Electromagnetic Compatibility Test Report

Description: JumpCharge

Model: JCEMDS

Hubbell Incorporated (Delaware), Wiring Device Kellems Division
40 Waterview Dr
Shelton, CT, 06484

Prepared by:

TUV Rheinland of North America, Inc.

Client:	Hubbell Incorporated (Delaware), Wiring Device Kellems Division 40 Waterview Dr Shelton, CT, 06484	***Contact:*** ***Tel:*** ***Fax:*** ***e-mail:***	David Gellis (475)-882-4676 -- dgellis@hubbell.com
Identification:	JumpCharge	***Serial No.:***	JEMI-KZ10-LK73
Test item:	JCEMDS	***Date Test Completed:***	02/24/2020
Testing location:	TUV Rheinland of North America 710 Resende Road, Building 199 Webster, NY 14580 U.S.A.	Tel: (585) 645-0125 Fax: -	
Test specification:	**Emissions:** FCC 15.209; FCC 15.225; RSS-210		
Test Result and/or Conclusion:	The above product was found to be **Compliant** to the above test standard(s)		

Report written/updated by: Alexander Sowinski	***reviewed by:*** Rachana Khanduri
31 March 2020 ***Date*** ***Signature***	31 March 2020 ***Date*** ***Signature***

FC	ilac-MRA A2LA ACCREDITED	VCCI	**Industry Canada ISED**
5253	**3331.08**	**1097 (A-0329)**	**482B-1**

Revisions

Date mm/dd/yy	Name	Page Number of Change	Describe Change
03/04/2020	Rev.0	N/A	Original Document
03/31/2020	Rev.1	44, 46	Removed unnecessary data

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1 General Information

1.1 Scope

This report is intended to document the status of conformance based on the results of testing performed on the JumpCharge, Model Number: JCEMDS, manufactured by Hubbell Incorporated (Delaware), Wiring Device Kellems Division. 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.

1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT (Equipment Under Test) in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

1.3 *Summary of Test Results*

Applicant:	Hubbell Incorporated (Delaware), Wiring Device Kellems Division 40 Waterview Dr Shelton, CT, 06484	**Tel:**	(475)-882-4676	**Contact:**	David Gellis
		Fax:	--	**e-mail:**	dgellis@hubbell.com

Description:	JumpCharge	**Model Number:**	JCEMDS
Serial Number:	JEMI-KZ10-LK73	**Test Voltage/Freq.:**	120V / 60Hz
Test Date Completed:	02/24/2020	**Test Engineer:**	Alexander Sowinski

Standards	Description	Severity Level or Limit	Criteria	Test Result
FCC 15.209; FCC 15.225; RSS-210 Product Family Standard Emissions	Emission Requirements for Intentional Radiators	See Basic Standards Below	See Below	**Complies**
FCC 15.225; RSS-210	Carrier Field Strength	< 124 dBµV/m @ 3m	Limit	**Complies**
FCC 15.225; RSS-210	Out-of-Band Emissions	Per 15.225, Section a-d	Limit	**Complies**
FCC 15.209; FCC 15.225; RSS-210	Transmitter Spurious Emissions	Class B, 9k - 30 MHz Class B, 30 - 1000 MHz	Limit	**Complies**
FCC 15.225; RSS-210	Frequency Stability + Voltage Variation	±0.01% of NFC Operating Frequency	Limit	**Complies**
FCC 15.215; RSS-210	Occupied Bandwidth	Reporting purposes only	N/A	**Complies**
RSS-210	Duty Cycle	Reporting purposes only	N/A	**Complies**

2 Laboratory Information

2.1 Accreditations & Endorsements

2.1.1 US Federal Communications Commission

TUV Rheinland of North America located at, 710 Resende Road Webster, NY 14580 is accredited by the commission for performing testing services for the general public on a fee basis. This laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (Registration No 5253). The laboratory scope of accreditation includes: Title 47 CFR Part 15, and 18. The accreditation is updated every 3 years.

2.1.2 ILAC/A2LA

This is a program which is administered under the auspices of A2LA. The laboratory has been assessed and accredited in accordance with ISO Standard 17025:2017 (Certificate Number: 3331.08). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

2.1.3 VCCI

VCCI Accredited test lab. Registration numbers A-0329.

2.1.4 Industry Canada

(Registration No.: 482B-1) The 10 meter Semi-Anechoic chamber has been accepted by Industry Canada to perform testing to 3 and to 10m, based on the test procedures described in ANSI C63.4-2014.

2.1.5 BSMI

Registration No.: SL2-IN-E-1159R. The BSMI accreditation was obtained by NIST MRA with the BSMI.

2.1.6 Korea

(Designation No.: US0192). Recognized by National Radio Research Agency (RRA) as an accredited Conformity Assessment Body (CAB) under the terms for Korea Phase I of the APEC TEL.

2.2 Test Software

1) CIGUI 32 Version 1.4 for California Instruments AC power source
2) HP software E7415A Version A.01.45
3) National Instruments 'Measurement & Automation Employer' Version 4.6.2f1
4) TILE version 3.4.K.28
5) Voltech PM 6000 Firmware 1.22.07RC6, Software IEC61000-3 for PM6000 Release 1.24.12
6) California Instruments AC power source MXHCL
7) Rohde & Schwarz EMI Measurement software EMC32 version 8.50.0
8) TILE version 4.0.B
9) Keytek CEWare 2.10

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, equal to the positive square root of a sum of terms, the terms being 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 measurand. 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 Emissions

Per CISPR 16-4-2	**Ulab**	**Ucispr**
Radiated Disturbance @ 10m		
30 MHz – 1,000 MHz	4.57 dB	5.2 dB
Radiated Disturbance @ 3m		
1.0 GHz – 6.0 GHz	5.18 dB	5.2 dB
6.0 GHz – 18.0 GHz	5.48 dB	5.5 dB
18.0 GHz – 26.5 GHz	5.21 dB	
26.5 GHz – 40.0 GHz	4.99 dB	
Conducted Disturbance @ Mains Terminals		
150 kHz – 30 MHz	2.62 dB	3.6 dB
Disturbance Power		
30 MHz – 300 MHz	3.88 dB	4.5 dB

Measurement Uncertainty Emissions

The estimated combined standard uncertainty for radiated emissions measurements is ± 4.57 dB	Per CISPR16-4-2 Method
The estimated combined standard uncertainty for radiated emissions measurements from 1 GHz to 6 GHz is ± 5.18dB	Per CISPR16-4-2 Method
The estimated combined standard uncertainty for radiated emissions measurements from 6 GHz to 18 GHz is ± 5.48dB	Per CISPR16-4-2 Method
The estimated combined standard uncertainty for conducted emissions measurements is ± 2.62dB.	Per CISPR16-4-2 Method

Expanded measurement uncertainty numbers are shown in the tables above. Compliance criteria are not based on measurement uncertainty.

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 ISO IEC 17025:2017. Equipment calibration records are kept on file at the test facility.

2.5 Measurement Equipment Identification

Equipment	Manufacturer	Model #	Ref.	Serial #	Last Cal dd/mm/yy	Next Cal dd/mm/yy	Test
Radiated Emissions							
Receiver (20Hz-40GHz)	Rohde & Schwarz	ESU 40		100274	29-Jul-19	29-Jul-20	RE
BiLog	Sunol	JB3		A102115	27-Jun-18	27-Jun-20	RE
Horn(1-18 GHz)	ETS-Lindgren	3117		109306	20-Aug-18	20-Aug-20	RE
Horn (18-26.5 GHz)	EMCO	024083		6707	02-Aug-18	02-Aug-20	RE
Horn (26.5-40 GHz)	EMCO	024085		1180	02-Aug-18	02-Aug-20	RE
Loop Antenna	EMCO	6502		8901-2302	24-Apr-18	24-Apr-20	RE
Horn (1-18 GHz)	EMCO	3115		9512-4630	N/A	N/A	RE
Amplifier	Hewlett-Packard	8447D		030907	30-Jul-19	30-Jul-20	RE
Temp Chamber	Cincinnati Sub-Zero	EZT-570Sv		ROC031	3-Sep-19	3-Sep-20	RE
General Laboratory Equipment							
Multimeter	Fluke	87		59890224	1-Aug-19	1-Aug-20	
Pressure/Temperature/RH	Control Company	68000-49		181704893	31-Oct-18	31-Oct-20	

Note: RE=Radiated Emissions

3 Product Information

3.1 Test Plan

The EUT product information, test configuration, mode of operation, test types, test procedures, test levels, pass/failure criteria, in this report were carried out per the product test plan located in appendix A of this report.

3.2 EUT Photos

"EUT Front.jpg"

Figure 1 – External Photo of EUT (Front)

"EUT Side.jpg"

Figure 2 – External Photo of EUT (Side)

"EUT Back.jpg"

Figure 3 – External Photo of EUT (Back)

"EUT with Batteries.jpg"

Figure 4 – External Photo of EUT (Charging Mode)

"Intermal Modifications.jpg"

Figure 5 – Internal Photo of EUT

4 Emissions

4.1 Carrier Field Strength

This test measures the electromagnetic levels of the fundamental transmission(s) generated by the EUT in the direction of the maximum level under specified conditions of measurements in the presence of modulation.

