

TEST REPORT**Report Number: 104685526MPK-008****Project Number: G104685526****November 19, 2021****Testing performed on the****AgeLOC LumiSpa iO****Model Number: LS2F****FCC ID: 2AZ3A-LS2F****IC: 26225-LS2F****to****FCC Part 15 Subpart C (15.225)****Industry Canada RSS-210 Issue 10****for****NSE Products, Inc.****Test Performed by:**

Intertek

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Menlo Park, CA 94025 USA

Test Authorized by:

NSE Products, Inc.

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Date: November 19, 2021

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Date: November 19, 2021

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Report No. 104685526MPK-008	
Equipment Under Test:	AgeLOC LumiSpa iO
Model Number:	LS2F
Applicant:	NSE Products, Inc.
Contact:	Alan Miller
Address:	NSE Products, Inc. 75 W Center St Provo, UT 84601
Country:	USA
Tel. Number:	(801) 310-4897
Email:	mmiller@nuskin.com
Applicable Regulation:	FCC Part 15 Subpart C (15.225) Industry Canada RSS-210 Issue 10
Date of Test:	September 9, 2021 – October 29, 2021

We attest to the accuracy of this report:



Kenneth Roque
EMC Project Engineer



Krishna K Vemuri
EMC Manager

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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	Not applicable. Radio does not function while charging.
Occupied Bandwidth	15.215	RSS-GEN	Complies
Antenna requirement	15.203	RSS-GEN	Complies ¹

¹ The EUT utilizes an internal Antenna.

EUT receive date: September 9, 2021

EUT receive condition: The pre-production version of 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: September 9, 2021

Test completion date: October 29, 2021

2.0 General Description

2.1 Product Description

NSE Products, Inc. supplied the following description of the EUT:

NSE Products, Inc. AgeLOC LumiSpa iO is a facial cleaning device.

This test report covers only the RFID radio.

Information about the RFID radio is presented below:

Applicant name & address	NSE Products, Inc. 75 W Center St Provo, UT 84601 USA
Contact info / Email	Alan Miller / mmiller@nuskin.com
Model	LS2F
FCC Identifier	2AZ3A-LS2F
IC Identifier	26225-LS2F
Operating Frequency	13.56 MHz
Number of Channels	1
Type of Modulation	ASK Modulation
Antenna Type	Internal Antenna

2.2 Related Submittal(s) Grants

None

2.3 Test Methodology

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, RSS-210 Issue 10 & 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

Equipment Under Test			
Type	Model #	Quantity	S/N
Facial Cleaning Device	LS2F	1	2

3.2 Block Diagram of Test Setup

The diagram shown below details the interconnection of the EUT and support equipment. For specific layout, refer to the test configuration photograph in the relevant section of this report.



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

EUT Photo



3.3 Justification

For radiated emission measurements the EUT is placed on a non-conductive table. The EUT was configured to continuously transmit. The highest clock frequency used is 2.4GHz, so radiated emissions were performed up to 18GHz for FCC.

3.4 Software Exercise Program

None

3.5 Mode of Operation during test

The LS2F was set up to continuously transmitting at 13.56MHz.

3.6 Modifications required for Compliance

No modifications were made by the manufacturer 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

- 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	$2400/F(\text{kHz})$	300
0.490-1.705	$24000/F(\text{kHz})$	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 made at 10 meters. Data results below are corrected for distance back to 30 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 ($\mu V/m$)

