. for Fremont: A-0327

2.1.5 Acceptance by Mutual Recognition Arrangement

The United States has an established agreement with specific countries under the Asia Pacific Laboratory Accreditation Corporation (APLAC) Mutual Recognition Arrangement. Under this agreement, all TUV Rheinland at 1279 Quarry Ln, Pleasanton, CA 94566 test results and test reports within the scope of the laboratory NIST / A2LA accreditation will be accepted by each member country.

2.2 Test Facilities

Test facilities are located at 5015 Brandin Ct, Fremont, California, 94538, USA and 1279 Quarry Lane, Pleasanton, California 94566, USA (Fremont is the Pleasanton Annex).

2.2.1 Emission Test Facility

The Semi-Anechoic Chambers and AC Line Conducted measurement facilities used to collect radiated and conducted emissions data have been constructed in accordance with ANSI C63.7:1992. The Fremont 10 meter semi-anechoic chamber has been measured in accordance with and verified to comply with the theoretical volumetric normalized site attenuation of ANSI C63.4:2014 and SVSWR requirements of CISPR 16-1-4 Consol. Ed. 3.0 (2010-04), at test distances of 3 and 10 meters. This site has been described in reports dated November 1st, 2006, submitted to the FCC, and accepted by letter dated November 28, 2006. The site is listed with the FCC and accredited by A2LA (Testing Certificate #3331.02). The Pleasanton 5 meter semi-anechoic chamber has been verified to comply with the theoretical volumetric normalized site attenuation of ANSI C63.4:2009 and SVSWR requirements of CISPR 16-1-4 Consol. Ed. 3.0 (2010-04) at a test distance of 3 meters. This site has been described in reports dated November 1st, 2006, submitted to the FCC, and accepted by letter dated November 28, 2006. The site is listed with the FCC and accredited by A2LA (Testing Certificate #3331.02).

2.3 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1st Edition, 1995.

The Combined Standard Uncertainty is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities; it is equal to the positive square root of the sum of the variances or co-variances of these other quantities, weighted according to how the measurement result varies with changes in these quantities. The term *standard uncertainty* is the result of a measurement expressed as a standard deviation.

The Expanded Uncertainty defines an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurement and the fraction may be viewed as the coverage probability or level of confidence of the interval.

2.3.1 Sample Calculation – radiated & conducted emissions

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength (dBμV/m) = RAW - AMP + CBL + ACF

Where: RAW = Measured level before correction (dBμV)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

Sample radiated emissions calculation @ 30 MHz

Measurement +Antenna Factor–Amplifier Gain+Cable loss=Radiated Emissions (dBuV/m)

25 dBuV/m + 17.5 dB – 20 dB + 1.0 dB = 23.5 dBuV/m

2.3.2 Measurement Uncertainty

Per CISPR 16-4-2	**U_{lab}**	**U_{cispr}**
Radiated Disturbance @ 10 meters		
30 – 1,000 MHz	2.25 dB	4.51 dB
Radiated Disturbance @ 3 meters		
30 – 1,000 MHz	2.26 dB	4.52 dB
1 – 6 GHz	2.12 dB	4.25 dB
6 – 18 GHz	2.47 dB	4.93 dB
Conducted Disturbance @ Mains Terminals		
150 kHz – 30 MHz	1.09 dB	2.18 dB
Disturbance Power		
30 MHz – 300 MHz	3.92 dB	4.3 dB

2.4 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Standard 17025:2017. Equipment calibration records are kept on file at the test facility.

3 Product Information

3.1 Product Description

The Model SC1400 is a SoClean 3 utilizing Bluetooth and RFID. The EUT will be in compliance with regulatory standards of regions it will be operating in.

3.2 Equipment Configuration

A description of the equipment configuration is given in the Test Plan Section. The EUT was tested as called for in the test standard and was configured and operated in a manner consistent with its intended use. The EUT was connected to rated power and allowed to reach intended operating conditions. The placement of the EUT system components was guided by the test standard and selected to represent typical installation conditions.

In the case of an EUT that can operate in more than one configuration, preliminary testing was performed to determine the configuration that produced maximum radiation.

The final configuration was selected to produce the worst case radiation for emissions testing and to place the EUT in the most susceptible state for immunity testing.

3.3 Operating Mode

A description of the operation mode is given in the Test Plan Section. In the case of an EUT that can operate in more than one state, preliminary testing was performed to determine the operating mode that produced maximum radiation.

The final operating mode was selected to produce the worst case radiation for emissions testing.

4 Emissions

Testing was performed in accordance with CFR 47 Part 15.247: 2019 and RSS 247: 2017. These test methods are listed under the laboratory's A2LA Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices. Procedures described in section 8 of the standard were used.

4.1 Radiated Emissions Co-Location

Transmitter spurious emissions are emissions outside the frequency range of the equipment when the equipment is in transmit mode; per requirement of CFR47 15.205, 15.209, 15.247(d), RSS 247 Sect.5.5, RSS-GEN Sect. 8.9 and 8.10.

4.1.1 Test Methodology

4.1.1.1 Preliminary Test

A test program that controls instrumentation and data logging was used to automate the preliminary RF emission test procedure. The frequency range of interest was divided into sub-ranges to yield a frequency resolution of approximately 120 kHz and provide a reading at each frequency for no more than 12° of turntable rotation. For each frequency sub-range the turntable was rotated 360° while peak emission data was recorded and plotted over the frequency range of interest in horizontal and vertical antenna polarization's.

Preliminary emission profile testing was performed inside the anechoic chamber. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm (<1 GHz) and 150cm (>1 GHz) above the floor. The EUT was positioned as shown in the setup photographs. The receiving antenna was placed at a distance of 3m at a fixed height of 1m. Measurement equipment was located outside of the chamber. A video camera was placed inside the chamber to view the EUT.

Pre-scans were performed to determine the worst data rate / chains.

4.1.1.2 Final Test

For each frequency measured, the peak emission was maximized by manipulating the receiving antenna from 1 to 4 meters above the ground plane and placing it at the position that produced the maximum signal strength reading. The turntable was then rotated through 360° while observing the peak signal and placing the EUT at the position that produced maximum radiation. The six highest emissions relative to the limit were measured unless such emissions were more than 20 dB below the limit. If less than six emissions are within 20 dB of the limit, than the noise level of the receiver is measured at frequencies where emissions are expected. Multiples of all oscillator and microprocessor frequencies were also checked.