4.1.1 Over View of Test

Results	**Complies** (as tested per this report)					**Date**	02/24/2020
Standard	FCC 15.225; RSS-210						
Product Model	JCEMDS			**Serial#**		JEMI-KZ10-LK73	
Configuration	See test plan for details.						
Test Set-up	Tested 3 meters semi- anechoic chamber placed on turn-table, see test plans for details.						
EUT Powered By	120V / 60Hz	**Temp**	24º C	**Humidity**	32%	**Pressure**	998 mbar
Frequency Range	13.56 MHz @ 3 meters						
Perf. Criteria	Fundamental < 124 dBµV/m			**Perf. Verification**		Readings Under Limit	
Mod. to EUT	See Test Plan			**Test Performed By**		Alexander Sowinski	

4.1.2 Test Procedure

Radiated emissions tests were performed using the procedures of FCC 15.225 and/or ANSI C63.4 and ANSI C63.10 including methods for signal maximizations and EUT configuration. The photos included with the report show the EUT in its maximized configuration. Further radiated emission tests were performed per the procedures stated in the other emissions standards listed in this report. Transmitter under test was switched on at maximum output power for the duration of the testing. The following frequencies were used during testing: NFC: 13.56 MHz.

4.1.3 Deviations

There were no deviations from the test methodology listed in the test plan for the radiated emission test.

4.1.4 Final Test

All final radiated emissions measurements were below (in compliance) the limits.

4.1.5 Final Data

Table 1: Carrier Field Strength

13.56 MHz	Measured	Loop Position	Azimuth	Height	Limit	Margin
	dBµV/m	deg	deg	cm	dBµV/m	dB
X-Axis	68.213	0°	178	100.0	124.0	-55.787
X-Axis	59.713	90°	182	100.0	124.0	-64.287
Y-Axis	65.932	0°	182	100.0	124.0	-58.068
Y-Axis	59.777	90°	182	100.0	124.0	-64.223
Z-Axis	62.295	0°	181	100.0	124.0	-61.705
Z-Axis	30.763	90°	97	100.0	124.0	-93.237

4.1.6 Test Setup Photos

“c-NFC-X.jpg”

Figure 6 – NFC Setup “X-axis”

“c-NFC-Y.jpg”

Figure 7 – NFC Setup “Y-axis”

“c-NFC-Z.jpg”

Figure 8 – NFC Setup “Z-axis”

4.2 Out-of-Band Emissions

This test measures the electromagnetic levels of out-of-band spurious signals generated by the EUT that radiated from the EUT and may affect the performance of other nearby electronic equipment.

4.2.1 Over View of Test

Results	**Complies** (as tested per this report)					**Date**	02/24/2020
Standard	FCC 15.225; RSS-210						
Product Model	JCEMDS			**Serial#**		JEMI-KZ10-LK73	
Configuration	See test plan for details.						
Test Set-up	Tested 3 meters semi- anechoic chamber placed on turn-table, see test plans for details.						
EUT Powered By	120V / 60Hz	**Temp**	24º C	**Humidity**	32%	**Pressure**	998 mbar
Frequency Range	13.110 – 14.010 MHz @ 3 meters						
Perf. Criteria	Per 15.225 Section a-d			**Perf. Verification**		Readings Under Limit	
Mod. to EUT	See Test Plan			**Test Performed By**		Alexander Sowinski	

4.2.2 Test Procedure

Out-of-Band Emissions tests were performed using the procedures of FCC 15.225 and/or ANSI C63.4 and ANSI C63.10 including methods for signal maximizations and EUT configuration. The photos included with the report show the EUT in its maximized configuration. Further radiated emission tests were performed per the procedures stated in the other emissions standards listed in this report. NFC transmitter was switched on at maximum output power for the duration of the testing. The following frequencies were used during testing: NFC: 13.56 MHz.

All plots consist of a Blue Max-Hold trace and a Red Clear-Write trace.

4.2.3 Deviations

There were no deviations from the test methodology listed in the test plan for the out-of-band emission test.

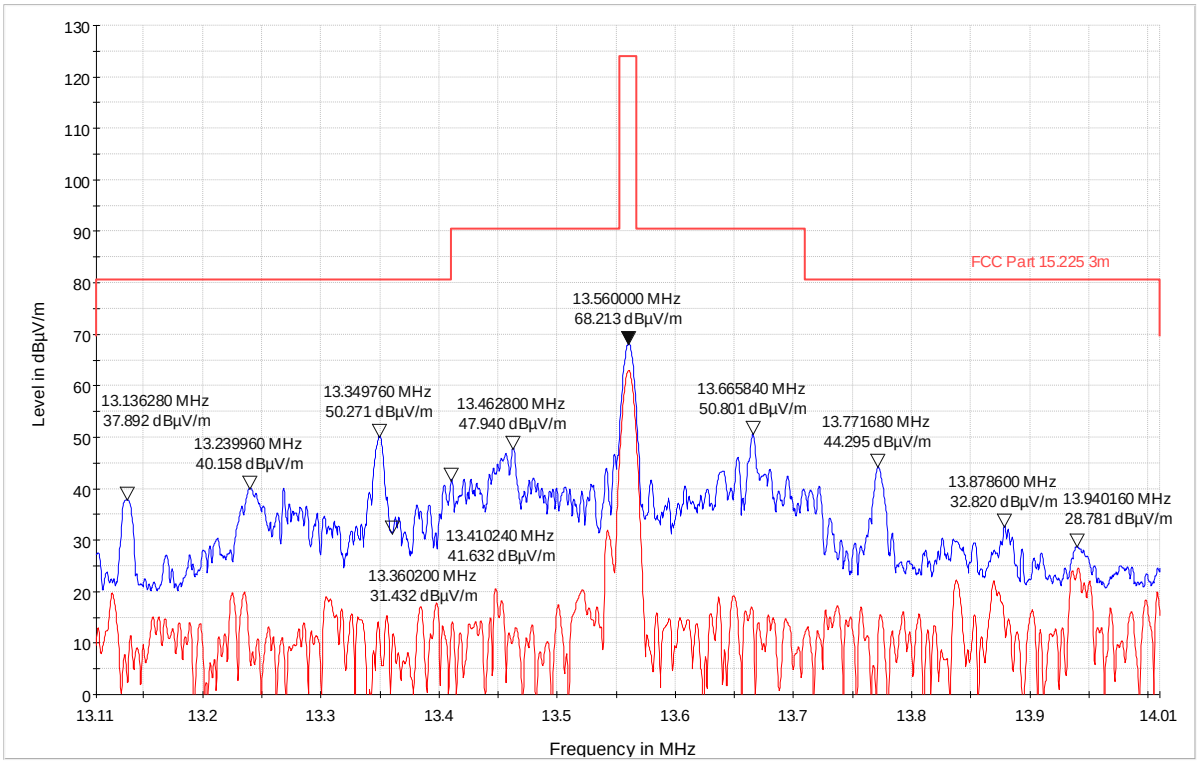
4.2.4 Final Test

All final out-of-band emissions measurements were below (in compliance) the limits.

4.2.5 Final Plots

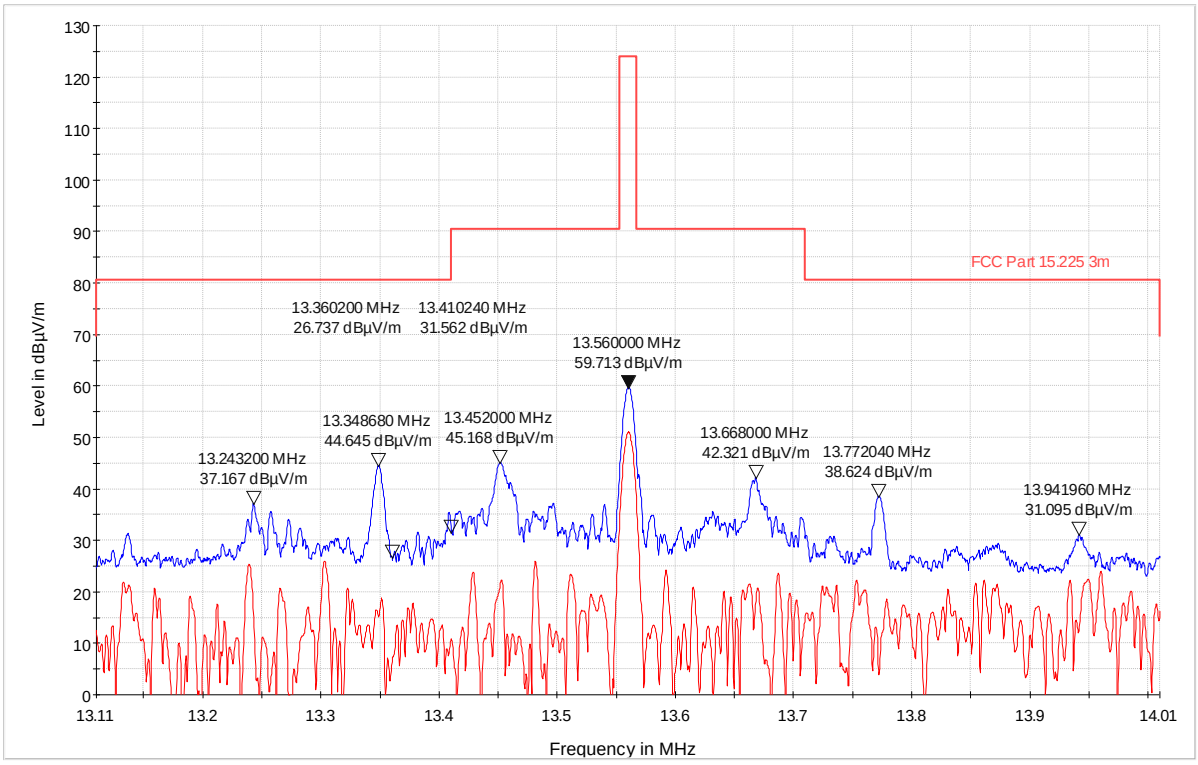
NOTES: 13.56MHz OOB X-axis

Band-edge Plot
Perpendicular (Loop 0°)



