TEST REPORT

Report Number: 103770502MPK-001
Project Number: G103770502
August 16, 2019

Testing performed on the
Haws Electronic Water Cooler
Model(s) Tested: 1202SF & 1212SF
Model(s) Not Tested but declared equivalent by the client: 1201SF & 1211SF

FCC ID: 2AUAN-1200SF
IC: 25359-1200SF

to

FCC Part 15 Subpart C (15.225)
Industry Canada RSS-210 Issue 9

For

Haws Corporation

Test Performed by:	Test Authorized by:
Intertek	Haws Corporation
1365 Adams Court	1455 Kleppe Ln
Menlo Park, CA 94025 USA	Sparks, NV 89432 USA

Prepared by: _____ **Date:** August 16, 2019
Minh Ly

Reviewed by: _____ **Date:** August 16, 2019
Krishna Vemuri

Report No. 103770502MPK-001	
Equipment Under Test:	Haws Electronic Water Cooler
Trade Name:	Haws Corporation
Model(s) Tested:	1202SF & 1212SF
Model(s) Not Tested but declared equivalent by the client:	1201SF & 1211SF
Applicant:	Haws Corporation
Contact:	Sam Hong
Address:	Haws Corporation 1455 Kleppe Ln Sparks, NV 89432 USA
Country:	USA
Tel. Number:	(775) 772-9235
Email:	samh@hawsco.com
Applicable Regulation:	FCC Part 15 Subpart C (15.247) Industry Canada RSS-247 Issue 2
Date of Test:	July 30 – August 02, 2019

We attest to the accuracy of this report:

Minh Ly
Project Engineer

Krishna K Vemuri
Engineering Team Lead

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1.0 Summary of Tests

TEST	REFERENCE FCC 15.225	REFERENCE RSS-210	RESULTS
Field Strength of Fundamental	15.225(a)	B.6	Complies
Radiated Emissions Outside the band	15.225(b), 15.225(c), 15.225(d), 15.209	B.6	Complies
Frequency Tolerance of the Carrier	15.225(e)	B.6	Complies
Line Conducted Emissions	15.207	RSS-GEN	Complies
Occupied Bandwidth	15.215	RSS-GEN	Complies
Antenna requirement	15.203	RSS-GEN	Complies[1]

[1] EUT utilizes an internal Antenna.

2.0 General Description

2.1 Product Description

Haws Corporation supplied the following description of the EUT:

The Equipment Under Test is a wall mounted, ADA, stainless steel electric water cooler with filtration, hi-low, and bottle filler options.

Overview of the EUT

Models	1202SF 1212SF
FCC Identifier	2AUAN-1200SF
IC Identifier	25359-1200SF
Operating Frequency	13.56MHz
Number of Channels	1
Type of Modulation	OOK
Operating Temperature	-20°C to +50°C
Antenna Type	Internal Loop Antenna
Applicant name & address	Haws Corporation 1455 Kleppe Ln Sparks, NV 89432

EUT receive date: July 30, 2019
EUT receive condition: The EUT was received in good condition with no apparent damage. As declared by the Applicant it is identical to the production units.
Test start date: July 30, 2019
Test completion date: August 02, 2019

2.2 Related Submittal(s) Grants

None

2.3 Test Methodology

Both AC mains line-conducted and radiated emissions measurements were performed according to the procedures in ANSI C63.4. Radiated tests were performed at an antenna to EUT distance of 10 meters, unless stated otherwise in this test report. All other measurements were made in accordance with the procedures in part 2 of CFR 47 7, ANSI C63.10: 2013, ANSI C63.4-2014 & RSS-GEN Issue 5.

2.4 Test Facility

The radiated emission test site and conducted measurement facility used to collect the data is 10m semi-anechoic chamber located in Menlo Park, California. This test facility and site measurement data have been fully placed on file with the FCC and Industry Canada (Site # 2042L-1).

2.5 Measurement Uncertainty

Compliance with the limits was based on the results of the measurements and doesn't take into account the measurement uncertainty.

Estimated Measurement Uncertainty

Measurement	Expanded Uncertainty (k=2)		
	0.15 MHz – 1 GHz	1 GHz – 2.5 GHz	> 2.5 GHz
RF Power and Power Density – antenna conducted	-	0.7 dB	-
Unwanted emissions - antenna conducted	1.1 dB	1.3 dB	1.9 dB
Bandwidth – antenna conducted	-	30 Hz	-

Measurement	Expanded Uncertainty (k=2)		
	0.15 MHz – 30MHz	30 MHz – 1 GHz	1 GHz – 18 GHz
Radiated emissions	-	4.7	5.1 dB
AC mains conducted emissions	2.1 dB	-	-

3.0 System Test Configuration

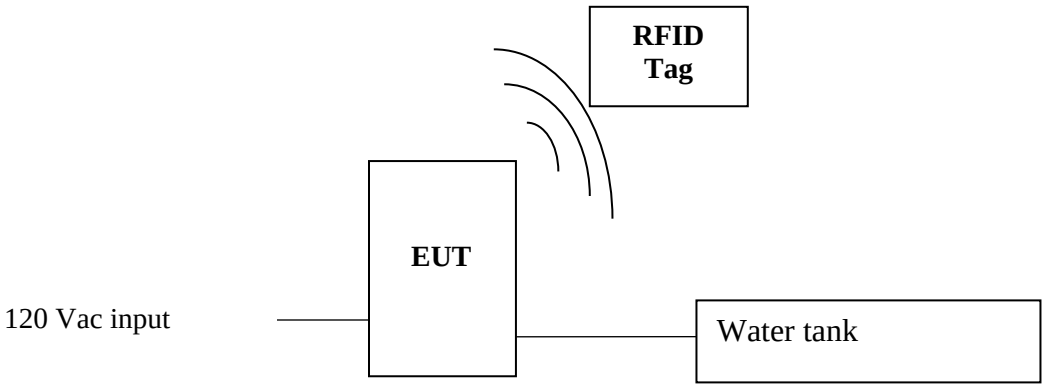
3.1 Support Equipment and description

Support Equipment		
Description	**Manufacturer**	**Model Number**
Water Tank	Not Listed	Not listed

3.2 Block Diagram of Test Setup

Equipment Under Test			
Description	**Manufacturer**	**Model**	**Serial Number**
Electric water cooler	Haws Corporation.	1202SF	MPK1907311131-002
Electric water cooler	Haws Corporation.	1212SF	MPK1907311131-001

3.2 Block Diagram of Test Setup (Continued)



S = Shielded **U** = Unshielded	**F** = With Ferrite **m** = Length in Meters

3.3 Justification

For radiated emission measurements the EUT is placed on a non-conductive table. The EUT was configured to continuously transmit and looking for tags. The highest clock frequency used in the EUT is less than 48MHz. The RFID radio is identical in all the models listed. Field strength and radiated emission were performed on both 1202SF and 1212SF models to show compliance.

Per manufacture:

- Model 1201SF is the same as model 1202SF. Model 1202SF includes the addition of the high unit.
- Model 1211SF is the same as model 1212SF. Model 1212SF includes the addition of the high unit.

Model: 1202SF

Model: 1212SF

3.4 Software Exercise Program

The EUT exercise program used during testing was provided by Haws Corporation.

3.5 Mode of Operation during test

The EUT was constantly broadcasting a 13.56 MHz signal while reading an RFID tag. Also, a water tank is hook up to provide the water at the water input line. The push button is pushed in during the test to keep the constant water stream from the dispenser.

3.6 Modifications required for Compliance

No Modifications were made e to bring the EUT into compliance.

3.7 Additions, deviations and exclusions from standards

No additions, deviations or exclusion have been made from standard.

4.0 Measurement Results

4.1 Field Strength of Fundamental and Radiated Emissions Outside the band

4.1.1 Requirements

FCC Rules 15.225, 15.209

a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter (84 dBuV) 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.

§15.209 Radiated emission limits; general requirements.

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

4.1.2 Procedure

Radiated Measurements Below 30 MHz

During the test the EUT is rotated and the measuring antenna angles are varied during the search for maximum signal level.

Radiated emissions are taken at ten meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Measurements for below 30 MHz were performed at 10 meters. Data results below are corrected for distance at 10m. Limits were normalized to 10 meters.

Radiated Measurements Above 30 MHz

During the test the EUT is rotated and the measuring antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at ten meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Measurements for above 30 MHz were made at 10 meters.

Radiated emission measurements were performed from 9kHz to 1 GHz.
Analyzer resolution is:

200Hz or greater for 9kHz to 150kHz
9 kHz or greater for 150kHz to 30 MHz
120 kHz or greater for 30MHz to 1000 MHz
For those frequencies quasi-peak detector applies

Data includes of the worst-case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation is as follows:

FS = RA + AF + CF – AG – DCF

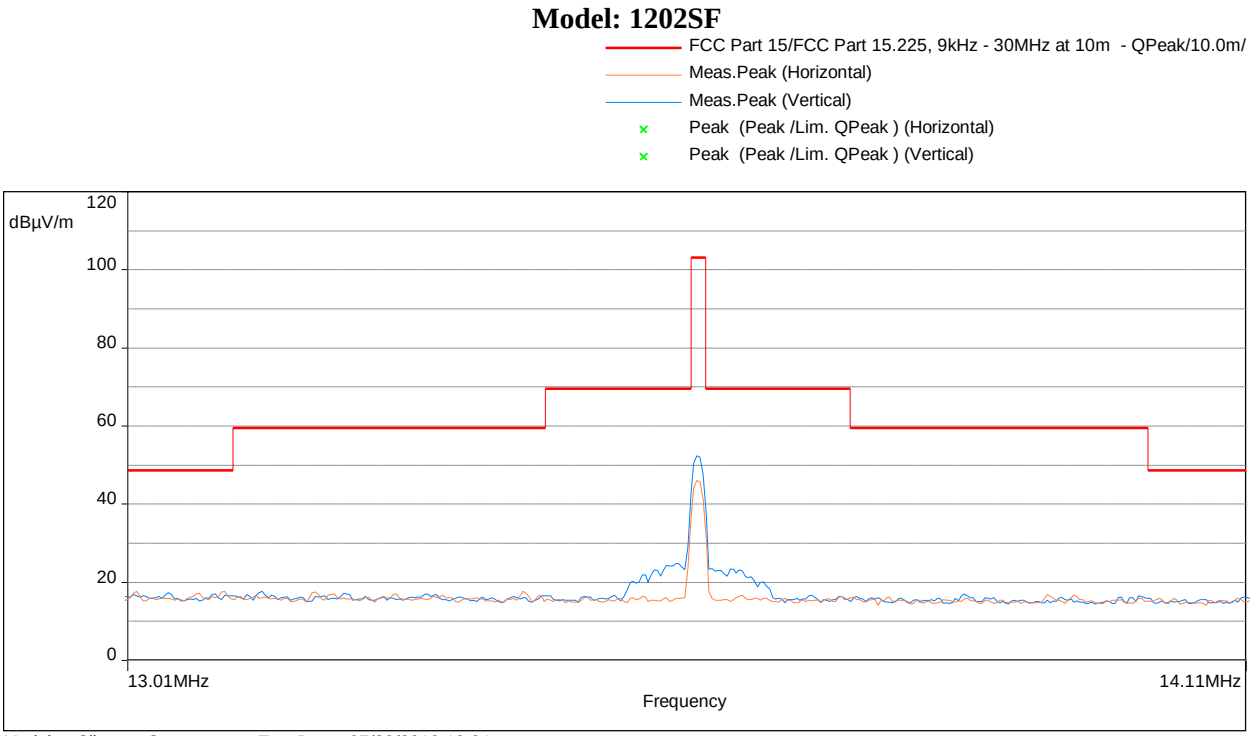
Where FS = Field Strength in dB (μV/m)

RA = Receiver Amplitude (including preamplifier) in dB (μV)
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB (1/m)
AG = Amplifier Gain in dB
DCF = Distance Correction Factor

Note: FS was measured with loop antenna below 30MHz

4.1.3 Test Results

The data below shows the significant emission frequencies, the limit and the margin of compliance.
Note: Measurements were performed at parallel and perpendicular orientation of loop antenna. The worst-case data was presented below.