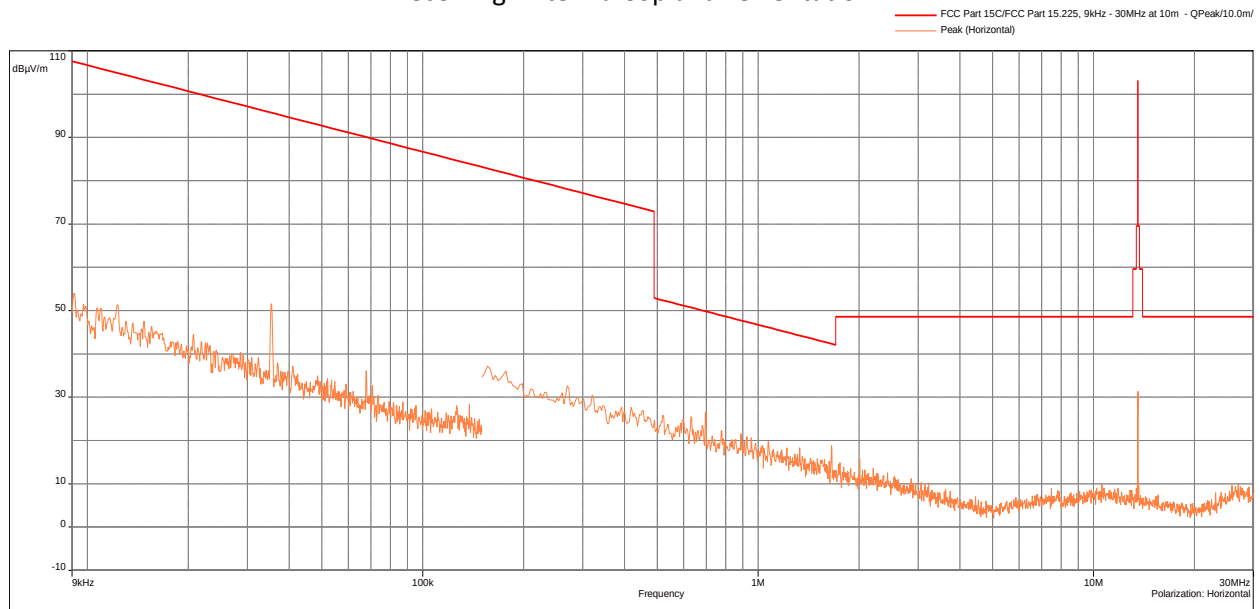
RA = Receiver Amplitude (including preamplifier) in dB (μV)
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB (1/m)
AG = Amplifier Gain in dB
DCF = Distance Correction Factor

Note: FS was measured with loop antenna below 30MHz

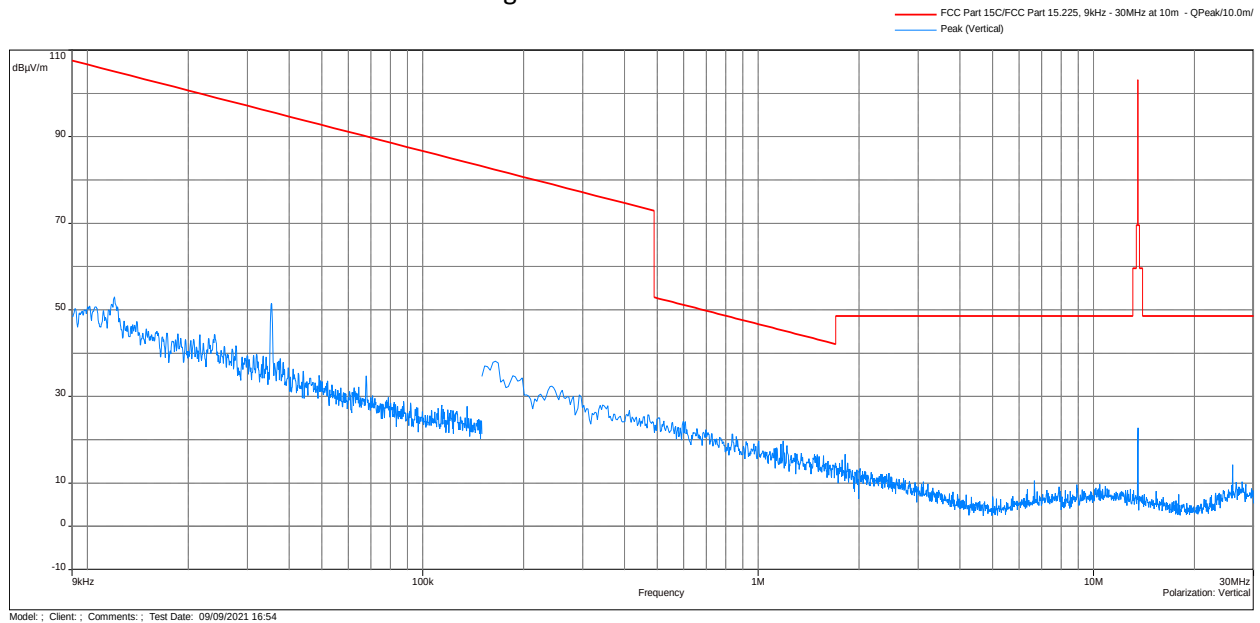
4.1.3 Test Result 15.225 (a) (b) (c) (d) and 15.209