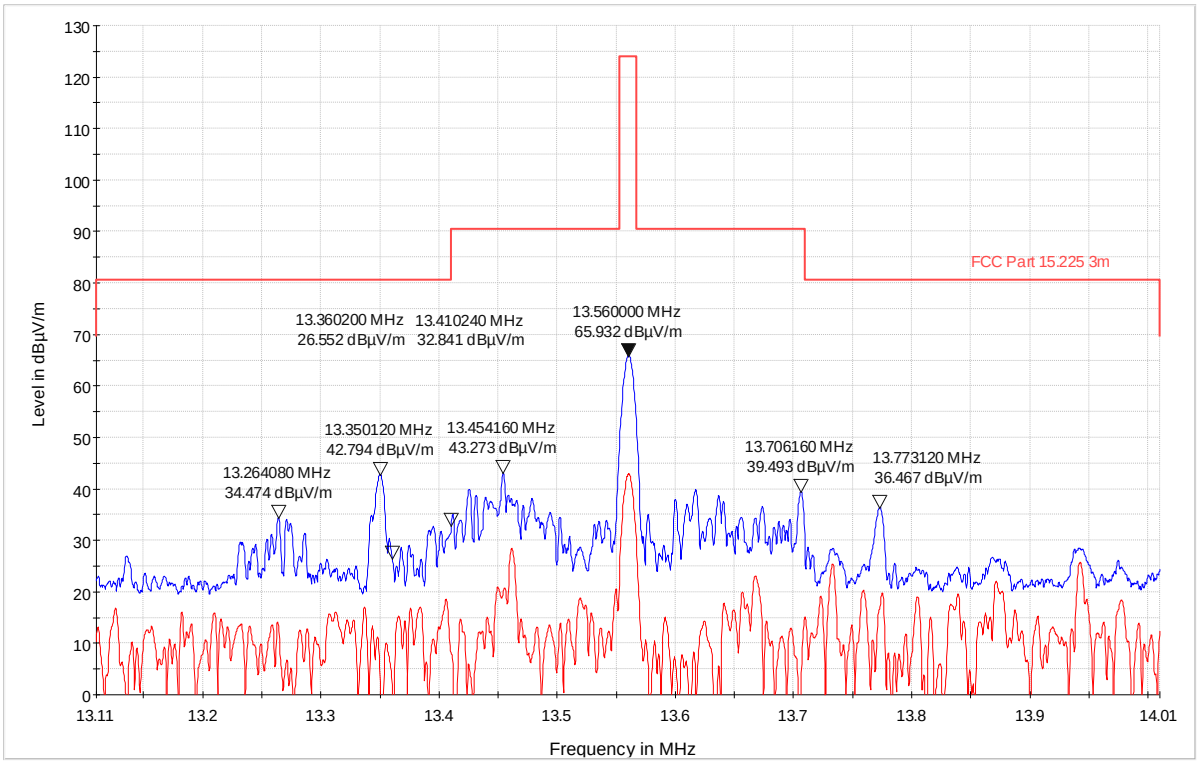
NOTES: 13.56MHz OOB X-axis

Band-edge Plot
Parallel (Loop 90°)



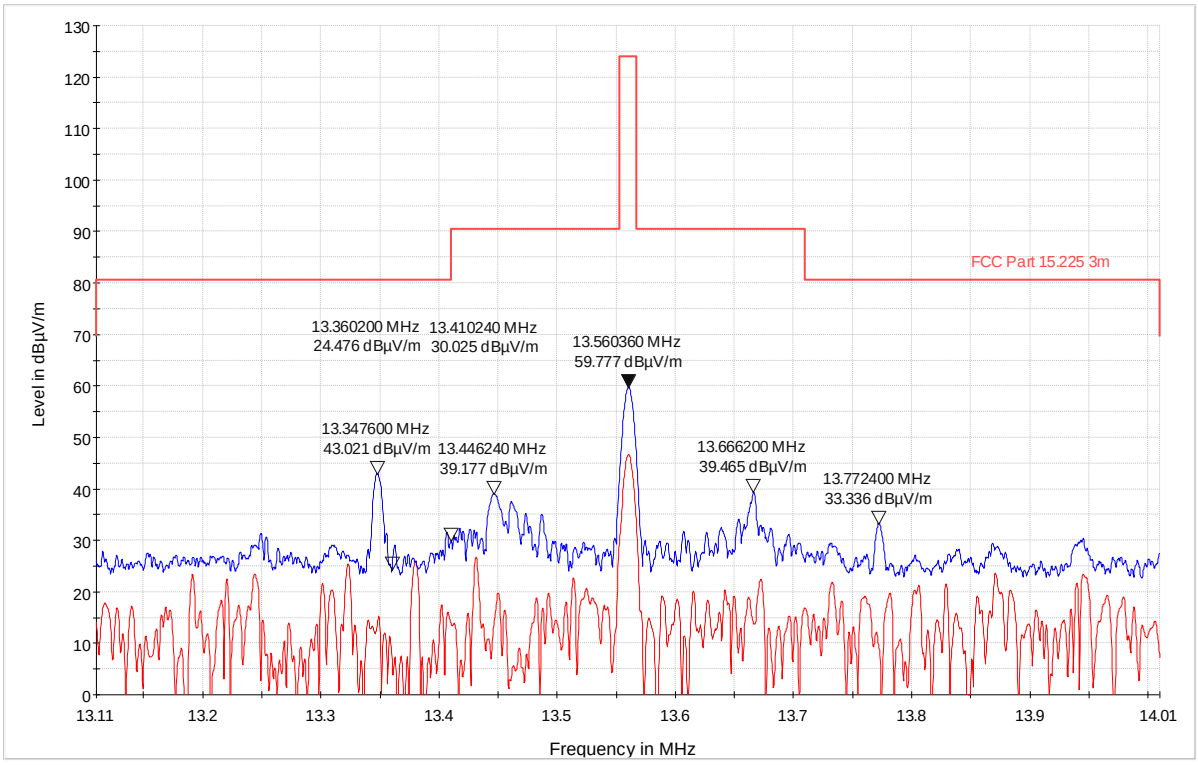
NOTES: 13.56MHz OOB Y-axis

Band-edge Plot
Perpendicular (Loop 0°)