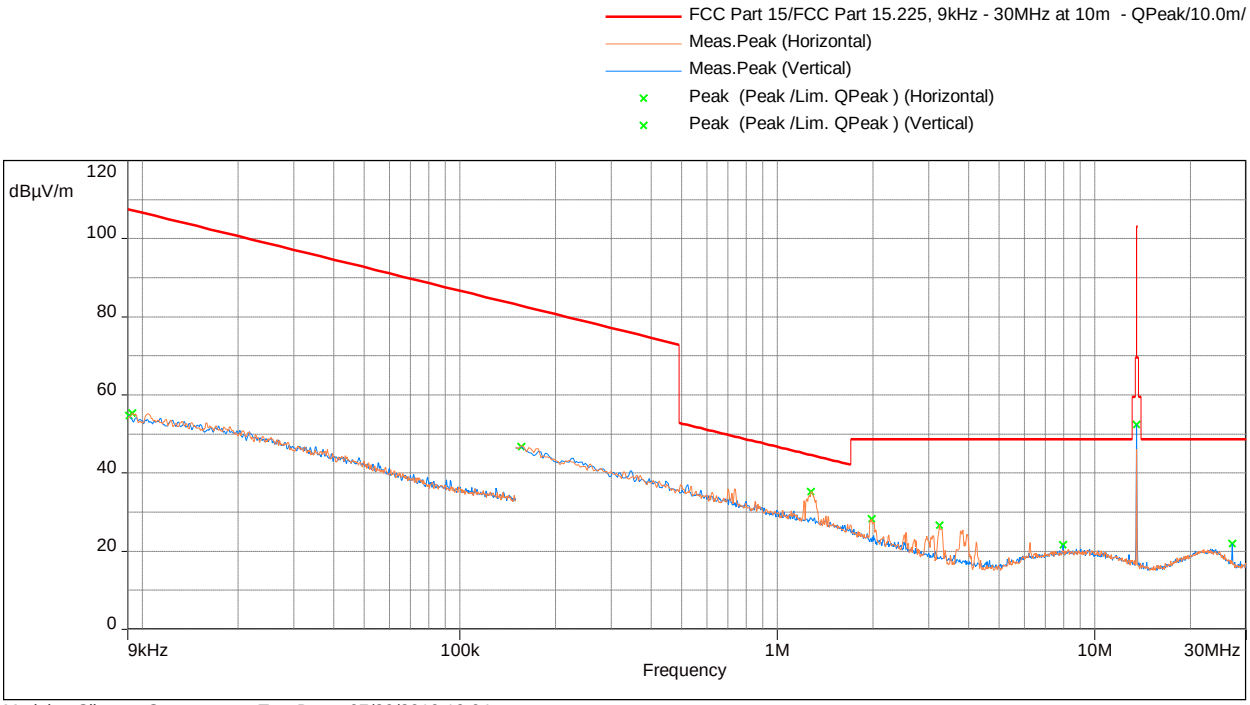


Frequency	Corrected Peak FS @10m	Limit @10m	Margin	RA@10m	Correction
(MHz)	dB(µV/m)	dB(µV/m)	dB	dB(uV)	dB
13.56	52.5	103.1	-50.7	49.2	3.3

Note: Correction = AF+CF–AG

4.1.3 Test Result (Continued)

***Radiated Spurious Emissions from 9 kHz to 30MHz,* Model: 1202SF**



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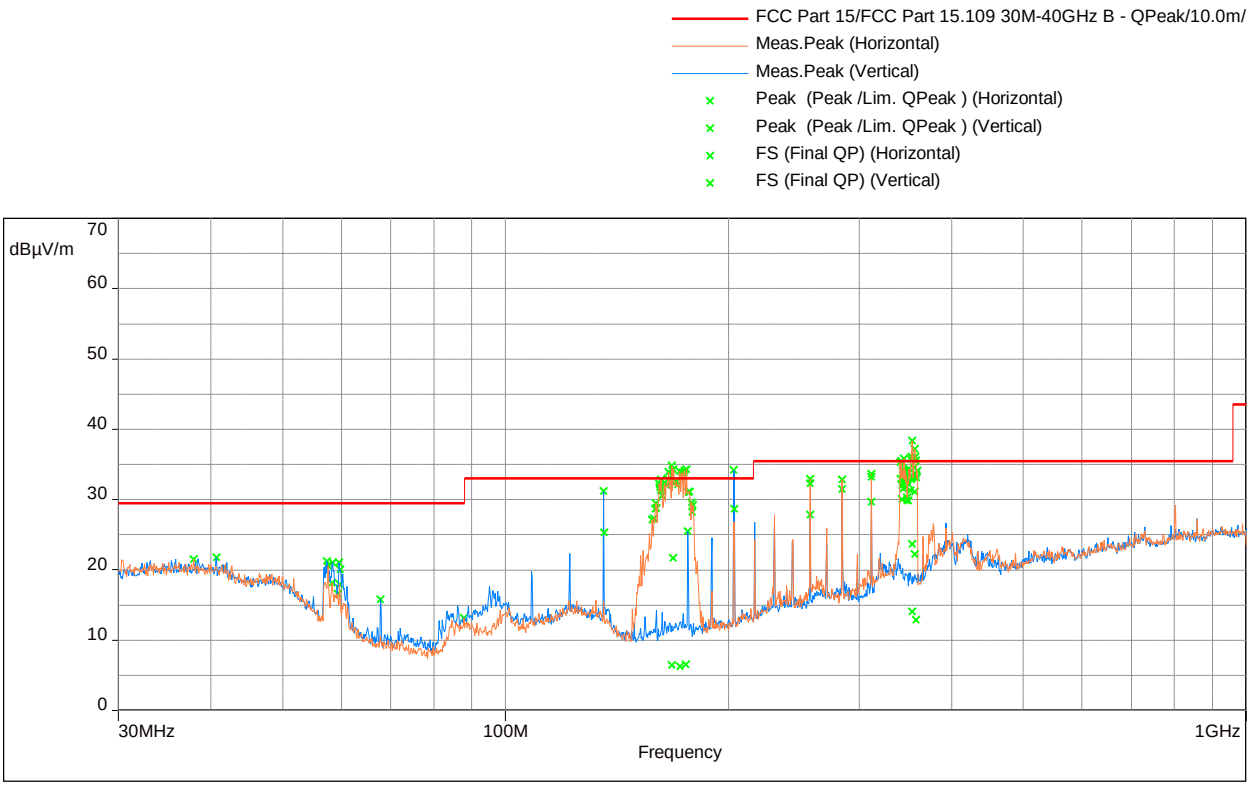
4.1.3 Test Result (Continued)

***Radiated Spurious Emissions from 30 MHz to 1000 MHz,* Model: 1202SF**



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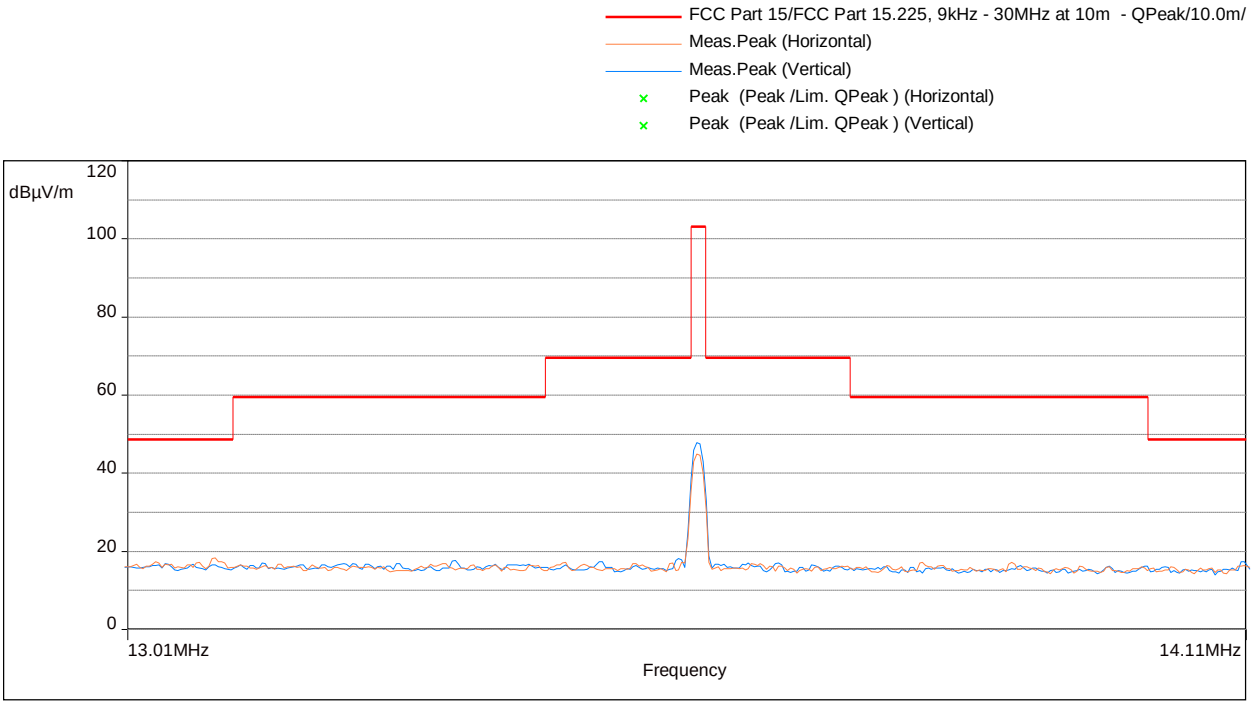
Frequency (MHz)	QP FS (dBµV/m) @10m	Lim. QPeak (dBµV/m) @10m	Margin (dB)	Height (m)	Angle (°)	Polarity	Correction (dB)
167.754	6.4	33.0	-26.6	136.5	4.0	Horizontal	21.7
168.222	21.7	33.0	-11.3	144.0	3.8	Horizontal	36.9
171.934	6.3	33.0	-26.7	139.0	3.4	Horizontal	21.0
175.137	6.5	33.0	-26.5	116.8	4.0	Horizontal	21.2
257.627	32.3	35.5	-3.2	137.0	3.2	Horizontal	43.6
311.864	33.2	35.5	-2.3	149.8	3.3	Horizontal	43.1
353.632	14.1	35.5	-21.5	102.5	1.7	Horizontal	23.0
354.180	23.7	35.5	-11.8	168.0	2.3	Horizontal	32.6
356.786	22.2	35.5	-13.3	154.3	3.2	Horizontal	31.1
357.947	12.9	35.5	-22.6	109.0	1.9	Horizontal	21.7
135.789	25.3	33.0	-7.7	321.3	1.2	Vertical	39.0
203.394	28.7	33.0	-4.3	30.8	2.7	Vertical	43.0
Results: **Complies** by 2.3 dB							