Final testing was performed on an NSA compliant test site. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm (<1 GHz) and 150cm (>1 GHz) above the ground plane. The placement of EUT and cables were the same as for preliminary testing and is shown in the setup photographs.

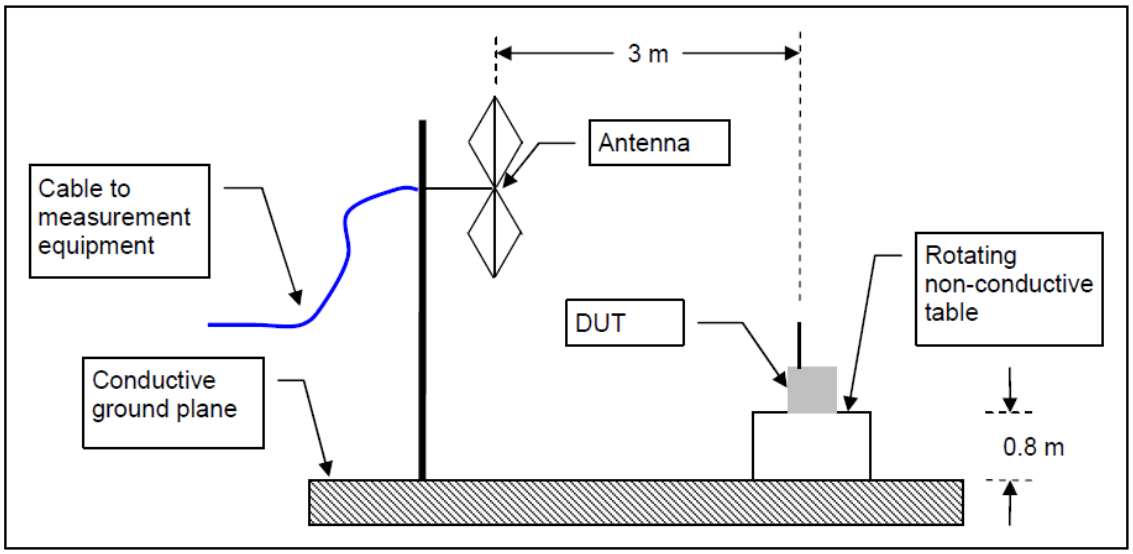
4.1.1.3 Deviations

None.

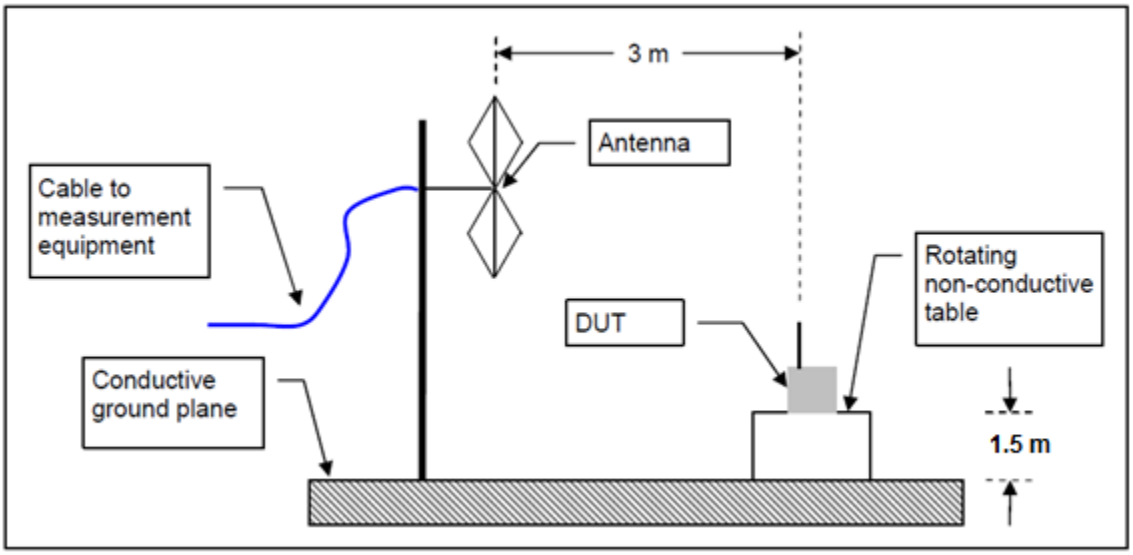
4.1.2 Test Setup:

All tests were conducted at full power on worst case of low, middle, and high channels. The DUT was stimulated by manufacturer provided test software that is not available to the end user.

30MHz-1GHz



1-26GHz



4.1.3 Transmitter Spurious Emission Limit

The spurious emissions of the transmitter shall not exceed the values in CFR47 Part 15.205, 15.209: 2015 and RSS Gen Sect. 8.9 and 8.10: 2014.

Frequency (MHz)	Field strength (microvolts/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

The SC1400 was in a continuous Co-Location TX mode operating at BLE 2402 with RFID 13.56 MHz and set at the max power levels mentioned in the table 6.

The final spurious emission scans performed on the worst case axis.
RBW is set to 200 Hz and VBW is set to 1 kHz for 9 kHz-150 kHz.
RBW is set to 9 kHz and VBW is set to 30 kHz for 150 kHz-30 MHz
RBW is set to 100 kHz, VBW is set to 300 kHz for 30 MHz-1 GHz.