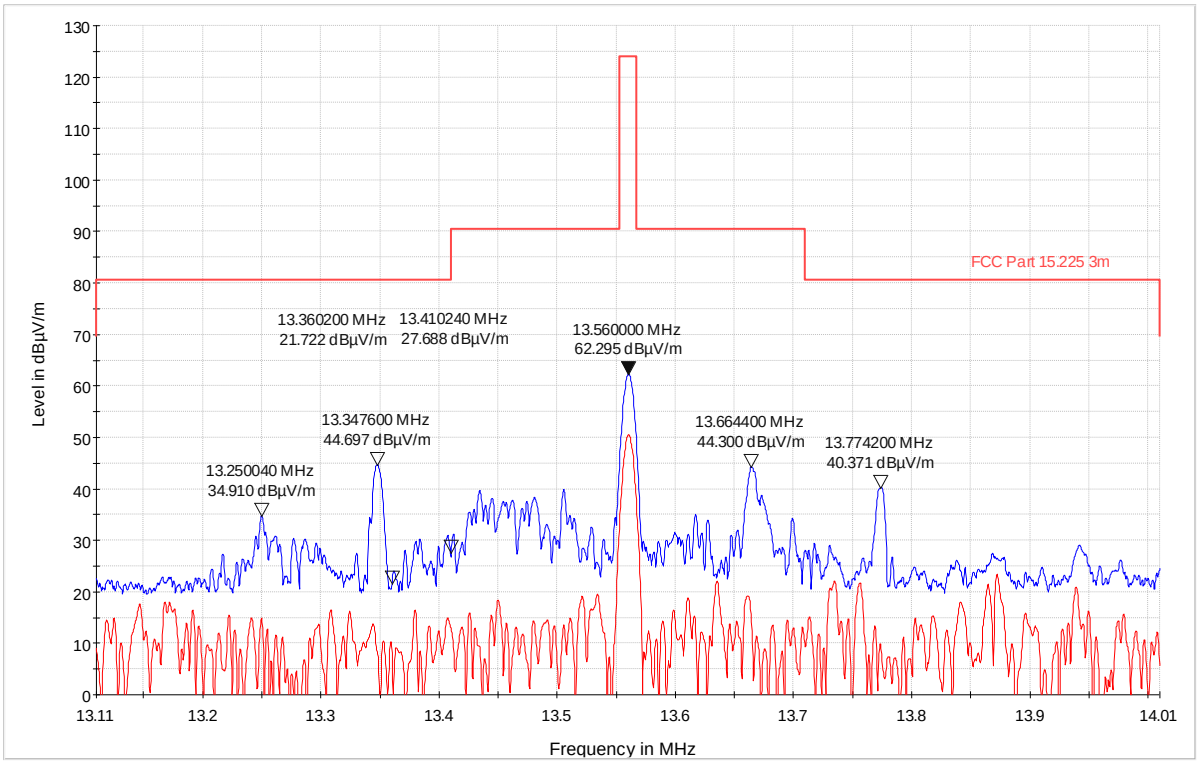
NOTES: 13.56MHz OOB Y-axis

Band-edge Plot
Parallel (Loop 90°)



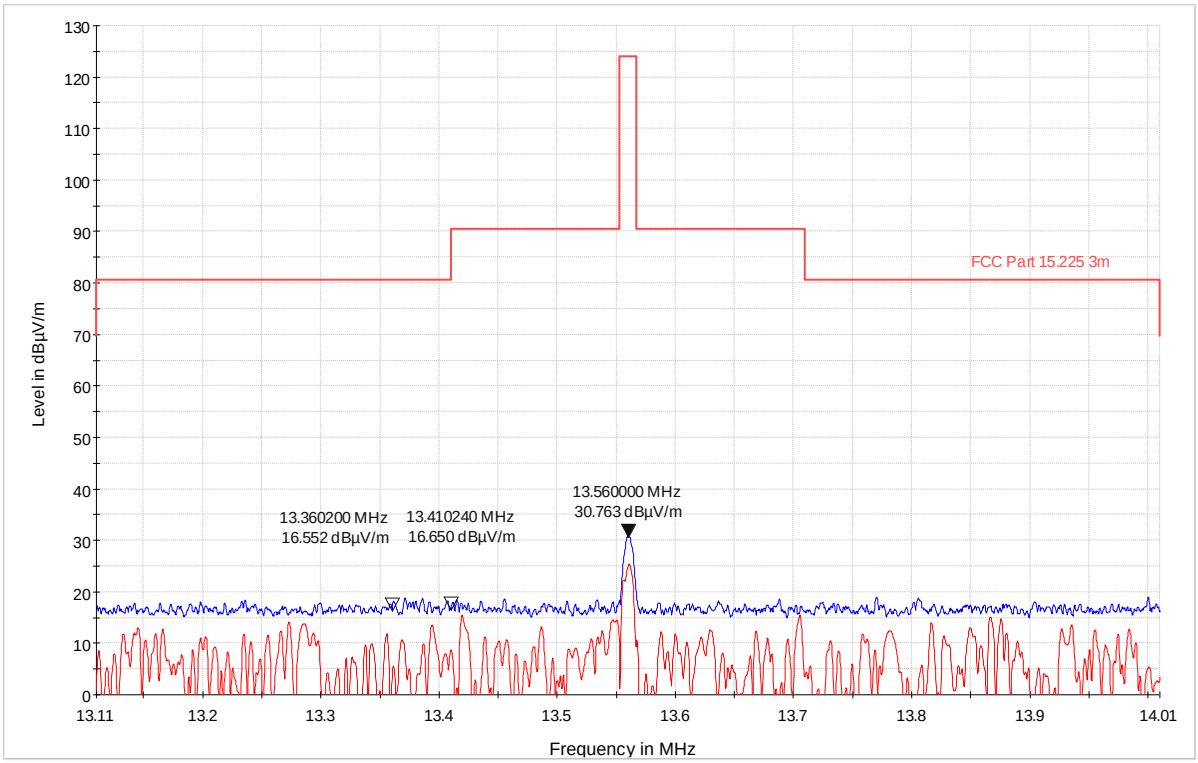
NOTES: 13.56MHz OOB Z-axis

Band-edge Plot
Perpendicular (Loop 0°)



NOTES: 13.56MHz OOB Z-axis

Band-edge Plot
Parallel (Loop 90°)



4.2.6 Test Setup Photos

"c-NFC-X.jpg"

Figure 9 – NFC Setup "X-axis"

"c-NFC-Y.jpg"

Figure 10 – NFC Setup "Y-axis"

"c-NFC-Z.jpg"

Figure 11 – NFC Setup "Z-axis"

4.3 Transmitter Spurious Emissions

This test measures the electromagnetic levels of spurious signals generated by the EUT that radiated from the EUT and may affect the performance of other nearby electronic equipment. Band-edge testing was also performed to confirm the absence of significant spurious emissions located within restricted bands.

4.3.1 Over View of Test

Results	**Complies** (as tested per this report)					**Date**	01/21/2020
Standard	FCC 15.209; FCC 15.225; RSS-210						
Product Model	JCEMDS			**Serial#**	JEMI-KZ10-LK73		
Configuration	See test plan for details.						
Test Set-up	Tested 3 meters semi- anechoic chamber placed on turn-table, see test plans for details.						
EUT Powered By	120V / 60Hz	**Temp**	24º C	**Humidity**	32%	**Pressure**	1016 mbar
Frequency Range	9k - 30 MHz @ 3 meters 30 - 1000 MHz @ 3 meters						
Perf. Criteria	Class B (Below Limit)			**Perf. Verification**	Readings Under Limit		
Mod. to EUT	See Test Plan			**Test Performed By**	Alexander Sowinski		

4.3.2 Test Procedure

Radiated emissions tests were performed using the procedures of FCC 15.209; FCC 15.225; RSS-210 and/or ANSI C63.4 and ANSI C63.10 including methods for signal maximizations and EUT configuration. The photos included with the report show the EUT in its maximized configuration. Further radiated emission tests were performed per the procedures stated in the other emissions standards listed in this report. All transmitters were switched on at maximum output power for the duration of the testing. The following frequencies were used during testing: NFC: 13.56 MHz.

4.3.3 Deviations

There were no deviations from the test methodology listed in the test plan for the radiated emission test.

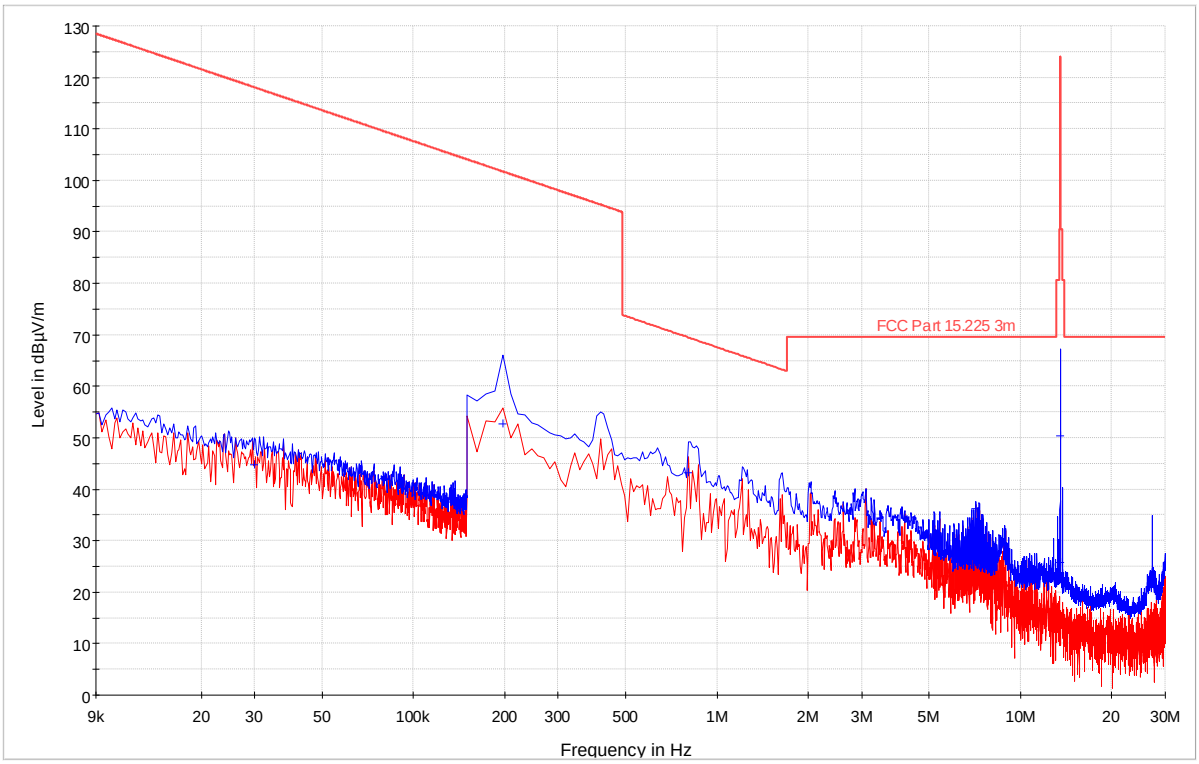
4.3.4 Final Test

All final radiated emissions measurements were below (in compliance) the limits.