4.1.3 Test Result (Continued)

Model: 1212SF



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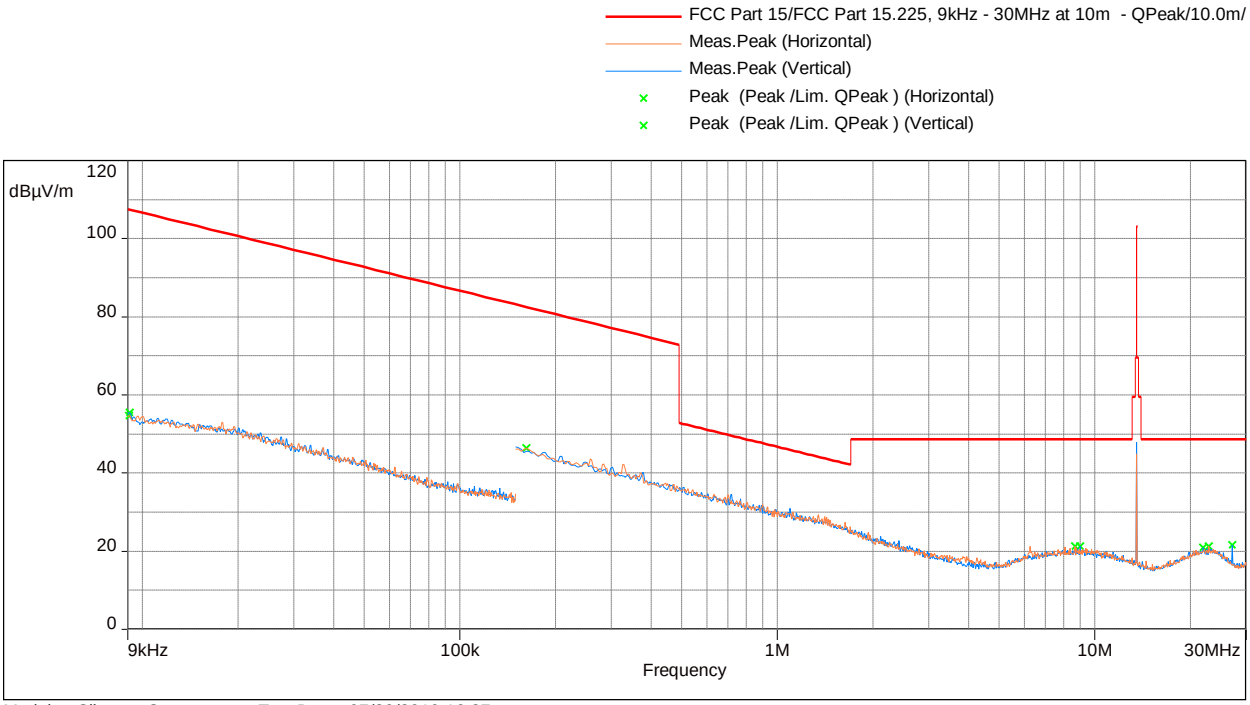
Frequency	Corrected Peak FS @10m	Limit @10m	Margin	RA@10m	Correction
(MHz)	dB(µV/m)	dB(µV/m)	dB	dB(uV)	dB
13.56	47.9	103.1	-55.2	44.6	3.3

Note: Correction = AF+CF–AG

4.1.3 Test Result (Continued)

***Radiated Spurious Emissions from 9 kHz to 30MHz,* Model: 1212SF**



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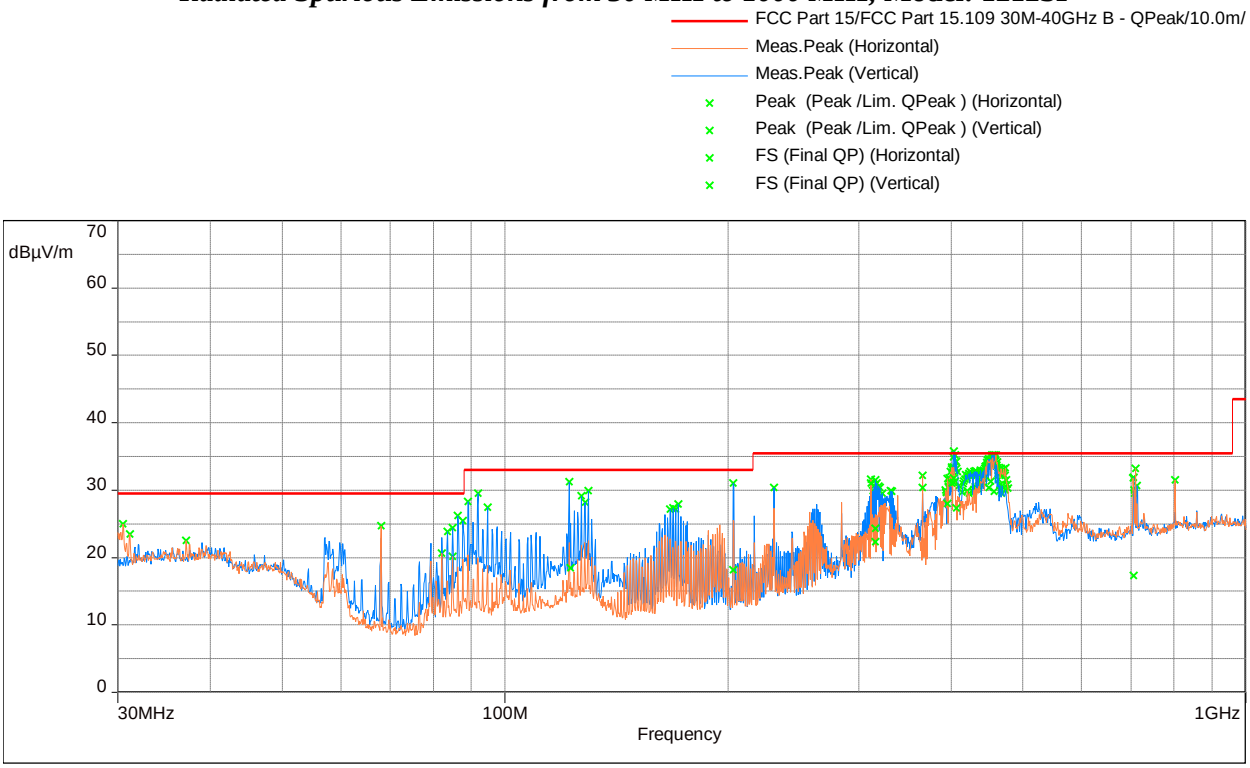
4.1.3 Test Result (Continued)

***Radiated Spurious Emissions from 30 MHz to 1000 MHz*, Model: 1212SF**



Model: ; Client: ; Comments: ; Test Date: 07/30/2019 14:13

Frequency (MHz)	QP FS (dBµV/m) @10m	Lim. QPeak (dBµV/m) @10m	Margin (dB)	Height (m)	Angle (°)	Polarity	Correction (dB)
122.542	18.5	33.0	-14.5	168.0	2.5	Vertical	30.8
203.384	18.2	33.0	-14.8	104.0	2.7	Vertical	32.5
311.866	31.0	35.5	-4.5	53.8	2.5	Horizontal	40.9
315.926	22.3	35.5	-13.2	162.8	3.1	Vertical	32.1
316.175	24.3	35.5	-11.2	130.8	2.7	Vertical	34.1
366.114	30.4	35.5	-5.2	145.5	2.4	Horizontal	38.5
395.229	28.1	35.5	-7.5	98.0	2.5	Horizontal	35.7
400.881	31.0	35.5	-4.5	155.3	2.4	Horizontal	38.4
403.629	31.1	35.5	-4.4	156.8	2.9	Horizontal	38.4
403.667	31.8	35.5	-3.7	157.0	3.0	Vertical	39.1
406.415	27.4	35.5	-8.2	0.0	2.5	Vertical	34.5
449.899	30.4	35.5	-5.1	289.5	2.9	Vertical	36.9
452.306	31.3	35.5	-4.2	76.8	1.5	Horizontal	37.7
456.646	29.8	35.5	-5.7	291.0	3.5	Vertical	36.2
706.103	17.3	35.5	-18.2	121.5	1.7	Vertical	20.1
Results: **Complies** by 3.7 dB							

4.1.4 Test Configuration Photographs

The following photographs show the testing configurations used.

Model: 1202SF

Electromagnetic Radiated Disturbance Setup Photograph

4.1.5 Test Configuration Photographs (Continued)

Model: 1202SF

4.1.5 Test Configuration Photographs (Continued)

Model: 1212SF

4.1.5 Test Configuration Photographs (Continued)

Model: 1212SF

4.2 Frequency Tolerance

4.2.1 Requirement

FCC 15.225 (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.

4.2.2 Procedure

The RFID radio was placed in the temperature chamber. The frequency counter was connected to the transmitter output. For each temperature, the carrier frequency was recorded.