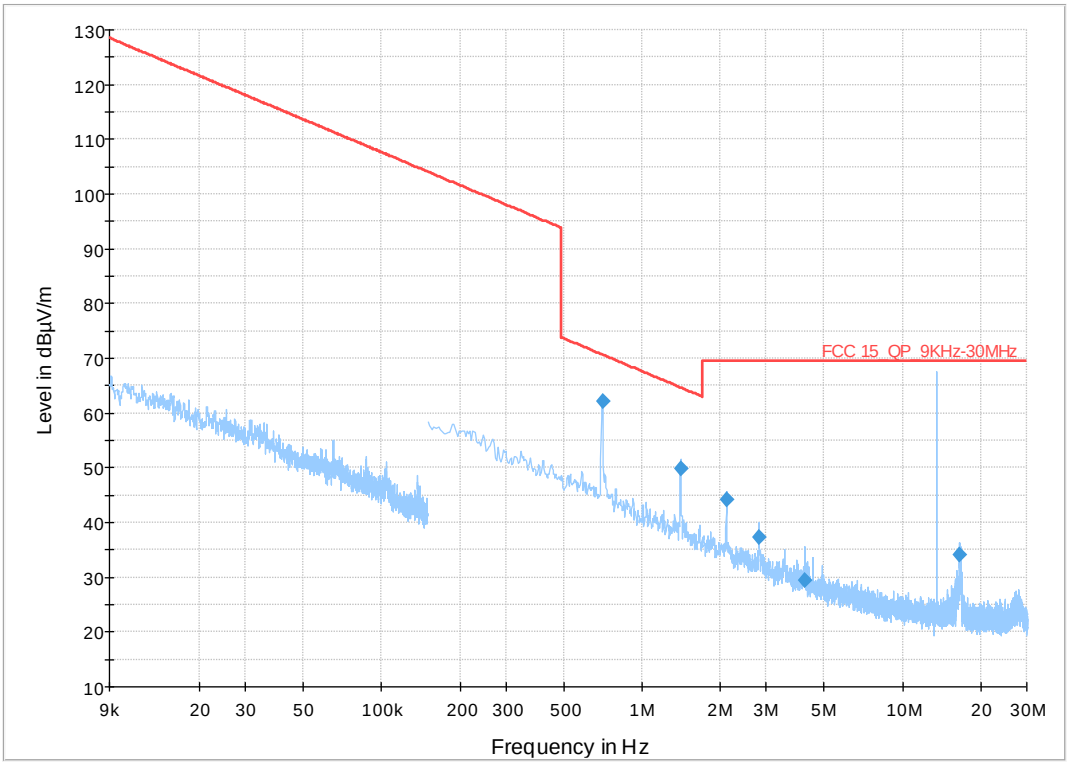
Note: The 2.4 GHz notch filter was used to protect the front end of the pre-amp.

4.1.4 Test Results

4.1.4.1 9 kHz to 30 MHz Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Deg	Azimuth (deg)	Corr. (dB/m)	Comment
0.70	62.18	70.64	8.46	1000.00	9.00	111.00	0.00	-158.00	15.50	
1.41	49.81	64.64	14.83	1000.00	9.00	111.00	0.00	-154.00	15.80	
2.11	44.07	69.54	25.47	1000.00	9.00	111.00	0.00	-54.00	15.90	
2.81	37.32	69.54	32.22	1000.00	9.00	111.00	0.00	-60.00	15.70	
4.23	29.54	69.54	40.00	1000.00	9.00	111.00	0.00	-141.00	15.60	
16.60	34.08	69.54	35.46	1000.00	9.00	111.00	0.00	-126.00	15.00	

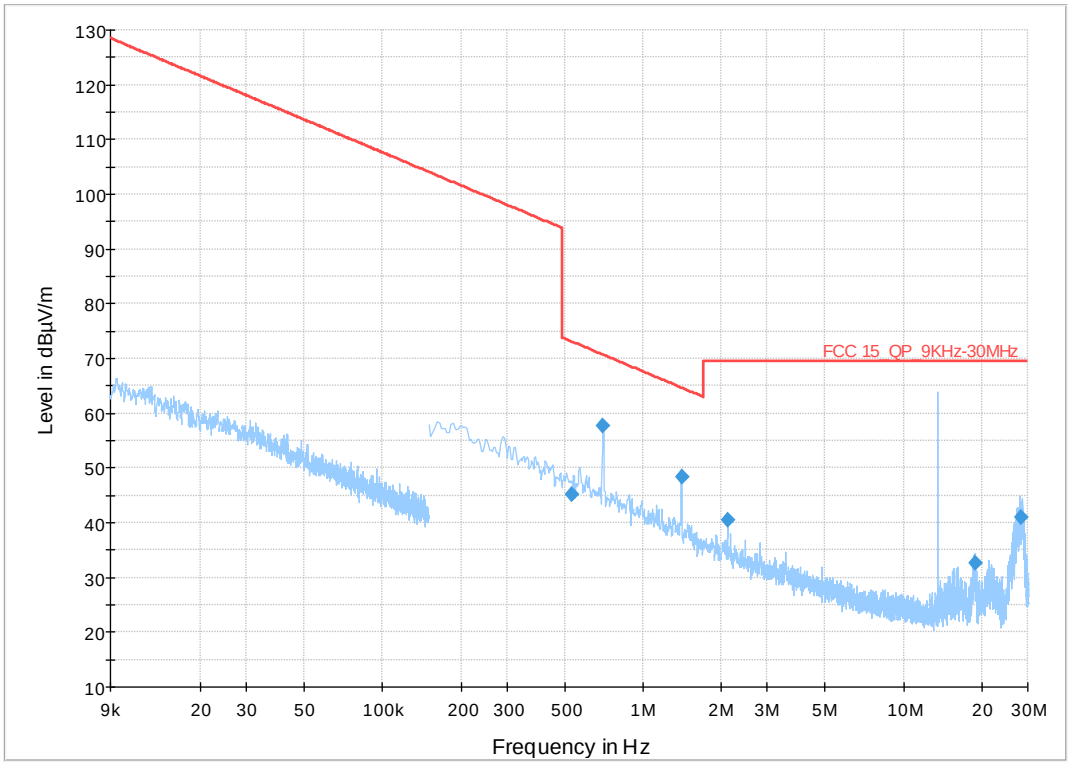
Note: The highest emission on the plot is the fundamental signal at 13.56 MHz.



Plot 1. 9 kHz-30 MHz, 2402 MHz & 13.56 MHz, 0 degrees

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Deg	Azimuth (deg)	Corr. (dB/m)	Comment
0.53	45.26	73.11	27.86	1000.00	9.00	111.00	90.00	168.00	15.50	
0.70	57.79	70.67	12.88	1000.00	9.00	111.00	90.00	-123.00	15.50	
1.41	48.25	64.65	16.40	1000.00	9.00	111.00	90.00	-123.00	15.80	
2.11	40.54	69.54	29.00	1000.00	9.00	111.00	90.00	-116.00	15.90	
18.76	32.74	69.54	36.80	1000.00	9.00	111.00	90.00	-110.00	14.80	
28.40	40.96	69.54	28.58	1000.00	9.00	111.00	90.00	-143.00	13.40	