4.3.5 Final Graphs

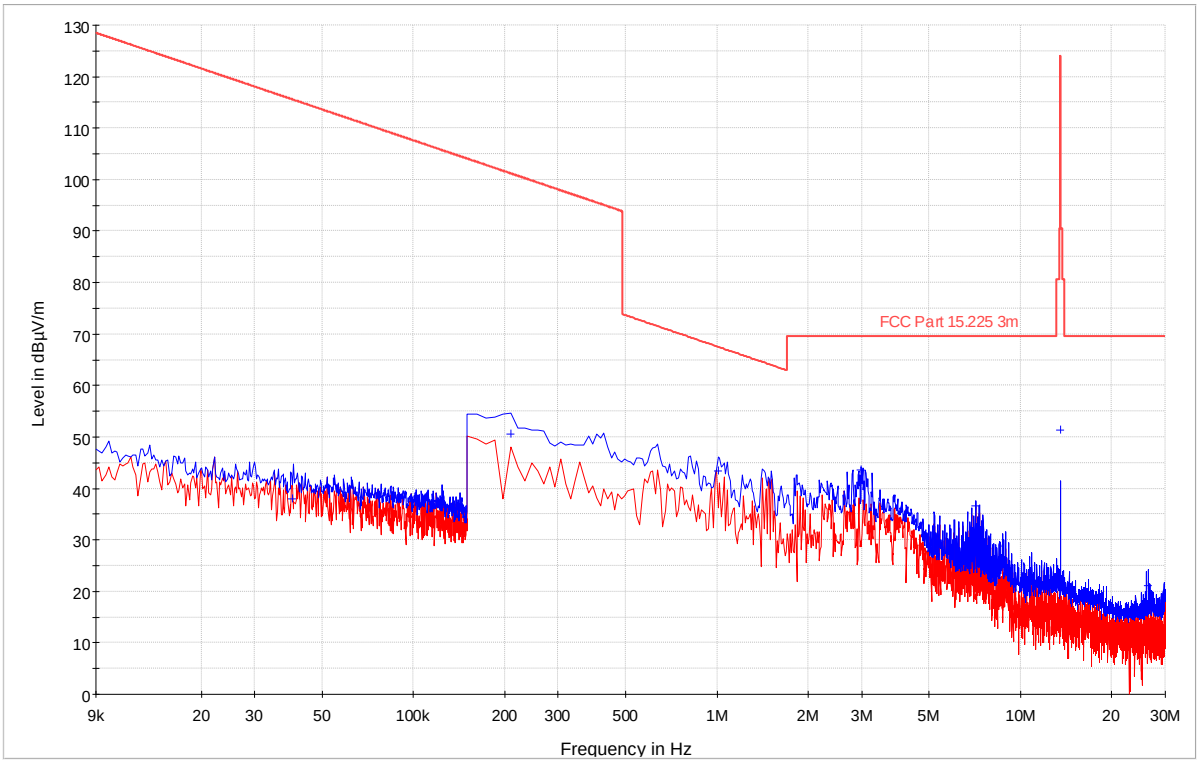
NOTES: 9k-30MHz, No Load

Radiated Emissions
Perpendicular (Loop 0°)



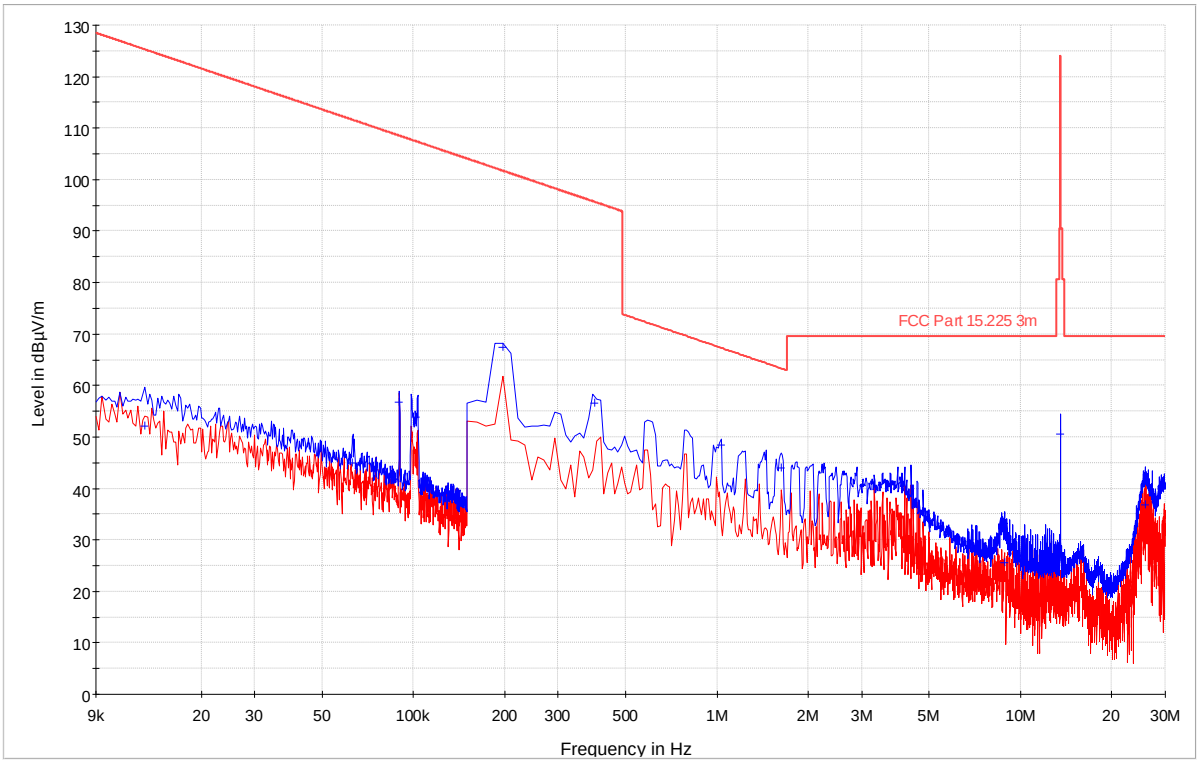
NOTES: 9k-30MHz, No Load

Radiated Emissions
Parallel (Loop 90°)



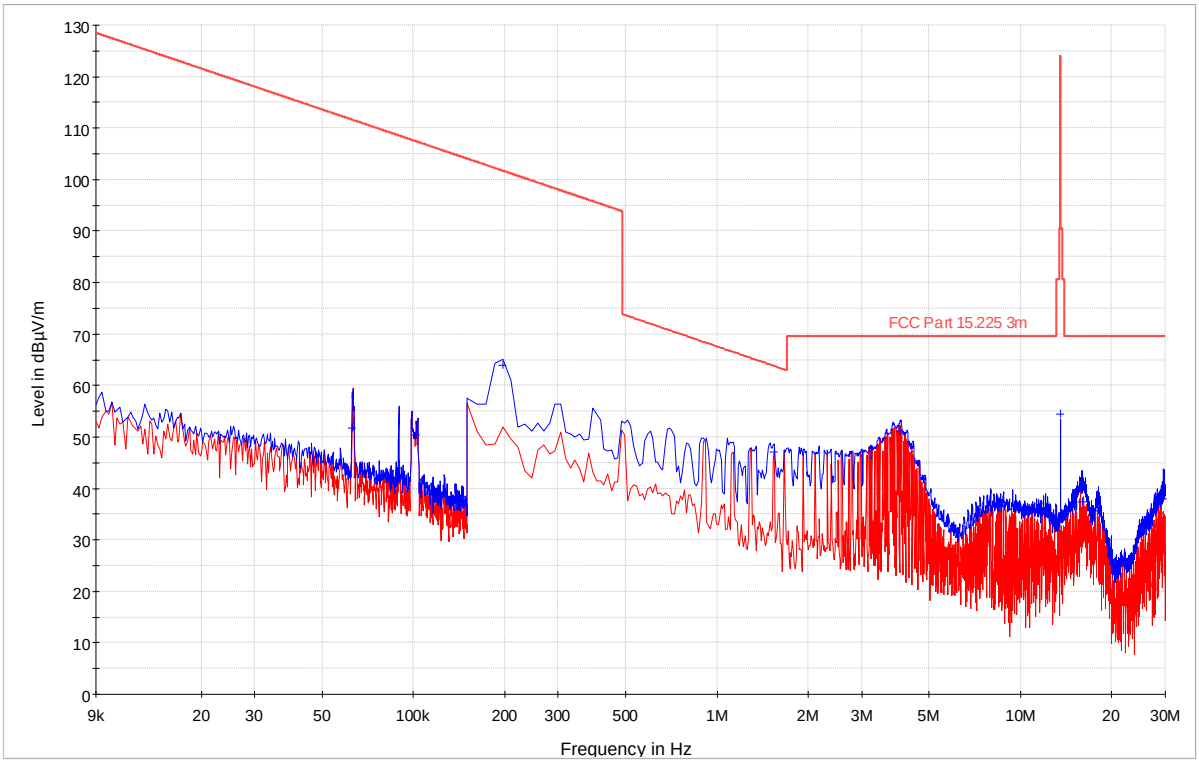
NOTES: 9k-30MHz, Charging

Radiated Emissions
Perpendicular (Loop 0°)