Radiated Spurious Emissions from 9 kHz to 30MHz, EUT Upright (X-Axis)

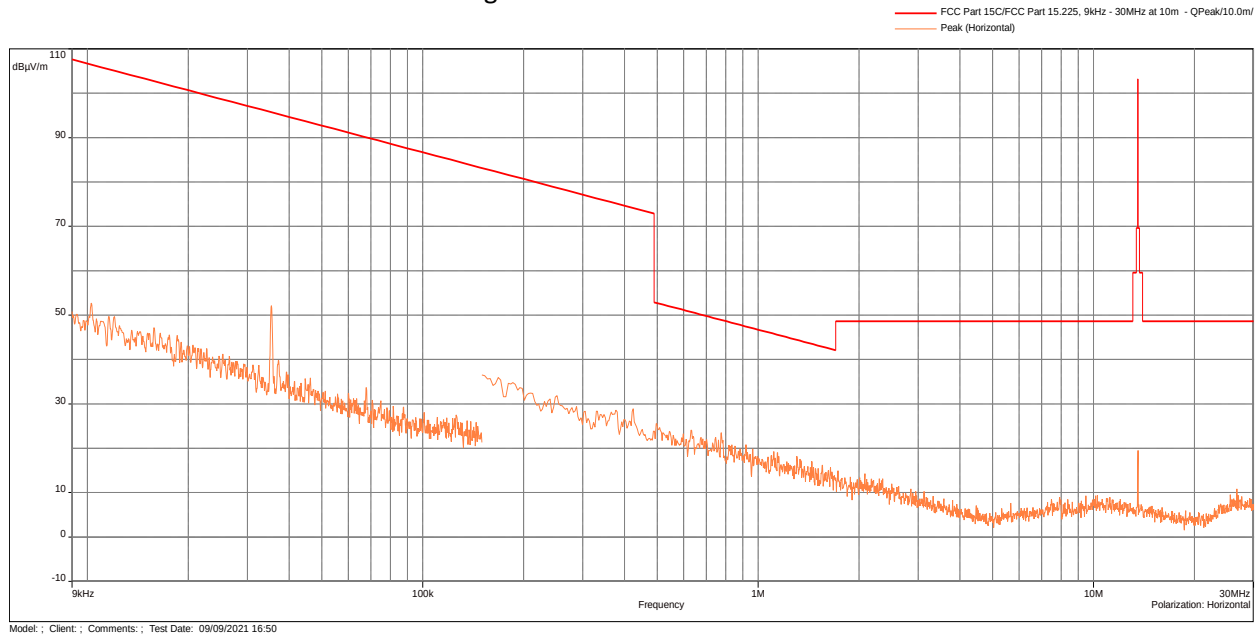
Receiving Antenna Coplanar Orientation



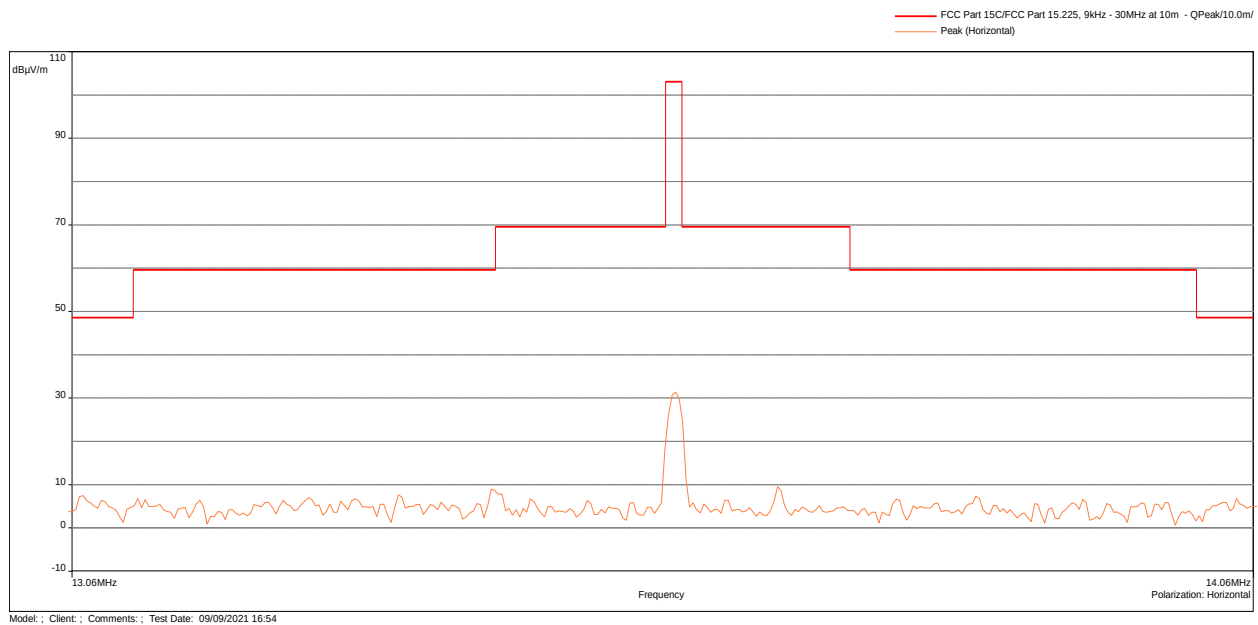
Receiving Antenna Coaxial Orientation



Receiving Antenna Horizontal Orientation



Test Result 15.225 (a)(b)(c) Radiated Spurious Emissions Mask