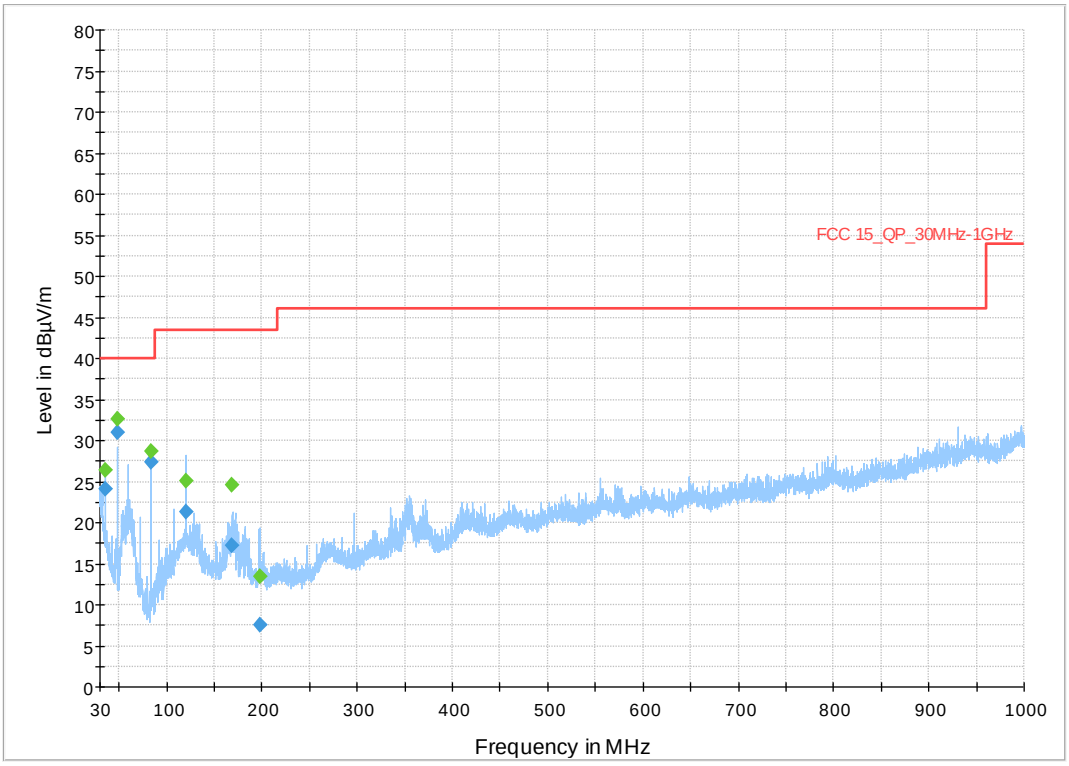
Note: The highest emission on the plot is the fundamental signal at 13.56 MHz.



Plot 2. 9 kHz-30 MHz, 2402 MHz & 13.56 MHz, 90 degrees

4.1.4.2 30 MHz to 1000 MHz Data

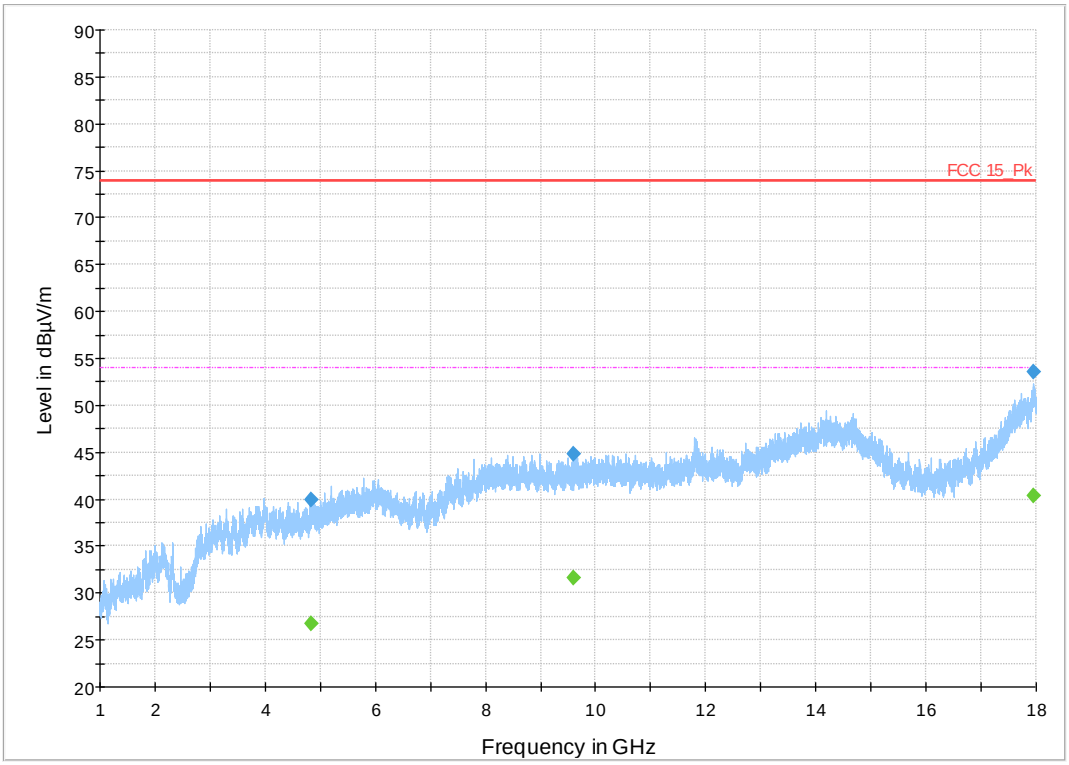
Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
36.00	24.14	---	40.00	15.86	1000.00	120.00	104.00	V	180.00	-10.90	
36.00	---	26.41	---	---	1000.00	120.00	104.00	V	180.00	-10.90	
48.01	---	32.70	---	---	1000.00	120.00	104.00	V	180.00	-17.40	
48.01	30.92	---	40.00	9.08	1000.00	120.00	104.00	V	180.00	-17.40	
84.01	27.36	---	40.00	12.64	1000.00	120.00	104.00	V	135.00	-20.10	
84.01	---	28.61	---	---	1000.00	120.00	104.00	V	135.00	-20.10	
120.00	21.31	---	43.52	22.21	1000.00	120.00	104.00	V	177.00	-10.70	
120.00	---	25.11	---	---	1000.00	120.00	104.00	V	177.00	-10.70	
168.76	17.23	---	43.52	26.29	1000.00	120.00	103.00	V	91.00	-13.40	
168.76	---	24.66	---	---	1000.00	120.00	103.00	V	91.00	-13.40	
197.80	---	13.39	---	---	1000.00	120.00	253.00	V	180.00	-14.60	
197.80	7.61	---	43.52	35.91	1000.00	120.00	253.00	V	180.00	-14.60	