4.2.3 Test Results

Voltage (AC)	Temperature (C)	Measured Frequency (Hz)	Deviation from Reference (Hz)	Deviation (%)
120	50	13559551	96	0.00071
120	40	13559583	64	0.00047
120	30	13559679	32	0.00024
120	20	13559647	0	0.00000
120	10	13559647	0	0.00000
120	0	13559775	128	0.00094
120	-10	13559711	64	0.00047
120	-20	13559743	96	0.00071
Voltage (AC)	**Temperature (C)**	**Measured Frequency (Hz)**	**Deviation from Reference (Hz)**	**Deviation (%)**
102	20	13559639	8	0.00006
138	20	13559639	8	0.00006

Nominal Frequency @ 20C, 120VAC: 13559647 Hz

4.3 Occupied Bandwidth
FCC 15.215

4.3.1 Requirements

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257, 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. 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.

4.3.2 Procedure

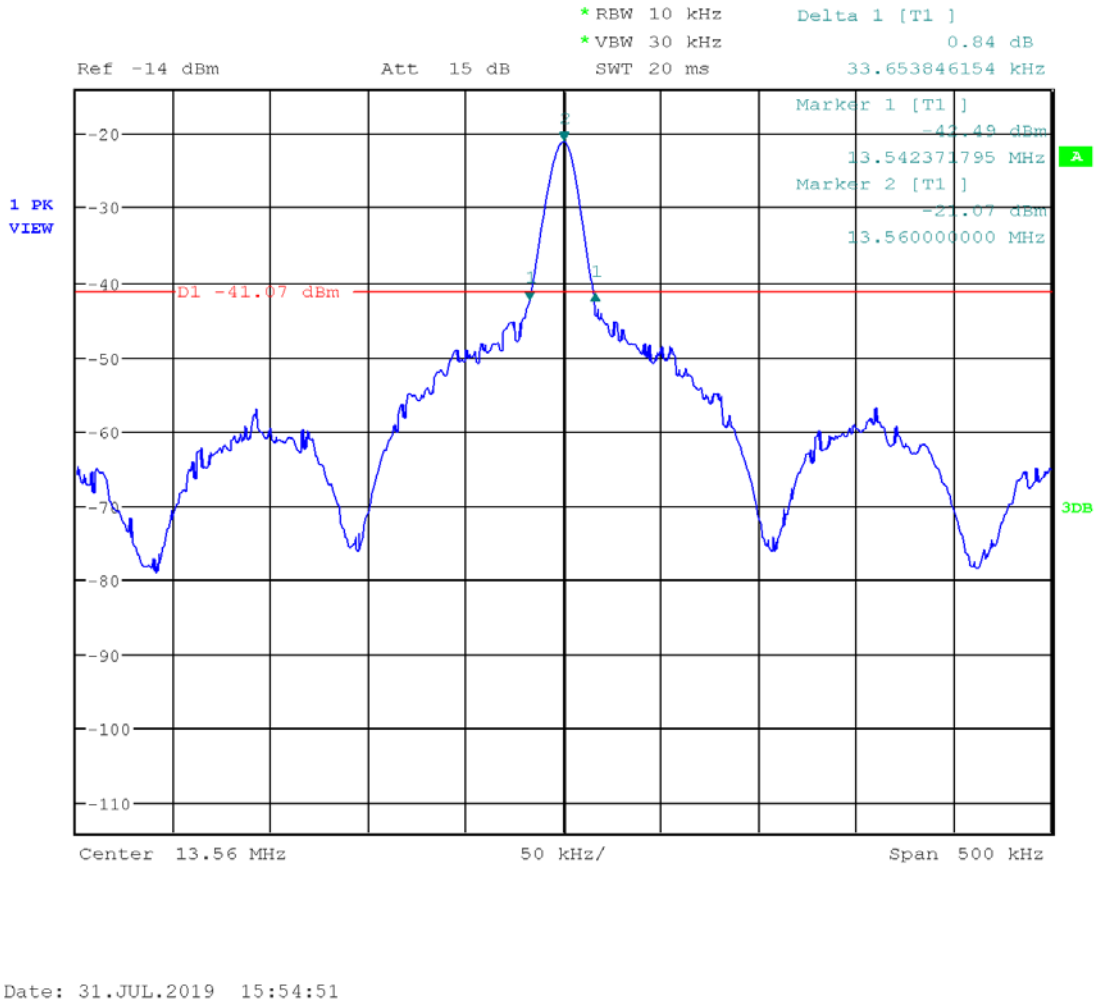
The EUT was setup to transmit in normal operating condition.

Measurements were made with the loop antenna in close proximity of the EUT. Following the procedures of ANSI 63.10, the 20dB bandwidth measurements were taken. The following plots show Occupied Bandwidth.

4.3.3 Test Results

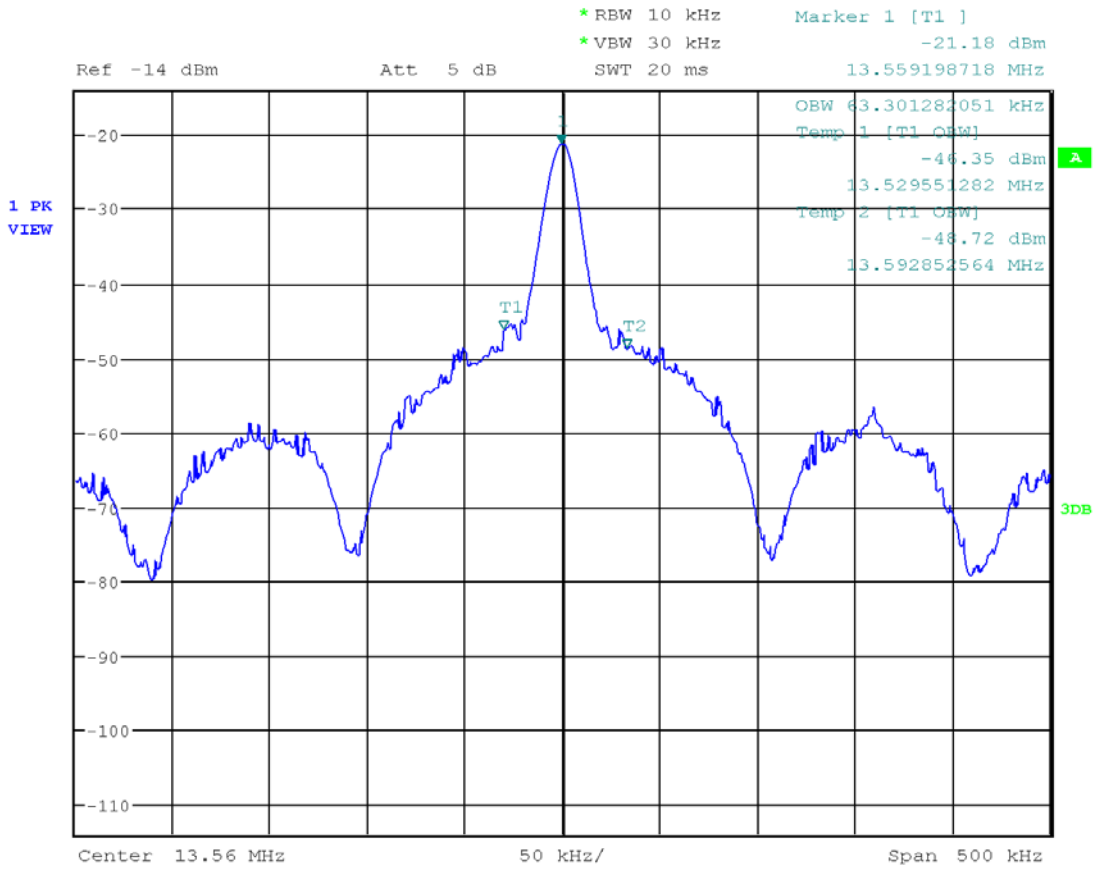
Frequency (MHz)	20-dB Channel Bandwidth (kHz)	99% Channel Bandwidth (kHz)
13.56	33.6	63.3

20-dB Channel Bandwidth



4.3.3 Test Results (Continued)

99% Channel Bandwidth



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4.4 AC Line Conducted Emission
FCC Rule 15.207

4.4.1 Requirement

Frequency Band MHz	15.207 Limit dB(μV)	
	Quasi-Peak	Average
0.15-0.50	66 to 56 *	56 to 46 *
0.50-5.00	56	46
5.00-30.00	60	50

*Note: *Decreases linearly with the logarithm of the frequency. At the transition frequency the lower limit applies.*

4.4.2 Procedure

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Floor standing EUT are placed on a horizontal metal ground plane and isolated from the ground plane by resting on an insulating material. The metal ground plane extends at least 0.5m beyond the boundaries of the EUT and has minimum dimensions of 2m by 2m.

EUT was placed in transmission mode then tested for conducted emissions per 15.207 to ensure the device complies with 15.207 outside the transmitter fundamental emissions band. After, the EUT antenna is removed from the EUT and only the fundamental emission band was measured to show that the fundamental emission band is in compliance with the 15.207 limits.

Equipment setup for conducted disturbance tests followed.

4.4.3 Test Result

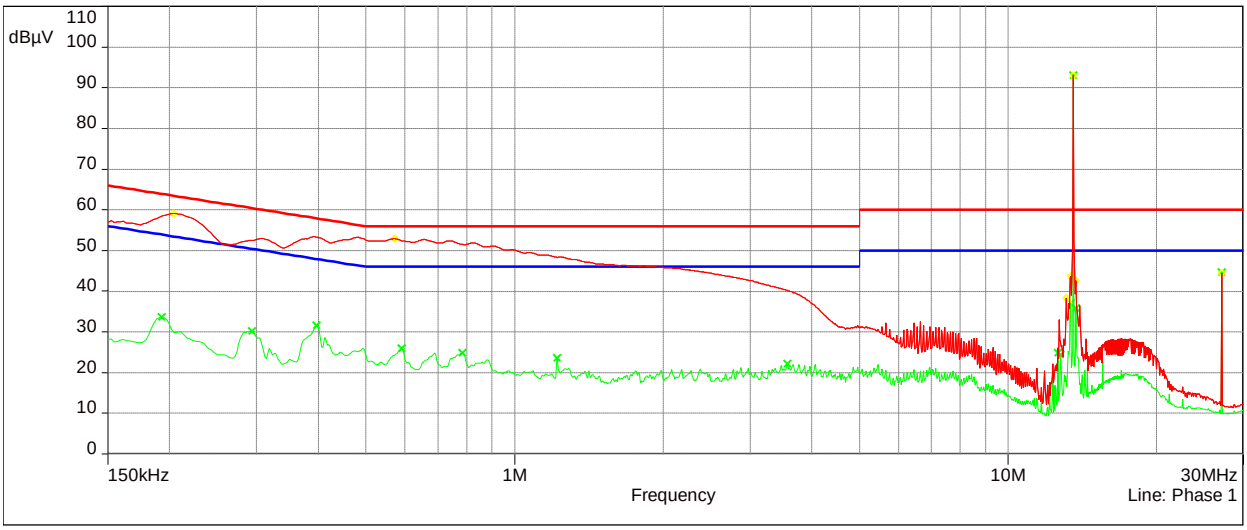
Measured with RFID Antenna

Model: 1202SF

Line 1

Sub-range 1
Frequencies: 150 kHz - 30 MHz (Mode: - Step: 2.25 kHz)
Settings: RBW: 9kHz, VBW: 30kHz, Sweep time: 1e+03 ms, Attenuation: 10 dB, Sweep count 3, Preamp: Off, LN Preamp: Off, Preselector: On
Line: Phase 1