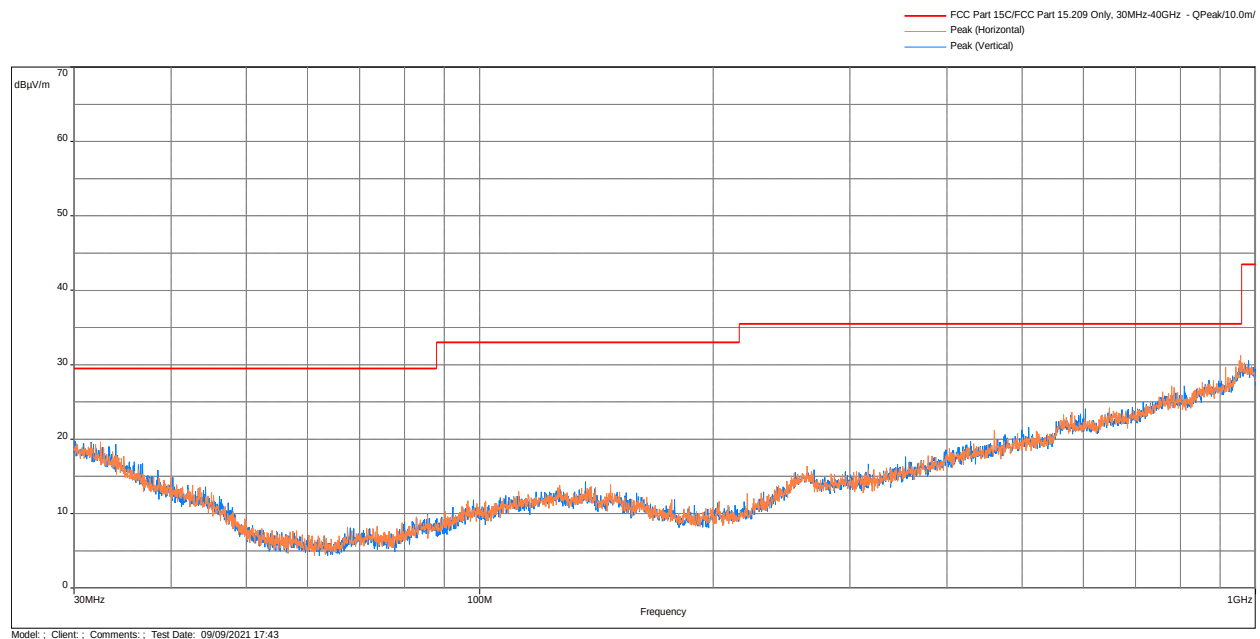


Frequency (MHz)	Peak FS dB(μV/m)	Limit@10m dB(μV/m)	Margin dB	Angle (°)	Polarity	Correction dB
13.56	31.36	103.1	-71.74	100.25	Coplanar	-7.64

Note: Correction = AF+CF-AG

Note: DCF: Distance Correction Factor to normalize from 3m to 10m

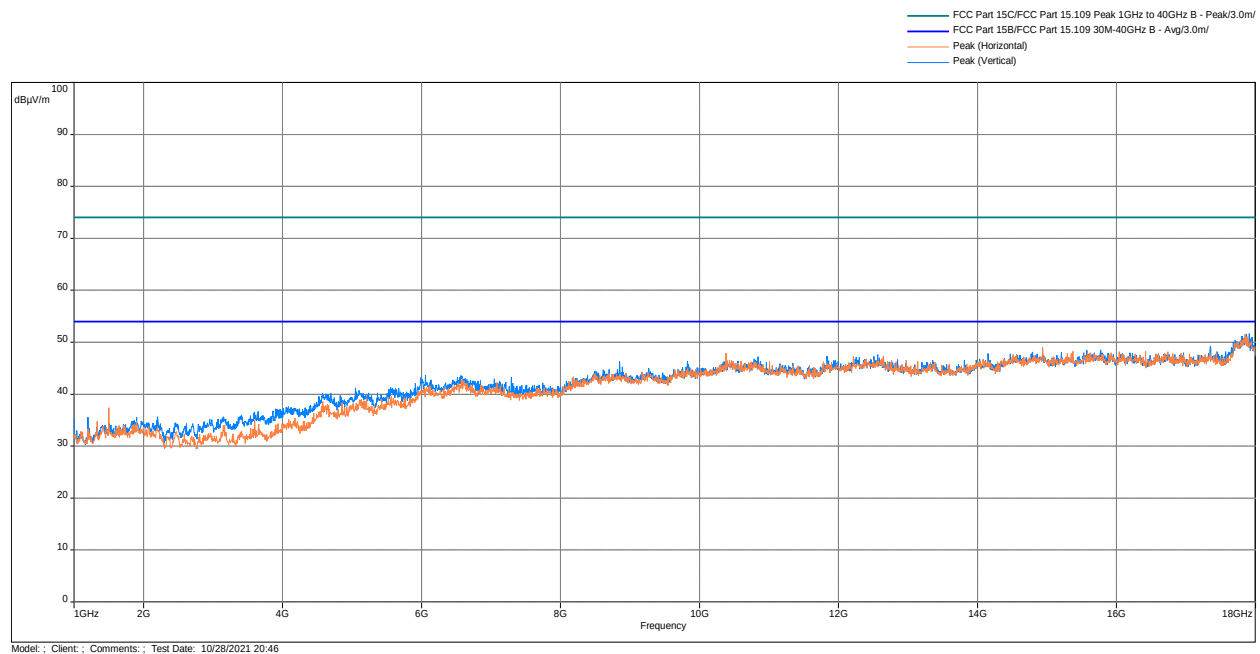
Radiated Spurious Emissions from 30 to 1000 MHz



Freq (MHz)	Peak FS @10m dB(uV/m)	Limit @10m dB(uV/m)	Margin (dB)	Height (m)	Azimuth (Deg)	Polarity	Correction (dB)
956.2853	31.31	35.5	-4.19	1	12.75	Horizontal	3.87
30.097	19.74	29.5	-9.76	0.99	343.75	Vertical	-8.46
45.09967	12.85	29.5	-16.65	2	13.75	Horizontal	-16.24
85.64567	9.91	29.5	-19.59	2	182.5	Vertical	-18.57