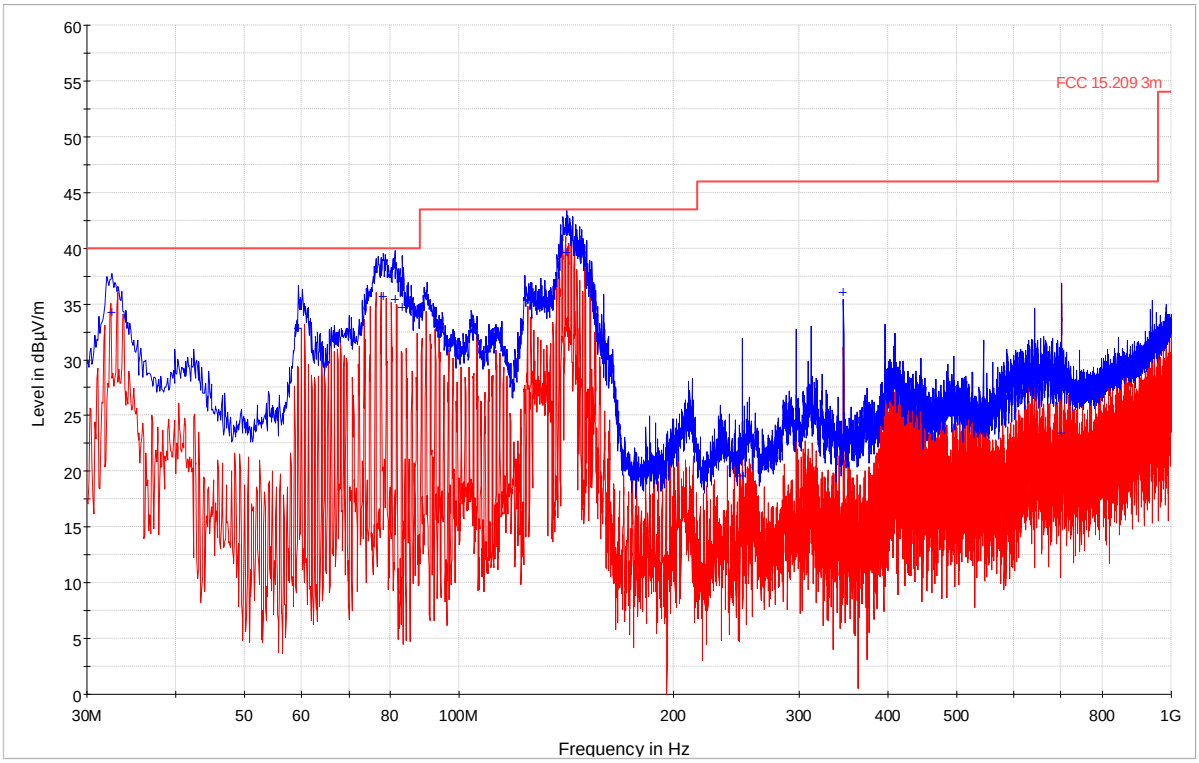
NOTES: 9k-30MHz, Charging

Radiated Emissions
Parallel (Loop 90°)