Plot 3. 30 MHz-1 GHz, 2402 MHz & 13.56 MHz

4.1.4.3 1 GHz to 18 GHz Data

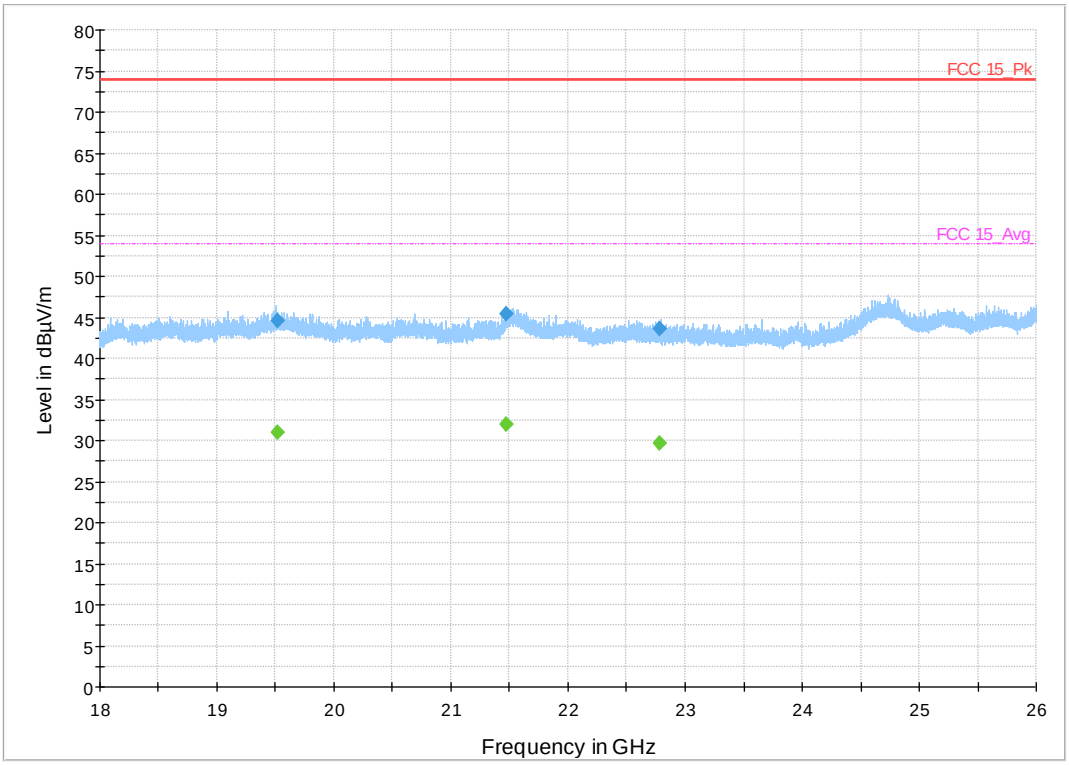
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
4822.61	---	26.68	54.00	27.32	1000.00	1000.00	103.00	H	-180.00	-24.20	
4822.61	39.97	---	74.00	34.03	1000.00	1000.00	103.00	H	-180.00	-24.20	
9609.45	44.88	---	74.00	29.12	1000.00	1000.00	200.00	V	180.00	-16.40	
9609.45	---	31.62	54.00	22.38	1000.00	1000.00	200.00	V	180.00	-16.40	
17945.81	53.50	---	74.00	20.50	1000.00	1000.00	103.00	V	36.00	-6.00	
17945.81	---	40.32	54.00	13.68	1000.00	1000.00	103.00	V	36.00	-6.00	



Plot 4. 1-18 GHz, 2402 MHz & 13.56 MHz

4.1.4.4 18 GHz to 26 GHz Data

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
19514.14	44.56	---	74.00	29.44	1000.00	1000.00	176.00	V	-180.00	11.90	
19514.14	---	31.04	54.00	22.96	1000.00	1000.00	176.00	V	-180.00	11.90	
21471.93	45.48	---	74.00	28.52	1000.00	1000.00	176.00	V	180.00	12.10	
21471.93	---	31.92	54.00	22.08	1000.00	1000.00	176.00	V	180.00	12.10	
22785.64	---	29.66	54.00	24.34	1000.00	1000.00	176.00	H	-180.00	11.80	
22785.64	43.54	---	74.00	30.46	1000.00	1000.00	176.00	H	-180.00	11.80	



Plot 5. 18-26 GHz, 2402 MHz & 13.56 MHz

4.2 AC Conducted Emissions

Testing was performed in accordance with ANSI C63.4: 2014. These test methods are listed under the laboratory's A2LA Scope of Accreditation.

This test measures the levels emanating from the EUT's AC input port, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices.

The AC conducted emissions of equipment under test shall not exceed the values in CFR47 Part 15.207 and RSS-GEN. Sect. 8.8.

4.2.1 Test Methodology

A test program that controls instrumentation and data logging was used to automate the AC Power Line Conducted emission test procedure. The frequency range of interest was divided into sub-ranges such as to yield a frequency resolution of 9 kHz. Each phase and neutral of the AC power line were measured with respect to ground. Measurements were performed using a set of 50µH / 50Ω LISNs.

Testing is performed in Lab1. The setup photographs clearly identify which site was used. The vertical ground plane used in the semi-anechoic chamber is a 2m x 2m solid aluminum frame and panel, and it is bonded to the horizontal ground plane.

In the case of tabletop equipment, the EUT is placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane and 40cm from a vertical ground reference plane. The rear of the EUT was positioned flush with the backside of the table and directly over the LISNs. The power and I/O cables were routed over the edge of the table and bundled approximately 40cm from the ground plane. Support equipment was powered from a separate LISN.

4.2.1.1 Deviations

There were no deviations from this test methodology.