FCC Part 15/FCC Part 15.107 B - Average/
FCC Part 15/FCC Part 15.107 B - QPeak/
Meas.QPeak (Phase 1)
Mes. CISPR AVG (Phase 1)
QPeak (QPeak /Lim. QPeak) (Phase 1)
CISPR AVG (CISPR AVG /Lim. Average) (Phase 1)



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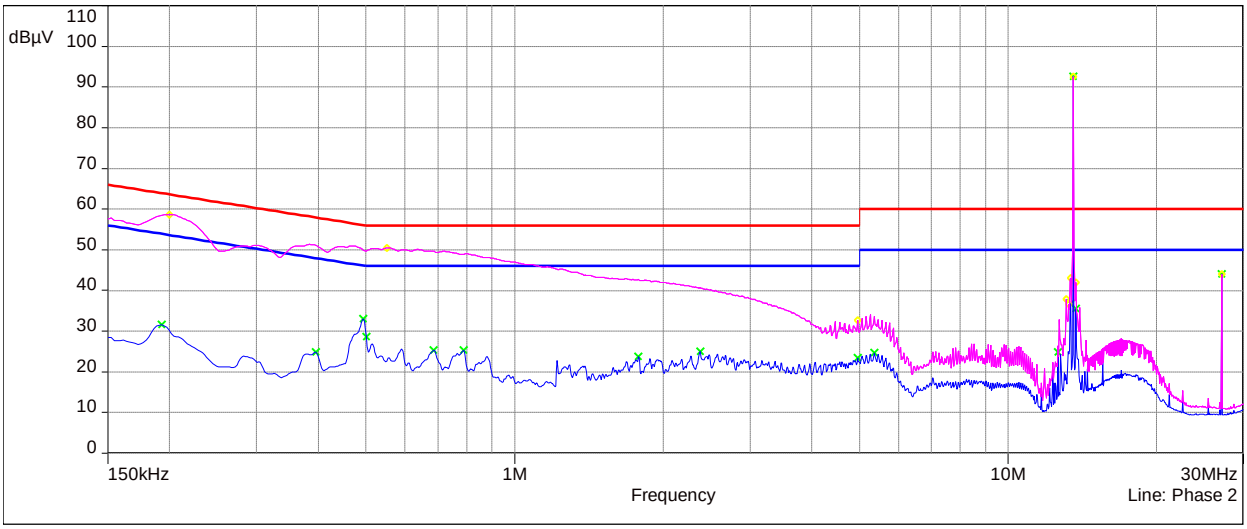
Line 2

Sub-range 2
Frequencies: 150 kHz - 30 MHz (Mode: - Step: 2.25 kHz)
Settings: RBW: 9kHz, VBW: 30kHz, Sweep time: 1e+03 ms, Attenuation: 10 dB, Sweep count 1, Preamp: Off, LN Preamp: Off, Preselector: On
Line: Phase 2

FCC Part 15/FCC Part 15.107 B - Average/
FCC Part 15/FCC Part 15.107 B - QPeak/
Meas.QPeak (Phase 2)
Mes. CISPR AVG (Phase 2)
QPeak (QPeak /Lim. QPeak) (Phase 2)
CISPR AVG (CISPR AVG /Lim. Average) (Phase 2)



Model: ; Client: ; Comments: ; Test Date: 07/31/2019 13:40

4.4.3 Test Result (Continued)

Quasi-Peak Table					
Frequency (MHz)	**Q.Peak (dBµV)**	**Limit (dBµV)**	**Margin (dB)**	**Comment**	**Correction (dB)**
0.200	58.7	63.6	-5.0	Phase 2	11.9
0.204	59.1	63.5	-4.4	Phase 1	11.9
0.551	50.5	56.0	-5.6	Phase 2	12.0
0.571	52.9	56.0	-3.1	Phase 1	12.0
4.961	32.7	56.0	-23.3	Phase 2	12.2
13.135	38.4	60.0	-21.7	Phase 1	12.4
13.135	37.9	60.0	-22.2	Phase 2	12.4
13.295	36.6	60.0	-23.4	Phase 2	12.4
13.295	37.1	60.0	-22.9	Phase 1	12.4
13.382	43.7	60.0	-16.3	Phase 1	12.4
13.382	43.1	60.0	-17.0	Phase 2	12.4
13.738	42.0	60.0	-18.1	Phase 2	12.4
13.738	42.6	60.0	-17.4	Phase 1	12.4
27.119	44.5	60.0	-15.5	Phase 1	12.6
27.119	44.0	60.0	-16.0	Phase 2	12.6
Results: **Complies** by 3.1 dB					

4.4.3 Test Result (Continued)

Average Table					
Frequency (MHz)	**Average (dBµV)**	**Limit (dBµV)**	**Margin (dB)**	**Comment**	**Correction (dB)**
0.193	31.5	53.9	-22.4	Phase 2	11.9
0.193	33.6	53.9	-20.3	Phase 1	11.9
0.294	30.2	50.4	-20.2	Phase 1	12.0
0.395	24.9	48.0	-23.1	Phase 2	12.0
0.398	31.6	47.9	-16.3	Phase 1	12.0
0.494	33.0	46.1	-13.1	Phase 2	12.0
0.501	28.6	46.0	-17.4	Phase 2	12.0
0.591	25.9	46.0	-20.1	Phase 1	12.0
0.686	25.3	46.0	-20.7	Phase 2	12.0
0.785	24.9	46.0	-21.2	Phase 1	12.0
0.789	25.3	46.0	-20.7	Phase 2	12.0
1.221	23.7	46.0	-22.3	Phase 1	12.0
1.784	23.7	46.0	-22.3	Phase 2	12.0
2.378	25.0	46.0	-21.1	Phase 2	12.1
3.570	22.2	46.0	-23.8	Phase 1	12.1
4.961	23.4	46.0	-22.6	Phase 2	12.2
5.361	24.6	50.0	-25.4	Phase 2	12.2
12.624	24.8	50.0	-25.2	Phase 2	12.4
12.624	24.8	50.0	-25.2	Phase 1	12.4
12.791	24.3	50.0	-25.7	Phase 1	12.4
13.382	36.8	50.0	-13.2	Phase 2	12.4
13.382	37.1	50.0	-12.9	Phase 1	12.4
13.738	35.9	50.0	-14.1	Phase 1	12.4
13.738	35.5	50.0	-14.5	Phase 2	12.4
27.119	44.1	50.0	-5.9	Phase 2	12.6
27.119	44.6	50.0	-5.4	Phase 1	12.6
Results: **Complies** by 5.4 dB					

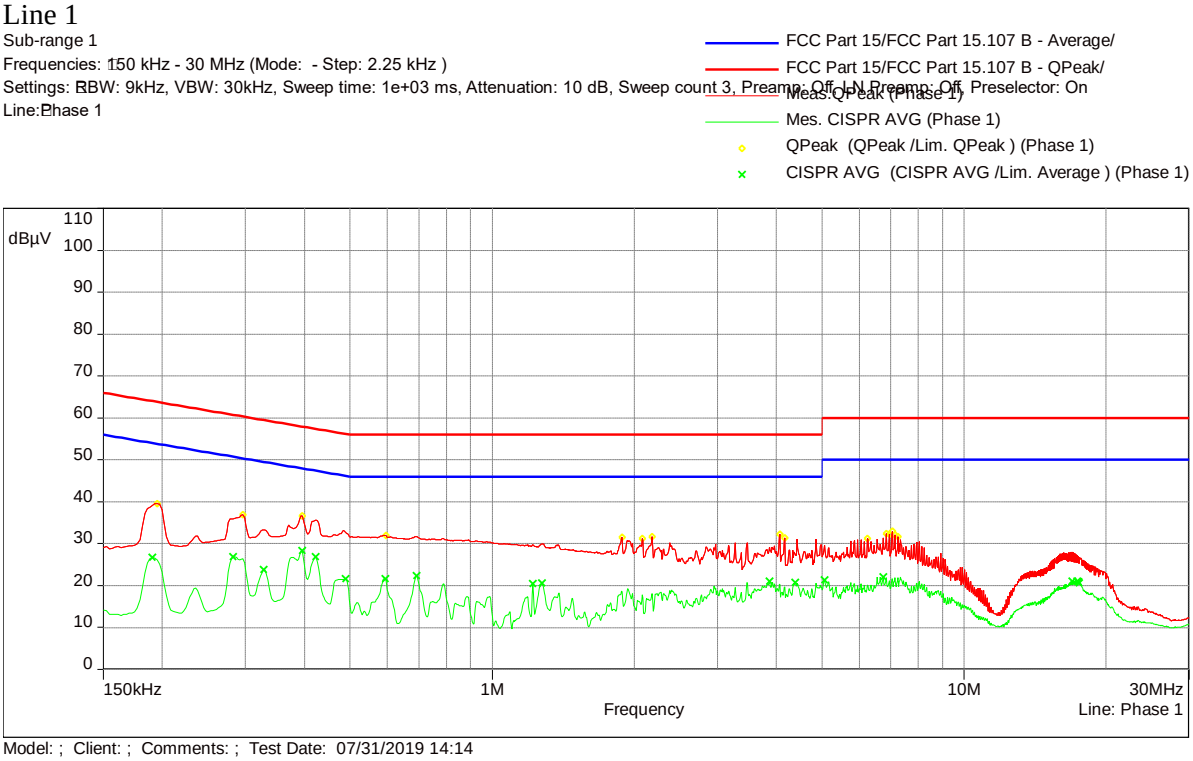
4.4.3 Test Result (Continued)