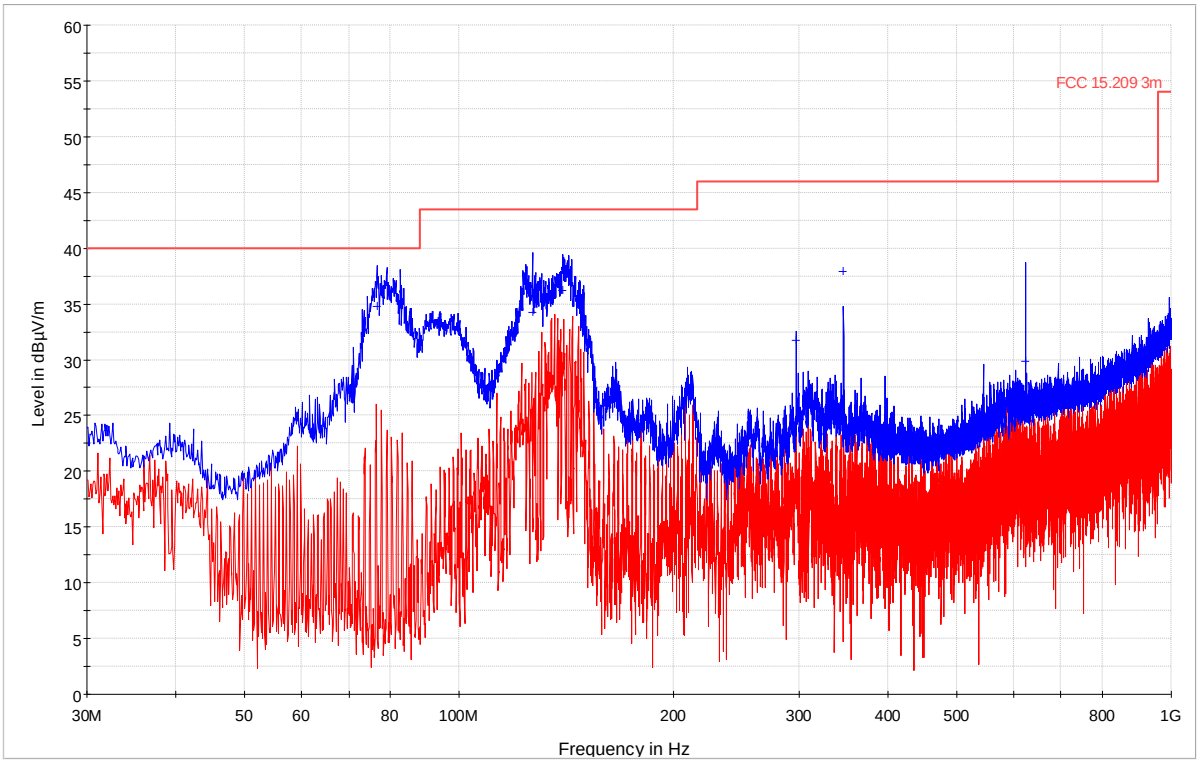
NOTES: 30-1000MHz, No Load

Radiated Emissions
Vertical



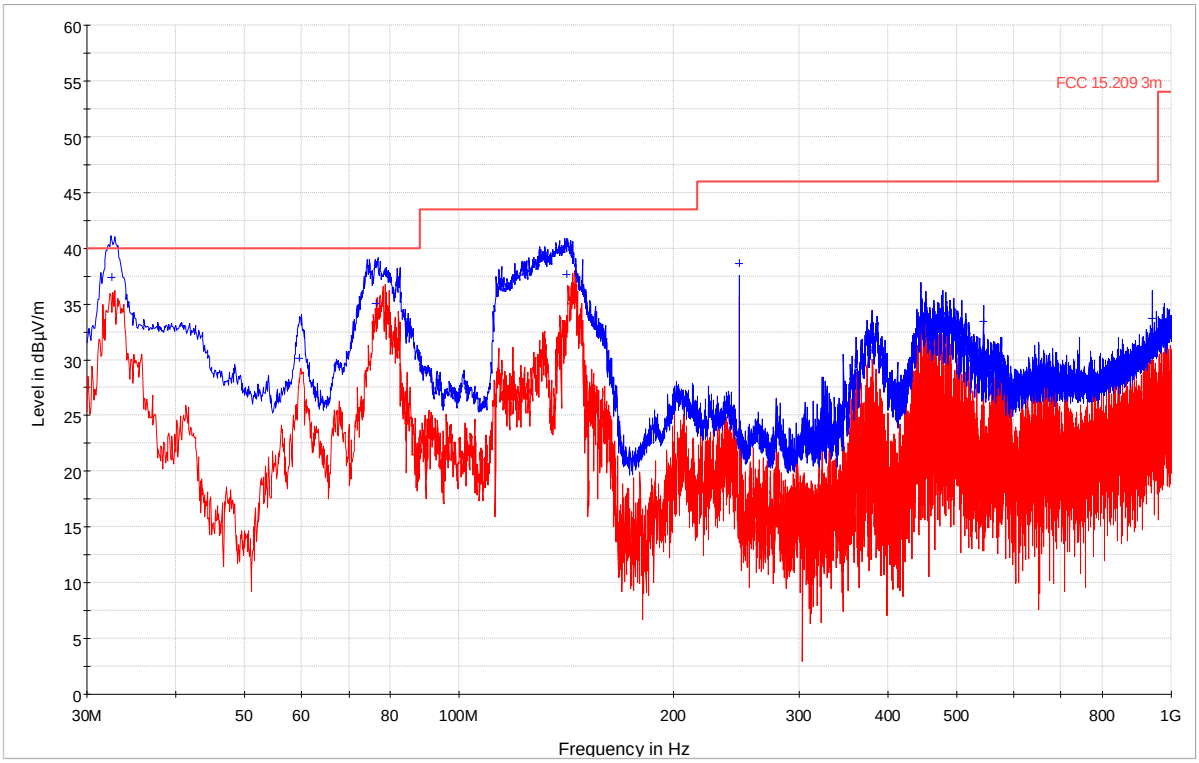
NOTES: 30-1000MHz, No Load

Radiated Emissions
Horizontal



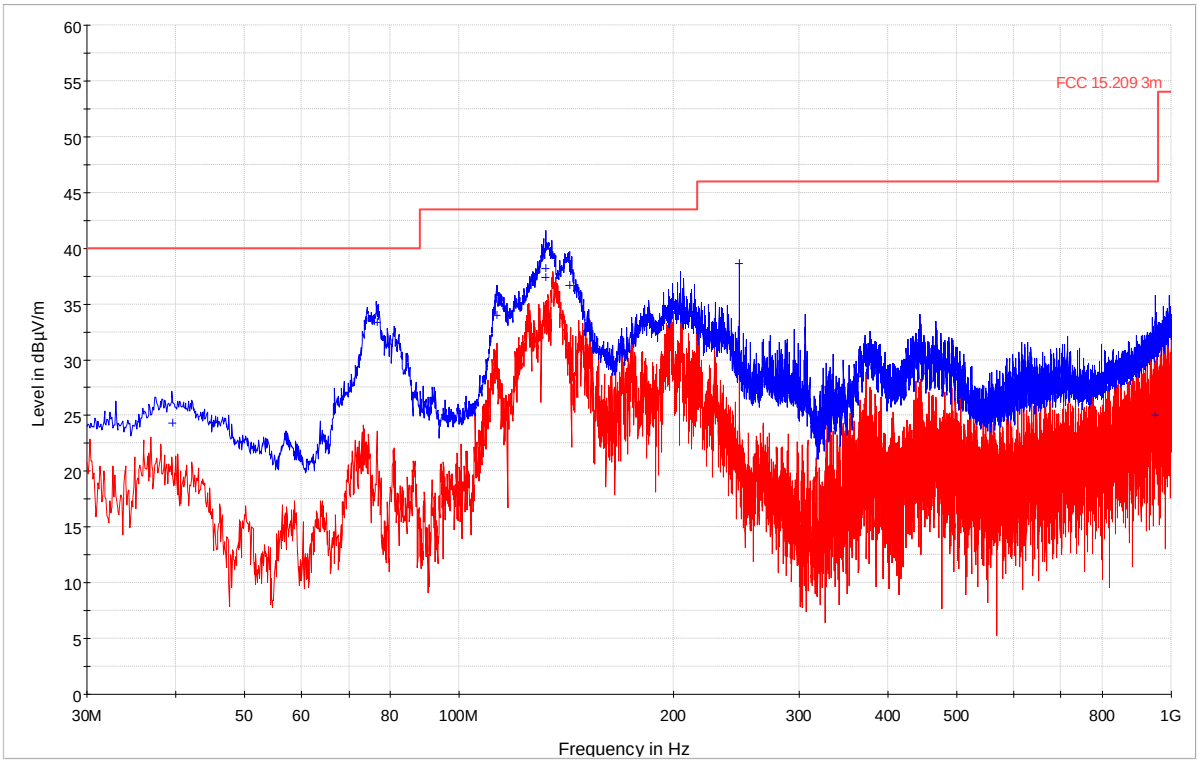
NOTES: 30-1000MHz, Charging

Radiated Emissions
Vertical



NOTES: 30-1000MHz, Charging

Radiated Emissions
Horizontal



4.3.6 Final Tabulated Data

Table 2: 9k – 30 MHz Tabulated Data, No Load

Frequency	QuasiPeak	Height	Loop Position	Azimuth	Limit	Margin
MHz	dBµV/m	cm	deg	deg	dBµV/m	dB
0.030	44.7	100.0	0°	2.0	118.1	-73.4
0.040	38.0	100.0	90°	259.0	115.6	-77.6
0.198	52.6	100.0	0°	153.0	101.7	-49.1
0.210	50.5	100.0	90°	151.0	101.2	-50.7
0.808	43.3	100.0	0°	0.0	69.5	-26.2
1.011	43.5	100.0	90°	54.0	67.5	-24.0
2.992	43.6	100.0	90°	0.0	69.5	-25.9
7.111	36.2	100.0	0°	309.0	69.5	-33.3
7.111	36.6	100.0	90°	86.0	69.5	-32.9
13.560	50.4	100.0	0°	182.0	124.0	-73.6
13.560	51.3	100.0	90°	182.0	124.0	-72.7
26.370	21.1	100.0	90°	4.0	69.5	-48.4
27.121	23.0	100.0	0°	35.0	69.5	-46.5

Table 3: 9k – 30 MHz Tabulated Data, Charging

Frequency	QuasiPeak	Height	Loop Position	Azimuth	Limit	Margin
MHz	dBµV/m	cm		deg	dBµV/m	dB
0.013	52.0	100.0	0°	-3.0	125.3	-73.3
0.063	51.7	100.0	90°	220.0	111.6	-59.9
0.063	44.9	100.0	0°	120.0	111.6	-66.7
0.089	41.9	100.0	90°	159.0	108.6	-66.7
0.090	56.8	100.0	0°	3.0	108.5	-51.7
0.102	50.4	100.0	90°	40.0	107.4	-57.0
0.102	53.9	100.0	0°	123.0	107.4	-53.5
0.197	67.4	100.0	0°	180.0	101.7	-34.3
0.198	64.0	100.0	90°	97.0	101.8	-37.8
0.395	56.6	100.0	0°	180.0	95.7	-39.1
1.034	48.5	100.0	0°	181.0	67.3	-18.8
1.547	47.0	100.0	90°	16.0	63.8	-16.8
1.635	44.0	100.0	0°	159.0	63.3	-19.3
4.019	51.2	100.0	90°	56.0	69.5	-18.3
8.854	25.5	100.0	0°	357.0	69.5	-44.0
13.560	54.5	100.0	90°	178.0	124.0	-69.5
13.560	50.6	100.0	0°	182.0	124.0	-73.4
16.042	37.5	100.0	90°	148.0	69.5	-32.0
18.036	35.7	100.0	90°	26.0	69.5	-33.8
25.749	36.7	100.0	0°	97.0	69.5	-32.8
29.606	38.1	100.0	90°	290.0	69.5	-31.4

Table 4: 30 – 1000 MHz Tabulated Data, No Load

Frequency	QuasiPeak	Height	Polarization	Azimuth	Limit	Margin
MHz	dBµV/m	cm		deg	dBµV/m	dB
32.48	34.3	100.0	V	318.0	40.0	-5.7
59.48	32.8	110.0	V	282.0	40.0	-7.2
76.60	34.8	230.0	H	104.0	40.0	-5.2
78.32	35.7	130.0	V	310.0	40.0	-4.3
81.24	35.5	190.0	V	311.0	40.0	-4.5
83.24	34.7	140.0	V	295.0	40.0	-5.3
126.76	34.2	244.0	H	115.0	43.5	-9.3
139.88	36.2	200.0	H	336.0	43.5	-7.3
141.60	39.6	100.0	V	358.0	43.5	-3.9
250.00	19.6	100.0	V	19.0	46.0	-26.4
297.00	31.8	350.0	H	240.0	46.0	-14.2
346.52	37.9	100.0	H	248.0	46.0	-8.1
346.52	36.0	150.0	V	54.0	46.0	-10.0
625.08	29.9	232.0	H	-3.0	46.0	-16.1
700.96	23.5	150.0	V	19.0	46.0	-22.5