4.2.2 Test Results

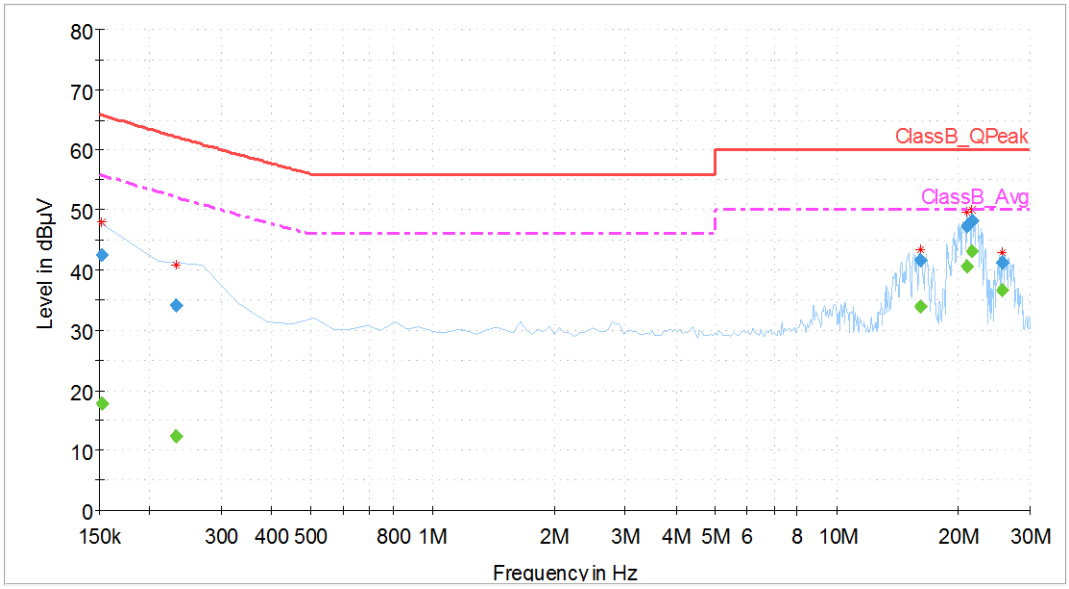
As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Table 2: AC Conducted Emissions – Test Results

Test Conditions: Conducted Measurement at Normal Conditions only, 2402 MHz & 13.56 MHz Tx.		
Antenna Type: PCB trace / Coil antenna	**Power Level:** See Table 6	
AC Power: 120 V_{AC} / 60 Hz	**Configuration:** Tabletop	
Configuration	**Frequency Range**	**Test Result**
Line 1 (Live)	0.15 to 30 MHz	Pass
Line 2 (Neutral)	0.15 to 30 MHz	Pass

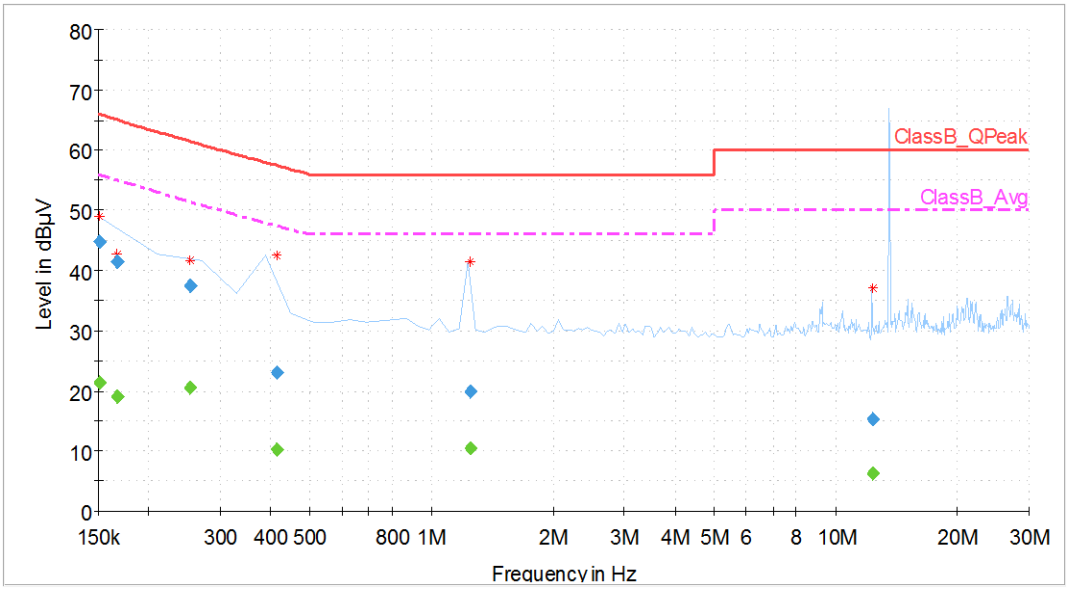
4.7.2.1 0.15 – 30 MHz Live Line

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)	Comment
0.15	---	17.89	55.86	37.97	10000.00	10.00	L1	GND	10.70	
0.15	42.43	---	65.86	23.43	10000.00	10.00	L1	GND	10.70	
0.23	---	12.44	52.12	39.68	10000.00	10.00	L1	GND	9.80	
0.23	34.11	---	62.16	28.05	10000.00	10.00	L1	GND	9.80	
16.13	---	34.00	50.00	16.00	10000.00	10.00	L1	GND	9.80	
16.13	41.75	---	60.00	18.25	10000.00	10.00	L1	GND	9.80	
20.98	---	40.60	50.00	9.40	10000.00	10.00	L1	GND	9.80	
20.98	47.43	---	60.00	12.57	10000.00	10.00	L1	GND	9.80	
21.58	---	43.19	50.00	6.81	10000.00	10.00	L1	GND	9.80	
21.58	48.11	---	60.00	11.89	10000.00	10.00	L1	GND	9.80	
25.71	---	36.65	50.00	13.35	10000.00	10.00	L1	GND	9.80	
25.71	41.16	---	60.00	18.84	10000.00	10.00	L1	GND	9.80	



Note: The transmitter fundamental 13.56 MHz band antenna was terminated.