Note: Correction = AF + CF –AG

Radiated Spurious Emissions from 1 to 18 GHz, Peak Scan vs Avg and Peak Limits



Freq (MHz)	Peak dB(uV/m)	Avg Limit dB(uV/m)	Margin (dB)	Height (m)	Azimuth (Deg)	Polarity	Correction (dB)
17910.47	51.71	54	-2.29	1.5	0	Vertical	9.19
17850.4	51.52	54	-2.48	3.49	337	Horizontal	9.56

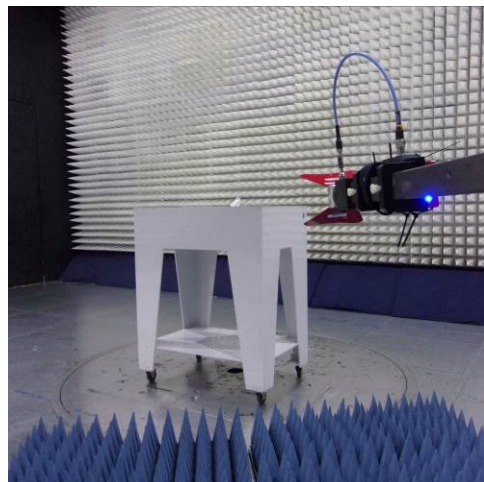
Note: Correction = AF + CF - AG

Result	Complies
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Note: The EUT was tested in horizontal and vertical orientations, worst case emissions were reported.

4.1.4 Test Configuration Photographs

The following photographs show the testing configurations used.



4.2 Frequency Tolerance

4.2.1 Requirement FCC 15.225 (e)

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ 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 EUT was placed in the temperature chamber. The frequency counter was connected to the transmitter output. For each temperature, the carrier frequency was recorded with the battery fully charged.

4.2.3 Test Results 15.225 (e)

Nominal Frequency: 13560036Hz

Voltage (DC)	Temperature (C)	Measured Frequency (Hz)	Deviation from Reference (Hz)	Deviation (%)
Fully charged Battery	50	13560081	45	0.00033
Fully charged Battery	40	13560068	32	0.00023
Fully charged Battery	30	13560061	25	0.00018
Fully charged Battery	20	13560036	0	0.00000
Fully charged Battery	10	13560065	29	0.00021
Fully charged Battery	0	13560070	34	0.00025
Fully charged Battery	-10	13560075	39	0.00028
Fully charged Battery	-20	13560088	52	0.00038

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

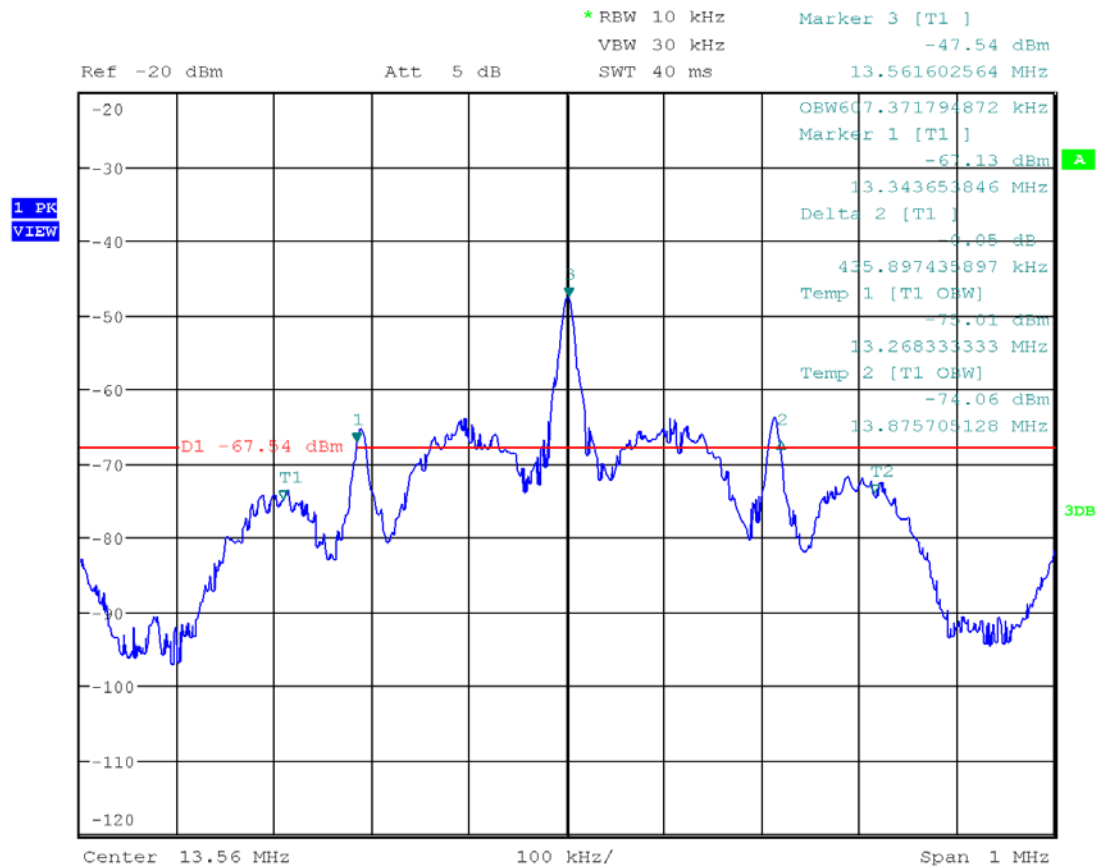
The EUT was setup to transmit in normal operating condition.