Measured with RFID Antenna Terminated with Load

Model: 1202SF

Line 1

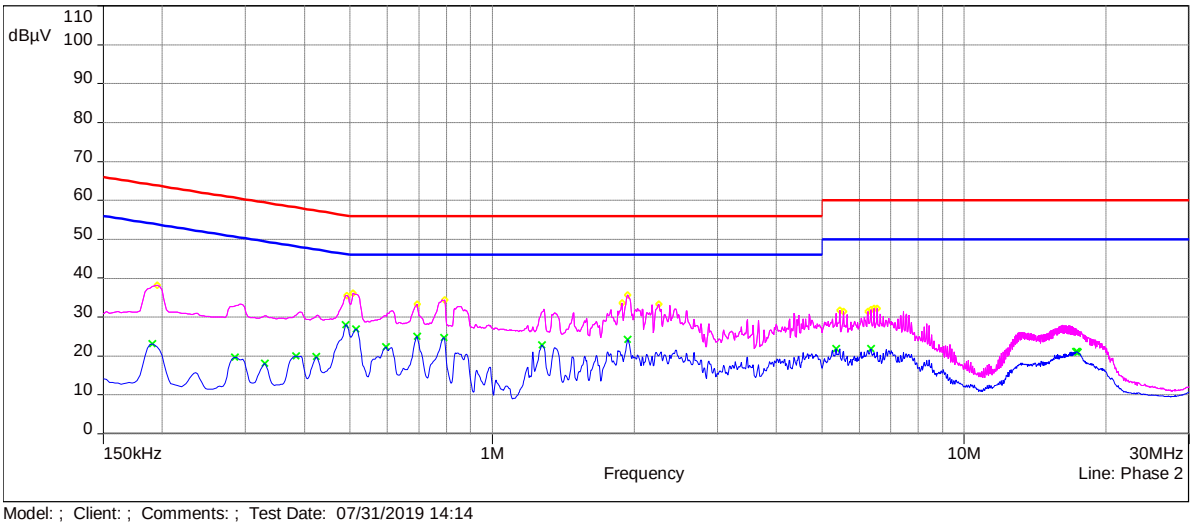
Sub-range 1
Frequencies: 150 kHz - 30 MHz (Mode: - Step: 2.25 kHz)
Settings: RBW: 9kHz, VBW: 30kHz, Sweep time: 1e+03 ms, Attenuation: 10 dB, Sweep count 3, Preamp: Off, LN Preamp: Off, Preselector: On
Line: Phase 1



Model: ; Client: ; Comments: ; Test Date: 07/31/2019 14:14

Line 2

Sub-range 2
Frequencies: 150 kHz - 30 MHz (Mode: - Step: 2.25 kHz)
Settings: RBW: 9kHz, VBW: 30kHz, Sweep time: 1e+03 ms, Attenuation: 10 dB, Sweep count 1, Preamp: Off, LN Preamp: Off, Preselector: On
Line: Phase 2



Model: ; Client: ; Comments: ; Test Date: 07/31/2019 14:14

4.4.3 Test Result (Continued)

Quasi-Peak Table					
Frequency (MHz)	**Q.Peak (dBµV)**	**Limit (dBµV)**	**Margin (dB)**	**Comment**	**Correction (dB)**
0.195	38.1	63.8	-25.7	Phase 2	11.9
0.195	39.5	63.8	-24.3	Phase 1	11.9
0.296	36.9	60.4	-23.5	Phase 1	12.0
0.395	36.7	58.0	-21.3	Phase 1	12.0
0.492	35.6	56.1	-20.5	Phase 2	12.0
0.508	36.1	56.0	-19.9	Phase 2	12.0
0.596	32.0	56.0	-24.0	Phase 1	12.0
0.695	33.4	56.0	-22.6	Phase 2	12.0
0.794	34.5	56.0	-21.5	Phase 2	12.0
1.885	33.7	56.0	-22.3	Phase 2	12.1
1.885	31.5	56.0	-24.5	Phase 1	12.1
1.939	35.6	56.0	-20.4	Phase 2	12.1
2.083	31.3	56.0	-24.7	Phase 1	12.1
2.182	31.7	56.0	-24.3	Phase 1	12.1
2.254	33.3	56.0	-22.7	Phase 2	12.1
4.067	32.3	56.0	-23.7	Phase 1	12.2
4.166	31.4	56.0	-24.7	Phase 1	12.2
5.458	31.7	60.0	-28.3	Phase 2	12.2
5.557	31.4	60.0	-28.6	Phase 2	12.2
6.250	31.2	60.0	-28.8	Phase 1	12.2
6.252	31.5	60.0	-28.5	Phase 2	12.2
6.351	31.8	60.0	-28.2	Phase 2	12.2
6.450	32.2	60.0	-27.8	Phase 2	12.3
6.551	32.3	60.0	-27.7	Phase 2	12.3
6.846	32.4	60.0	-27.6	Phase 1	12.3
6.945	32.3	60.0	-27.7	Phase 1	12.3
7.044	33.0	60.0	-27.0	Phase 1	12.3
7.143	32.1	60.0	-27.9	Phase 1	12.3
7.242	31.7	60.0	-28.3	Phase 1	12.2
Results: **Complies** by 19.9 dB					

4.4.3 Test Result (Continued)

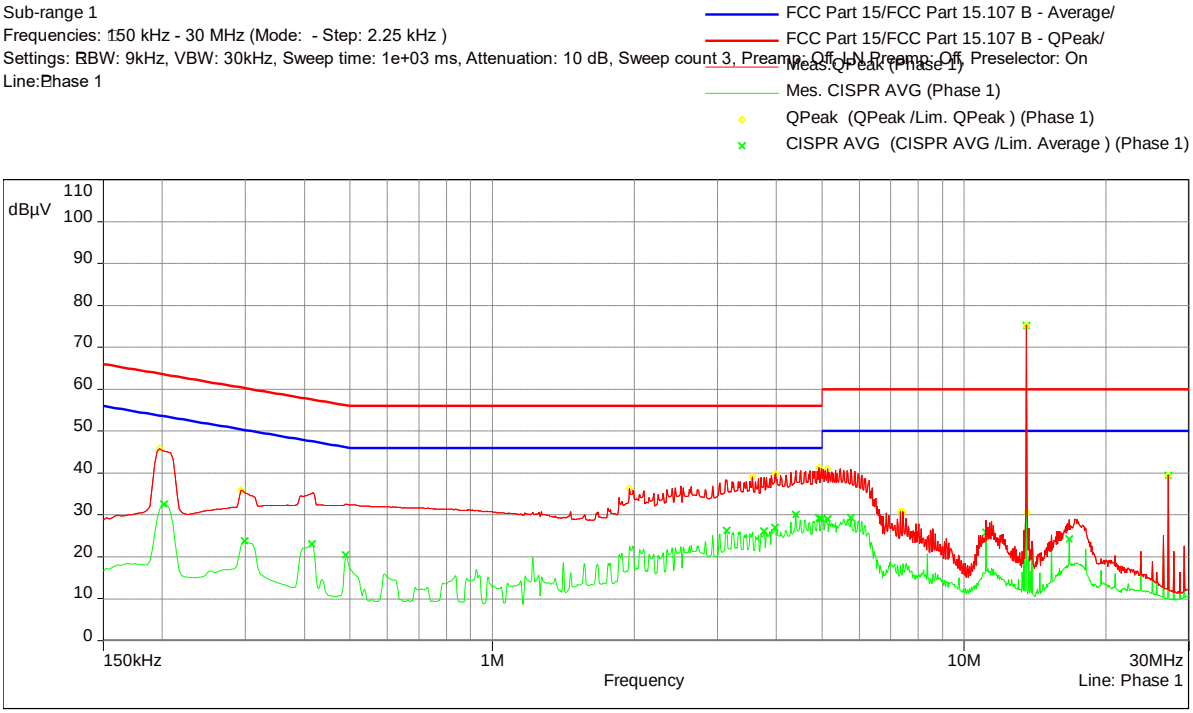
Average Table					
Frequency (MHz)	**Average (dBµV)**	**Limit (dBµV)**	**Margin (dB)**	**Comment**	**Correction (dB)**
0.191	26.7	54.0	-27.3	Phase 1	11.9
0.191	23.1	54.0	-30.9	Phase 2	11.9
0.283	26.9	50.7	-23.8	Phase 1	11.9
0.285	19.7	50.7	-31.0	Phase 2	11.9
0.328	23.8	49.5	-25.7	Phase 1	11.9
0.330	18.1	49.5	-31.4	Phase 2	11.9
0.384	20.0	48.2	-28.2	Phase 2	12.0
0.395	28.4	48.0	-19.6	Phase 1	12.0
0.422	26.8	47.4	-20.6	Phase 1	12.0
0.425	19.8	47.4	-27.6	Phase 2	12.0
0.490	21.6	46.2	-24.6	Phase 1	12.0
0.490	28.0	46.2	-18.2	Phase 2	12.0
0.515	26.9	46.0	-19.1	Phase 2	12.0
0.593	21.7	46.0	-24.3	Phase 1	12.0
0.596	22.3	46.0	-23.7	Phase 2	12.0
0.692	22.4	46.0	-23.6	Phase 1	12.0
0.695	25.0	46.0	-21.0	Phase 2	12.0
0.791	24.7	46.0	-21.3	Phase 2	12.0
1.221	20.4	46.0	-25.6	Phase 1	12.0
1.275	22.8	46.0	-23.2	Phase 2	12.0
1.275	20.5	46.0	-25.5	Phase 1	12.0
1.939	24.2	46.0	-21.9	Phase 2	12.1
3.869	21.0	46.0	-25.0	Phase 1	12.2
4.389	20.7	46.0	-25.3	Phase 1	12.2
5.057	21.4	50.0	-28.6	Phase 1	12.2
5.354	21.9	50.0	-28.2	Phase 2	12.2
6.351	21.9	50.0	-28.1	Phase 2	12.2
6.747	22.1	50.0	-27.9	Phase 1	12.3
16.962	21.1	50.0	-28.9	Phase 1	12.5
17.252	21.1	50.0	-28.9	Phase 2	12.5
17.347	21.1	50.0	-29.0	Phase 2	12.5
17.390	21.0	50.0	-29.1	Phase 1	12.5
17.394	21.1	50.0	-28.9	Phase 2	12.5
17.444	20.9	50.0	-29.1	Phase 2	12.5
Results: **Complies** by 18.2 dB					