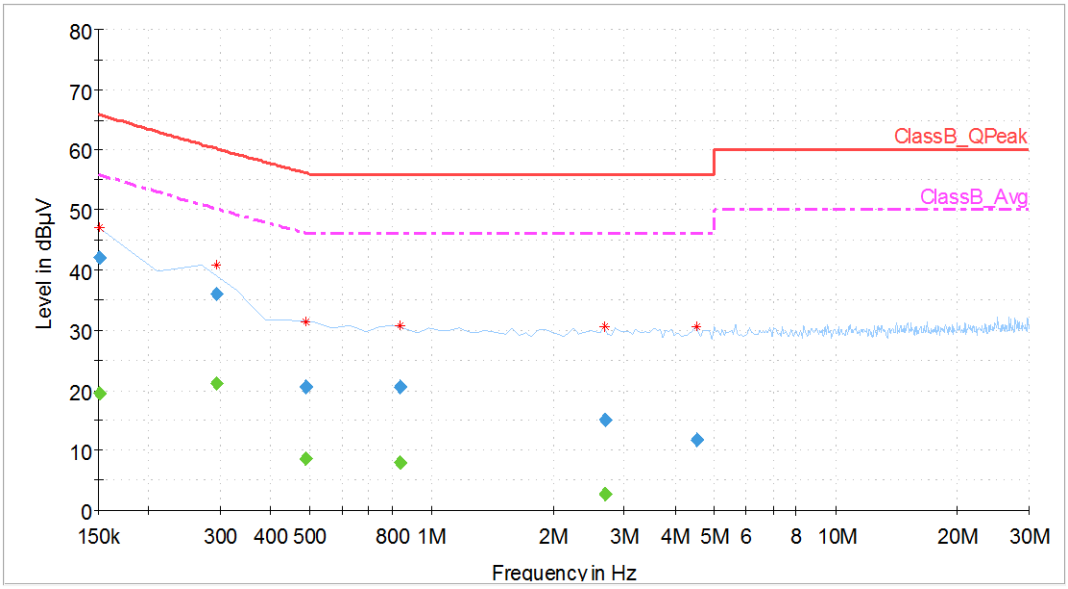
Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)	Comment
0.15	---	21.28	55.91	34.63	10000.00	10.00	L1	GND	10.80	
0.15	44.92	---	65.91	20.99	10000.00	10.00	L1	GND	10.80	
0.17	---	18.98	55.01	36.04	10000.00	10.00	L1	GND	10.10	
0.17	41.46	---	65.03	23.56	10000.00	10.00	L1	GND	10.10	
0.25	---	20.60	51.41	30.81	10000.00	10.00	L1	GND	9.80	
0.25	37.51	---	61.45	23.94	10000.00	10.00	L1	GND	9.80	
0.42	---	10.36	47.42	37.06	10000.00	10.00	L1	GND	9.70	
0.42	22.95	---	57.44	34.49	10000.00	10.00	L1	GND	9.70	
1.25	---	10.40	46.00	35.60	10000.00	10.00	L1	GND	9.70	
1.25	19.98	---	56.00	36.02	10000.00	10.00	L1	GND	9.70	
12.34	---	6.29	50.00	43.71	10000.00	10.00	L1	GND	9.80	
12.34	15.35	---	60.00	44.65	10000.00	10.00	L1	GND	9.80	



Note: The emission over average and quasi peak limit is in-band emission at 13.56 MHz meet FCC Class B limit.

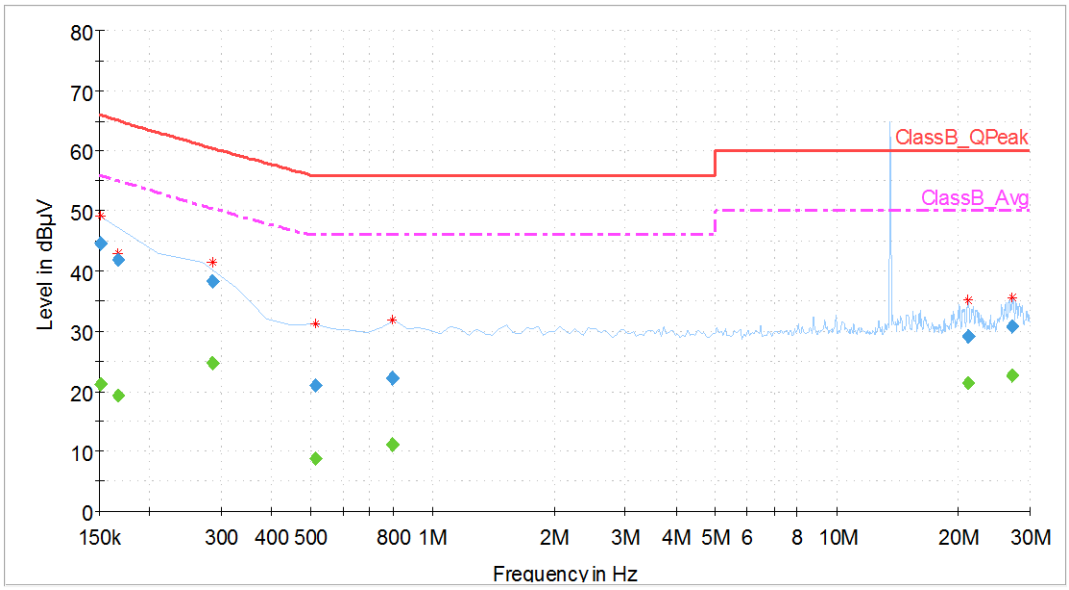
4.7.2.2 0.15 – 30 MHz Neutral Line

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)	Comment
0.15	---	19.51	55.91	36.39	10000.00	10.00	N	GND	10.60	
0.15	42.03	---	65.91	23.88	10000.00	10.00	N	GND	10.60	
0.29	---	21.24	50.15	28.91	10000.00	10.00	N	GND	9.70	
0.29	36.08	---	60.19	24.11	10000.00	10.00	N	GND	9.70	
0.49	---	8.58	46.19	37.61	10000.00	10.00	N	GND	9.60	
0.49	20.61	---	56.19	35.58	10000.00	10.00	N	GND	9.60	
0.83	---	7.98	46.00	38.02	10000.00	10.00	N	GND	9.70	
0.83	20.49	---	56.00	35.51	10000.00	10.00	N	GND	9.70	
2.70	---	2.73	46.00	43.27	10000.00	10.00	N	GND	9.70	
2.70	15.00	---	56.00	41.00	10000.00	10.00	N	GND	9.70	
4.54	---	-0.06	46.00	46.06	10000.00	10.00	N	GND	9.70	
4.54	11.66	---	56.00	44.34	10000.00	10.00	N	GND	9.70	



Note: The transmitter fundamental 13.56 MHz band antenna was terminated.