Measurements were made with the loop antenna in close proximity of the EUT. Following the procedures of ANSI 63.10: 2013, the 20dB bandwidth measurements were taken. The following plots show Occupied Bandwidth.

4.3.3 Test Results

Frequency (MHz)	-20 dB Channel Bandwidth (Hz)	99% Channel Bandwidth (kHz)
13.56	435.897	607.37

-20dB & 99% Channel Bandwidth Plot



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4.4 AC Line Conducted Emission FCC: 15.207; RSS-GEN;

4.4.1 Requirement

Frequency Band MHz	Class B Limit dB(μV)		Class A Limit dB(μV)	
	Quasi-Peak	Average	Quasi-Peak	Average
0.15-0.50	66 to 56 *	56 to 46 *	79	66
0.50-5.00	56	46	73	60
5.00-30.00	60	50	73	60

*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.

Equipment setup for conducted disturbance tests followed the guidelines of ANSI C63.10-2013.

4.4.3 Test Result

Results	Not applicable. RFID does not function during charging.
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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 #	Cal Int	Cal Due
EMI Receiver	Rohde and Schwarz	ESU40	ITS 00961	12	03/09/22
Spectrum Analyzer	Rohde and Schwarz	FSU	ITS 00913	12	05/24/22
Horn Antenna	ETS Lindgren	3117PA	ITS 01636	12	12/17/21
Loop Antenna	EMCO	6512	ITS 01598	12	11/03/21
BI-Log Antenna	Teseq	CBL 6111D	ITS 01505	12	03/22/22
Pre-Amplifier	Sonoma Instrument	310N	ITS 00942	12	04/19/22
RF Cable	TRU Corporation	TRU CORE 300	ITS 01462	12	09/14/22
RF Cable	TRU Corporation	TRU CORE 300	ITS 01465	12	09/14/22
RF Cable	TRU Corporation	TRU CORE 300	ITS 01470	12	09/14/22
RF Cable	TRU Corporation	TRU CORE 300	ITS 01342	12	09/14/22
RF Cable	Mega Phase	EMC1-K1K1-236	ITS 01484	12	06/29/22
10m Semi-anechoic chamber	Panashield	10m Chamber	ITS 00984	36	07/29/23

Software used for emission compliance testing utilized the following:

Name	Manufacturer	Version	Template/Profile
BAT-EMC	Nexio	3.20.0.14	ESU and ESR Intertek Emissions Template
RS Commander	Rohde Schwarz	1.6.4	Not Applicable (Screen grabber)

6.0 Document History

Revision/ Job Number	Writer Initials	Reviewer Initials	Date	Change
1.0 / G104685526	KR	KV	November 19, 2021	Original document

END OF REPORT