Measured with RFID Antenna

Model: 1212SF

Line 1

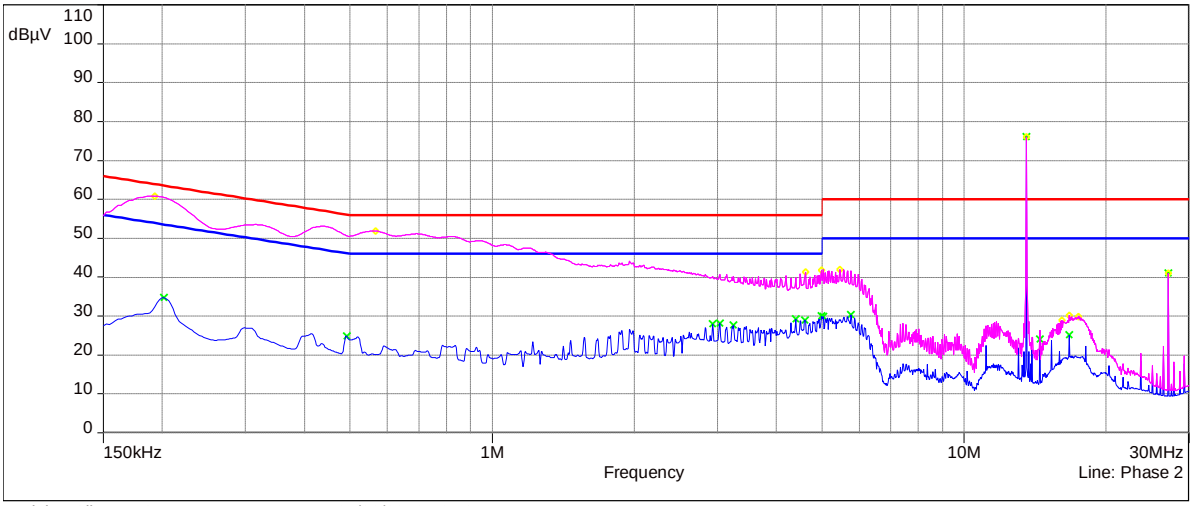
Sub-range 1
Frequencies: 150 kHz - 30 MHz (Mode: - Step: 2.25 kHz)
Settings: RBW: 9kHz, VBW: 30kHz, Sweep time: 1e+03 ms, Attenuation: 10 dB, Sweep count 3, Preamp: Off, LN Preamp: Off, Preselector: On
Line:Phase 1



Model: ; Client: ; Comments: ; Test Date: 07/30/2019 16:48

Line 2

Sub-range 2
Frequencies: 150 kHz - 30 MHz (Mode: - Step: 2.25 kHz)
Settings: RBW: 9kHz, VBW: 30kHz, Sweep time: 1e+03 ms, Attenuation: 10 dB, Sweep count 1, Preamp: Off, LN Preamp: Off, Preselector: On
Line:Phase 2



Model: ; Client: ; Comments: ; Test Date: 07/30/2019 16:48

4.4.3 Test Result (Continued)

Quasi-Peak Table					
Frequency (MHz)	**Q.Peak (dBµV)**	**Limit (dBµV)**	**Margin (dB)**	**Comment**	**Correction (dB)**
0.193	60.8	63.9	-3.1	Phase 2	11.9
0.197	45.9	63.7	-17.9	Phase 1	11.9
0.294	35.9	60.4	-24.6	Phase 1	12.0
0.566	51.9	56.0	-4.1	Phase 2	12.0
1.955	36.3	56.0	-19.7	Phase 1	12.1
3.563	39.1	56.0	-16.9	Phase 1	12.1
3.984	39.8	56.0	-16.2	Phase 1	12.2
4.612	41.3	56.0	-14.7	Phase 2	12.2
4.927	41.2	56.0	-14.8	Phase 1	12.2
4.983	41.8	56.0	-14.2	Phase 2	12.2
5.136	41.1	60.0	-18.9	Phase 1	12.2
5.451	42.0	60.0	-18.0	Phase 2	12.2
7.328	30.8	60.0	-29.2	Phase 1	12.2
7.427	30.8	60.0	-29.2	Phase 1	12.2
13.612	30.6	60.0	-29.4	Phase 1	12.4
16.121	28.9	60.0	-31.1	Phase 2	12.5
16.719	30.2	60.0	-29.8	Phase 2	12.5
17.486	29.9	60.0	-30.1	Phase 2	12.5
27.119	39.4	60.0	-20.7	Phase 1	12.6
27.119	41.0	60.0	-19.0	Phase 2	12.6
Results: **Complies** by 3.1 dB					

4.4.3 Test Result (Continued)

Average Table					
Frequency (MHz)	**Average (dBµV)**	**Limit (dBµV)**	**Margin (dB)**	**Comment**	**Correction (dB)**
0.202	34.7	53.5	-18.8	Phase 2	11.9
0.202	32.6	53.5	-20.9	Phase 1	11.9
0.299	23.8	50.3	-26.5	Phase 1	12.0
0.416	23.1	47.5	-24.4	Phase 1	12.0
0.490	20.4	46.2	-25.8	Phase 1	12.0
0.492	24.9	46.1	-21.2	Phase 2	12.0
2.933	28.0	46.0	-18.1	Phase 2	12.1
3.037	28.1	46.0	-17.9	Phase 2	12.1
3.143	26.3	46.0	-19.7	Phase 1	12.1
3.246	27.7	46.0	-18.3	Phase 2	12.1
3.770	26.2	46.0	-19.9	Phase 1	12.2
3.980	27.0	46.0	-19.0	Phase 1	12.2
4.400	30.1	46.0	-15.9	Phase 1	12.2
4.400	29.3	46.0	-16.7	Phase 2	12.2
4.610	28.9	46.0	-17.1	Phase 2	12.2
4.925	29.2	46.0	-16.8	Phase 1	12.2
4.988	30.1	46.0	-15.9	Phase 2	12.2
4.988	29.1	46.0	-16.9	Phase 1	12.2
5.028	29.9	50.0	-20.1	Phase 2	12.2
5.134	29.1	50.0	-21.0	Phase 1	12.2
5.764	29.3	50.0	-20.7	Phase 1	12.3
5.764	30.3	50.0	-19.7	Phase 2	12.3
11.148	25.8	50.0	-24.2	Phase 1	12.3
14.494	24.0	50.0	-26.0	Phase 2	12.4
16.719	24.3	50.0	-25.7	Phase 1	12.5
16.719	25.2	50.0	-24.8	Phase 2	12.5
27.119	39.4	50.0	-10.6	Phase 1	12.6
27.119	41.1	50.0	-8.9	Phase 2	12.6
Results: **Complies** by 8.9 dB					

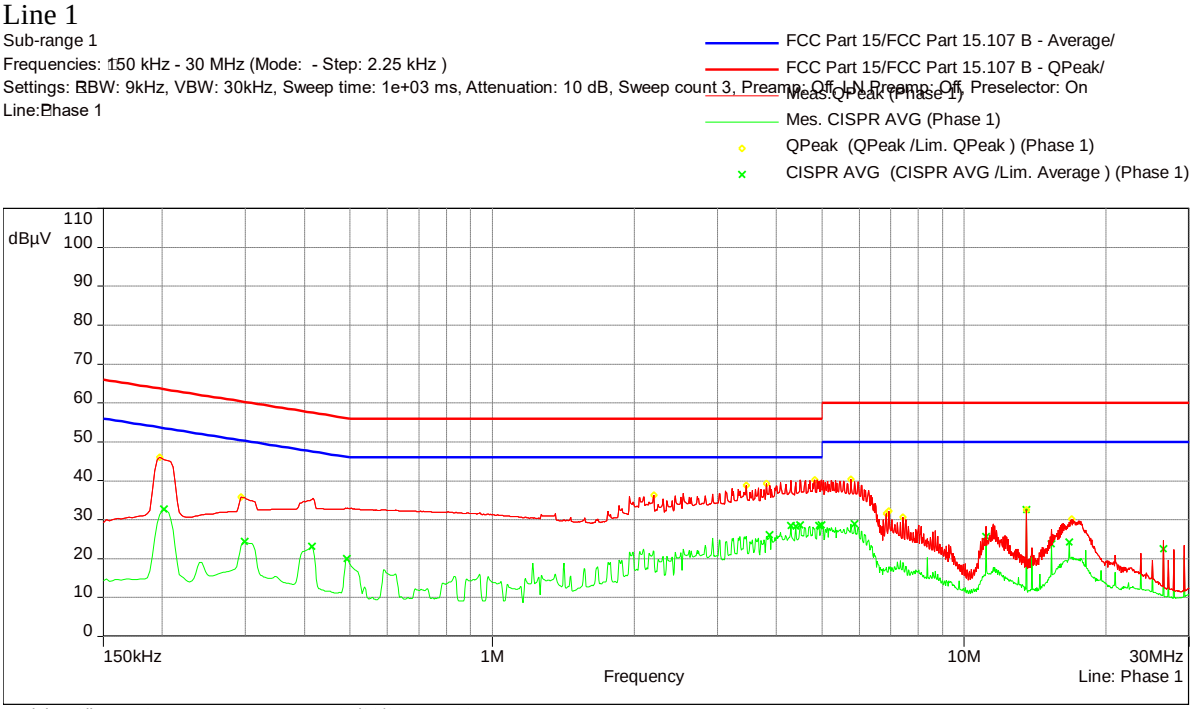
4.4.3 Test Result (Continued)

Measured with RFID Antenna Terminated with Load

Model: 1212SF

Line 1

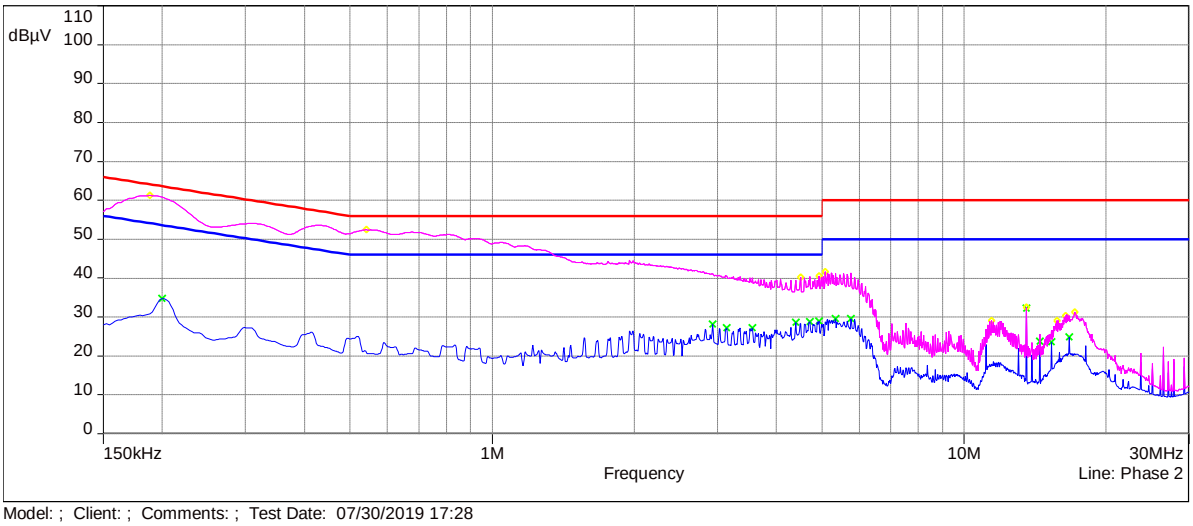
Sub-range 1
Frequencies: 150 kHz - 30 MHz (Mode: - Step: 2.25 kHz)
Settings: RBW: 9kHz, VBW: 30kHz, Sweep time: 1e+03 ms, Attenuation: 10 dB, Sweep count 3, Preamp: Off, LN Preamp: Off, Preselector: On
Line: Phase 1