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)	Comment
0.15	---	21.12	55.96	34.84	10000.00	10.00	N	GND	10.70	
0.15	44.68	---	65.96	21.28	10000.00	10.00	N	GND	10.70	
0.17	---	19.22	55.00	35.78	10000.00	10.00	N	GND	10.00	
0.17	41.79	---	65.02	23.23	10000.00	10.00	N	GND	10.00	
0.29	---	24.69	50.40	25.70	10000.00	10.00	N	GND	9.70	
0.29	38.31	---	60.44	22.13	10000.00	10.00	N	GND	9.70	
0.52	---	8.90	46.00	37.10	10000.00	10.00	N	GND	9.70	
0.52	21.01	---	56.00	34.99	10000.00	10.00	N	GND	9.70	
0.79	---	11.16	46.00	34.84	10000.00	10.00	N	GND	9.70	
0.79	22.19	---	56.00	33.81	10000.00	10.00	N	GND	9.70	
21.05	---	21.45	50.00	28.55	10000.00	10.00	N	GND	10.10	
21.05	29.13	---	60.00	30.87	10000.00	10.00	N	GND	10.10	
27.13	---	22.62	50.00	27.38	10000.00	10.00	N	GND	10.30	
27.13	30.88	---	60.00	29.12	10000.00	10.00	N	GND	10.30	



Notes: The emission over average and quasi peak limit is in-band emission at 13.56 MHz meet FCC Class B limit.

5 Test Equipment List

5.1 Equipment List

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal mm/dd/yyyy	Next Cal mm/dd/yyyy
EMI Receiver	R&S	ESW, 2Hz-44GHz	838399	1/10/2019	1/10/2021
Preamplifier, 9 kHz – 1 GHz	Sonoma	310N	213221	8/6/2020	8/6/2022
Bilog Antenna	Sunol Sciences	JB3	A061907	12/19/2018	12/19/2020
Preamp, 1-10 GHz	HP	8449B	3008A01013	6/8/2020	6/8/2022
Preamplifier, 1-18GHz	Miteq	AMF-70-01001800-30-10P-L	2074297	1/16/2019	1/16/2021
Pre-Amp/Antenna	Rohde & Schwarz	TS-PR40	100012	6/13/2020	6/13/2022
Pre-Amp/Antenna	Rohde & Schwarz	TS-PR26	100011	6/13/2020	6/13/2022
Horn Antenna	Sunol Sciences	DRh-118	A040806	6/17/2020	6/17/2022
Active Loop Antenna	EMCO	6502	00062531	07/01/2019	07/01/2021
Amplifier	Sonoma	310N	185516	N/A (See Note)	
1.6 GHz Low Pass Filter	K&L Microwave	8L120-X1600-0/09135-0249	UA691-35	N/A (See Note)	
3.5 GHz High Pass Filter	Hewlett Packard	84300-80038	820004	N/A (See Note)	
2.4 GHz Notch Filter	Micro-Tronics	BRM50702	009	01/15/2020	01/15/2021

Calibration of equipment past due for re-calibration will be performed expeditiously. If any equipment is found to be out of tolerance at that time, affected customers will be notified accordingly.

NA = Equipment is characterized before use.

6 EMC Test Plan

6.1 Introduction

This section provides a description of the Equipment Under Test (EUT), configurations, operating conditions, and performance acceptance criteria. It is an overview of information provided by the manufacturer so that the test laboratory may perform the requested testing.

6.2 Customer

Table 3: Customer Information

Company Name	SoClean Inc.
Address	12 Vose farm road
City, State, Zip	Petersborough, NH, 03458
Country	USA

Table 4: Technical Contact Information

Name	Alex Wang
E-mail	awang@baycomp.com

6.3 Equipment Under Test (EUT)

The information provided in the following table should be listed as it should appear in the final report. For those products that have only a model name, list the model number as *non-applicable* and vice-versa.

Table 5: EUT Designation

Product Name	SoClean 3
Model Number	SC1400
System Name	SoClean 3
Product Description	The SoClean 3 is a CPAP cleaner and sanitizing machine.

6.4 Product Specifications

Table 6: EUT Specifications

EUT Specifications	
AC Input	AC/DC medical wall wart 120VAC-240VAC in 12V nominal 10-14V out
Environment	Indoor
Operating Temperature Range:	10°C - 38°C
Multiple Feeds:	☐ Yes and how many ☒ No
Product Marketing Name (PMN)	SoClean 3
Hardware Version Identification Number (HVIN)	Rev 10
Firmware Version Identification Number (FVIN)	1.1.5
RF Test Software Version	1.1.5
Operating Modes	BT Low Energy, 1Mbps RFID
Transmitter Frequency Band	2.4 GHz – 2.480 GHz
Power Setting @ Operating Channel	BLE: 0dBm RFID: 27 mW
Modulation	BLE: FSK, RFID: AM ASK
TX/RX Chain (s)	N/A
Type of Equipment	☒ Table Top ☐ Wall-mount ☐ Floor standing cabinet ☐ Other:
Note: EUT will be on / transmitted at all times with the highest power levels and antenna gains per channel.	

Table 7: Antenna Information

Number	Antenna Type	Description	Max Gain (dBi)
Antenna 0	PCB trace antenna	Bluetooth Low Energy	0
Antenna 1	Integral coil antenna	RFID	0

Table 8: Interface Specifications

Interface Type	Cabled with what type of cable?	Is the cable shielded?	Maximum potential length of the cable?	Metallic (M), Coax (C), Fiber (F), or Not Applicable?
USB	USB	Yes	< 3m	M

Table 9: Accessory Equipment

Equipment	Manufacturer	Model	Serial	Comment
N/A	N/A	N/A	N/A	N/A

Table 10: Ancillary Equipment (used for test purposes only)

Equipment	Manufacturer	Model	Serial	Used for
Laptop	Dell	Inspiron 15-5548	N/A	Setup EUT operating modes/ channels via a USB connection to pins in EUT
Note: None.				

Table 11: Description of Sample used for Testing

Sample Number	Device	Serial Number	Configuration	Used For
1	SC1400	SC140019070110007	Radiated/ Conducted Sample	TX Spurious Emissions
2	SC1400	SC1400200401100002	Radiated/ Conducted Sample	AC Mains Conducted Emissions
Note: None.				

Table 12: Description of Test Configuration used for Radiated Measurement.

Device	Antenna	Mode	Setup Photo (X-Axis)	Setup Photo (Y-Axis)	Setup Photo (Z-Axis)
SC1400	Integral coil antenna	Transmit	EUT upright	N/A	N/A
Note:					

6.5 Test Specifications

Table 13: Test Specifications

Emissions and Immunity	
Standard	**Requirement**
CFR 47 Part 15.247, 15.209: 2020	All
RSS 247 Issue 2, 2017	All

END OF REPORT