Model: ; Client: ; Comments: ; Test Date: 07/30/2019 17:28

Line 2

Sub-range 2
Frequencies: 150 kHz - 30 MHz (Mode: - Step: 2.25 kHz)
Settings: RBW: 9kHz, VBW: 30kHz, Sweep time: 1e+03 ms, Attenuation: 10 dB, Sweep count 1, Preamp: Off, LN Preamp: Off, Preselector: On
Line: Phase 2



Model: ; Client: ; Comments: ; Test Date: 07/30/2019 17:28

4.4.3 Test Result (Continued)

Quasi-Peak Table					
Frequency (MHz)	**Q.Peak (dBµV)**	**Limit (dBµV)**	**Margin (dB)**	**Comment**	**Correction (dB)**
0.188	61.2	64.1	-2.9	Phase 2	11.9
0.197	46.0	63.7	-17.7	Phase 1	11.9
0.294	35.8	60.4	-24.6	Phase 1	12.0
0.542	52.5	56.0	-3.6	Phase 2	12.0
2.200	36.3	56.0	-19.8	Phase 1	12.1
3.458	38.8	56.0	-17.2	Phase 1	12.1
3.811	39.4	56.0	-16.6	Phase 1	12.2
4.506	40.3	56.0	-15.7	Phase 2	12.2
4.821	40.3	56.0	-15.7	Phase 1	12.2
4.927	40.5	56.0	-15.5	Phase 2	12.2
5.080	41.7	60.0	-18.3	Phase 2	12.2
5.764	40.4	60.0	-19.6	Phase 1	12.3
6.837	31.6	60.0	-28.4	Phase 1	12.3
6.936	32.3	60.0	-27.7	Phase 1	12.3
7.424	30.7	60.0	-29.3	Phase 1	12.2
11.429	29.1	60.0	-30.9	Phase 2	12.3
13.560	32.6	60.0	-27.4	Phase 1	12.4
13.560	32.5	60.0	-27.5	Phase 2	12.4
15.727	29.0	60.0	-31.0	Phase 2	12.5
16.411	30.3	60.0	-29.7	Phase 2	12.4
16.897	30.1	60.0	-29.9	Phase 1	12.5
17.192	31.3	60.0	-28.7	Phase 2	12.5
Results: **Complies** by 2.9 dB					

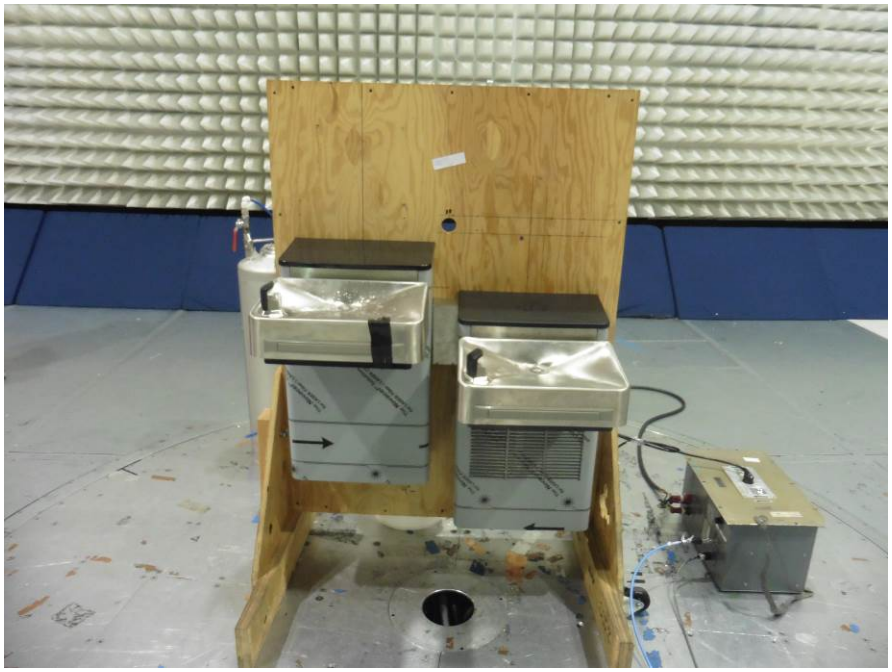
4.4.3 Test Result (Continued)

Average Table					
Frequency (MHz)	**Average (dBµV)**	**Limit (dBµV)**	**Margin (dB)**	**Comment**	**Correction (dB)**
0.200	34.7	53.6	-18.9	Phase 2	11.9
0.202	32.6	53.5	-20.9	Phase 1	11.9
0.299	24.3	50.3	-26.0	Phase 1	12.0
0.416	23.1	47.5	-24.4	Phase 1	12.0
0.492	19.9	46.1	-26.2	Phase 1	12.0
2.933	28.1	46.0	-17.9	Phase 2	12.1
3.143	27.2	46.0	-18.8	Phase 2	12.1
3.561	27.3	46.0	-18.7	Phase 2	12.1
3.876	26.1	46.0	-19.9	Phase 1	12.2
4.297	28.4	46.0	-17.6	Phase 1	12.2
4.398	28.3	46.0	-17.8	Phase 1	12.2
4.400	28.6	46.0	-17.4	Phase 2	12.2
4.499	28.6	46.0	-17.4	Phase 1	12.2
4.713	28.7	46.0	-17.3	Phase 2	12.2
4.925	28.4	46.0	-17.6	Phase 1	12.2
4.925	29.0	46.0	-17.0	Phase 2	12.2
4.985	28.7	46.0	-17.4	Phase 1	12.2
5.343	29.6	50.0	-20.4	Phase 2	12.2
5.764	29.6	50.0	-20.4	Phase 2	12.3
5.865	29.0	50.0	-21.1	Phase 1	12.2
11.148	25.6	50.0	-24.4	Phase 1	12.3
13.560	32.5	50.0	-17.5	Phase 1	12.4
13.560	32.3	50.0	-17.7	Phase 2	12.4
14.498	23.7	50.0	-26.3	Phase 2	12.4
15.329	23.7	50.0	-26.3	Phase 1	12.5
15.329	23.6	50.0	-26.4	Phase 2	12.5
16.721	24.3	50.0	-25.7	Phase 1	12.5
16.721	24.9	50.0	-25.1	Phase 2	12.5
26.477	22.6	50.0	-27.4	Phase 1	12.6
Results: **Complies** by 17.0 dB					

4.4.4 Test Configuration Photographs

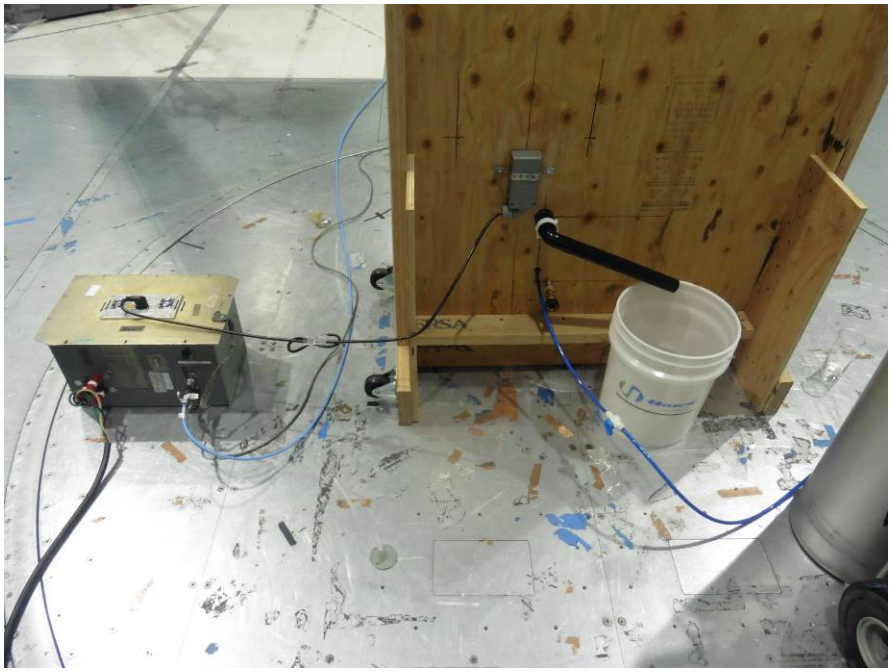
The following photographs show the testing configurations used.

Model: 1202SF



4.4.4 Test Configuration Photographs(Continued)

Model: 1212SF



5.0 List of test equipment

Measurement equipment used for emission compliance testing utilized the equipment on the following list:

Equipment	Manufacturer	Model/Type	Asset No.	Calibration Interval	Cal Due
Bi-Log Antenna	Antenna Research	LPB-2513/A	ITS 00355	12	04/24/20
Pre-Amplifier	Sonoma Instrument	310N	ITS 00415	12	04/19/20
EMI Receiver	Rohde and Schwarz	ESR7	ITS 01607	12	10/23/19
LISN	FCC	FCC-LISN-50-50-M-H	ITS 00552	12	12/07/19
RF Cable	TRU Corporation	TRU CORE 300	ITS 01330	12	05/09/20
RF Cable	TRU Corporation	TRU CORE 300	ITS 00465	12	08/16/19
RF Cable	TRU Corporation	TRU CORE 300	ITS 01470	12	08/16/19
Loop Sensor	Solar Electronics	7334-1	ITS 01608	12	10/09/19
Environmental Test Chamber	ESPEC	BTX-475	ITS 01436	12	09/21/19
Ant-Passive Loop	EMCO	6512	ITS 01598	12	10/09/19

Software used for emission compliance testing utilized the following:

Name	Manufacturer	Version	Template/Profile
BAT-EMC	Nexio	3.17.0.10	Haws, ML_07-2019.bpp

6.0 Document History

Revision/ Job Number	Writer Initials	Reviewer Initials	Date	Change
1.0 / G103770502	ML	KV	August 16, 2019	Original document

END OF REPORT