Table 5: 30 – 1000 MHz Tabulated Data, Charging

Frequency	QuasiPeak	Height	Polarization	Azimuth	Limit	Margin
MHz	dBµV/m	cm		deg	dBµV/m	dB
32.48	37.4	100.0	V	168.0	40.0	-2.6
39.56	24.3	250.0	H	224.0	40.0	-15.7
59.64	30.2	100.0	V	248.0	40.0	-9.8
76.48	35.0	180.0	V	334.0	40.0	-5.0
76.60	33.4	250.0	H	82.0	40.0	-6.6
112.84	34.0	200.0	H	65.0	43.5	-9.5
132.32	38.2	200.0	H	318.0	43.5	-5.3
141.64	37.6	100.0	V	188.0	43.5	-5.9
142.84	36.6	200.0	H	331.0	43.5	-6.9
247.52	38.6	120.0	H	43.0	46.0	-7.4
247.52	38.7	210.0	V	-2.0	46.0	-7.3
379.52	30.9	125.0	V	322.0	46.0	-15.1
443.16	31.3	100.0	H	17.0	46.0	-14.7
445.52	33.4	130.0	V	328.0	46.0	-12.6
544.52	33.5	100.0	V	307.0	46.0	-12.5
940.48	33.7	100.0	V	356.0	46.0	-12.3
949.32	25.0	100.0	H	26.0	46.0	-21.0

4.3.7 Photos

"RE 9k NoLoad1.jpg"

Figure 12 - Radiated Emissions Test Setup (9k – 30 MHz, No Load)

"RE 9k NoLoad2.jpg"

Figure 13 - Radiated Emissions Test Setup (9k – 30 MHz, No Load)

"RE 9k Chrg1.jpg"

Figure 14 - Radiated Emissions Test Setup (9k – 30 MHz, Charging)

"RE 9k Chrg2.jpg"

Figure 15 - Radiated Emissions Test Setup (9k – 30 MHz, Charging)

"RE Low NoLoad1.jpg"

Figure 16 - Radiated Emissions Test Setup (30 – 1000 MHz No Load)

"RE Low NoLoad2.jpg"

Figure 17 - Radiated Emissions Test Setup (30 – 1000 MHz, No Load)

"RE Low Chrg1.jpg"

Figure 18 - Radiated Emissions Test Setup (30 – 1000 MHz, Charging)

"RE Low Chrg2.jpg"

Figure 19 - Radiated Emissions Test Setup (30 – 1000 MHz, Charging)

4.4 Frequency Stability + Voltage Variation

This test evaluates the stability of the EUT's transmit frequency under extreme conditions.

4.4.1 Test Over View

Results	**Complies** (as tested per this report)				**Date**	02/19/2020	
Standard	FCC 15.225; RSS-210						
Product Model	JCEMDS			**Serial#**	JEMI-KZ10-LK73		
Configuration	See test plan for details.						
Test Set-up	Tested in shielded room, EUT placed inside temperature chamber. See test plan for details						
EUT Powered By	120V / 60Hz	**Temp**	23º C	**Humidity**	32%	**Pressure**	1015 mbar
Perf. Criteria	±0.01 % Transmit frequency			**Perf. Verification**	Readings under Limit		
Mod to EUT	See Test Plan			**Test Performed By**	Alexander Sowinski		

4.4.2 Test Procedure

Frequency stability was performed inside the temperature chamber, varying the ambient temperature of the EUT between -20℃ and 50℃, and the supply voltage between 85% and 115% of the nominal supply voltage. The peak frequency of the transmitter was recorded via loop antenna and spectrum analyzer. Nominal transmit frequencies – NFC: 13.56MHz.

4.4.3 Deviations

There were no deviations from the test methodology listed in the test plan for the frequency stability test.

4.4.4 Final Test

The frequency stability of the EUT was recorded to be within the tolerances specified by the standard.

4.4.5 Final Frequency Stability Data

Table 6: NFC (13.56MHz) Frequency Stability

Voltage	Temperature	Measured Freq	Lower Limit	Upper Limit	Error	Result
V	℃	MHz	MHz	MHz	kHz	
102	-20	13.560401	13.558644	13.561356	0.401	Pass
102	22	13.560481	13.558644	13.561356	0.481	Pass
102	50	13.560401	13.558644	13.561356	0.401	Pass
138	-20	13.560401	13.558644	13.561356	0.401	Pass
138	22	13.560481	13.558644	13.561356	0.481	Pass
138	50	13.560401	13.558644	13.561356	0.401	Pass

4.4.6 Sample Plot

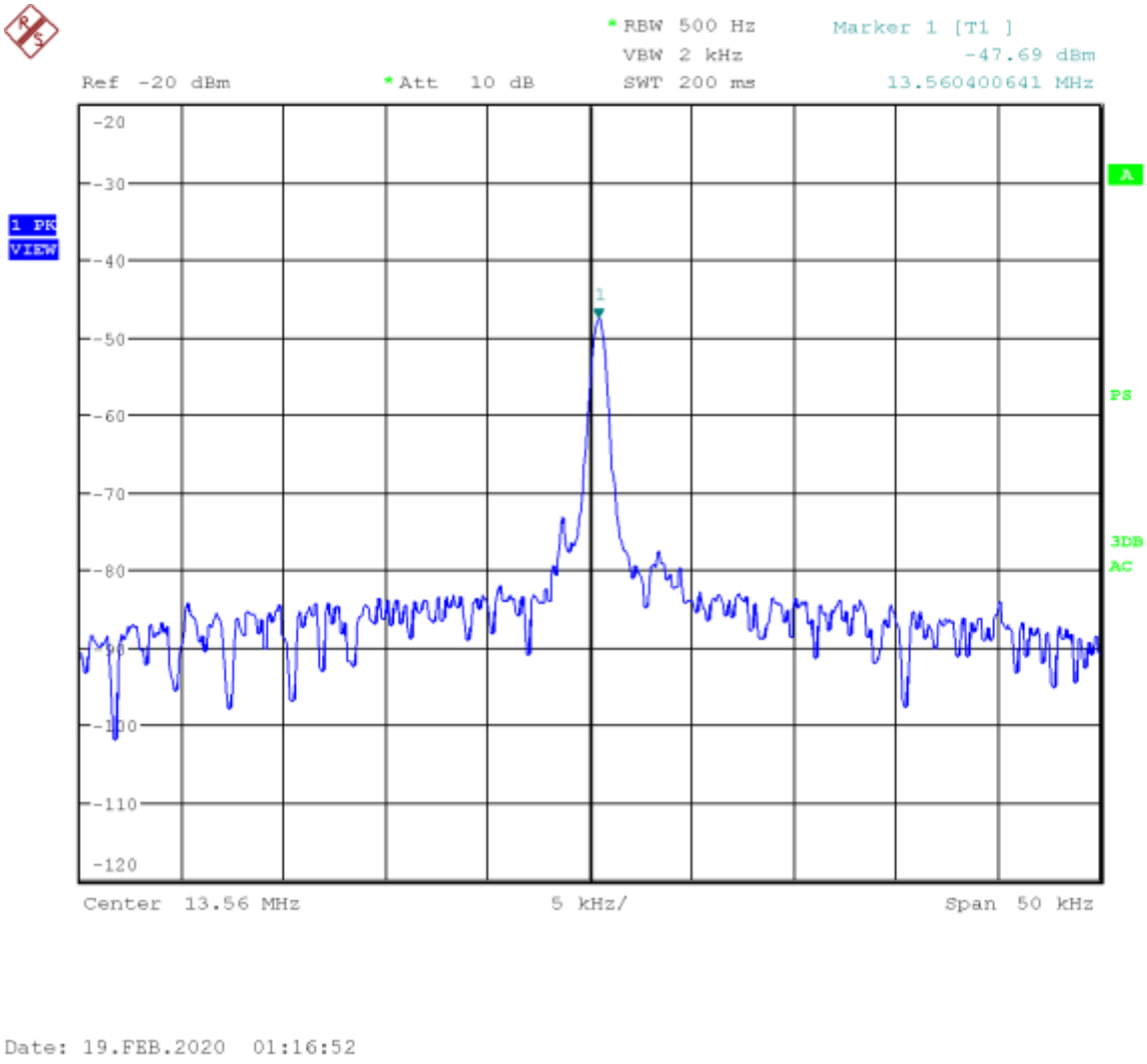


Figure 20 – Sample NFC Frequency Stability Plot

4.4.7 Setup Photos

"NFC Stability Setup.jpg"

Figure 21 –Frequency Stability Test Setup (NFC)

"Chamber Stability Setup.jpg"

Figure 22 – Frequency Stability Test Setup (Inside Chamber)

4.5 Occupied Bandwidth

This test evaluates the 99% Occupied Bandwidth of the EUT

4.5.1 Test Over View

Results	**Complies** (as tested per this report)				**Date**	02/19/2020	
Standard	FCC 15.215; RSS-210						
Product Model	JCEMDS			**Serial#**	JEMI-KZ10-LK73		
Configuration	See test plan for details.						
Test Set-up	Tested in shielded room, EUT placed on table inside semi-anechoic chamber. See test plan for details						
EUT Powered By	120V / 60Hz	**Temp**	23º C	**Humidity**	32%	**Pressure**	1015 mbar
Perf. Criteria	Report result			**Perf. Verification**	Report result		
Mod to EUT	See Test Plan			**Test Performed By**	Alexander Sowinski		

4.5.2 Test Procedure

Occupied Bandwidth testing was performed by measuring the transmission of the EUT and applying the procedures detailed in ANSI C63.10 Section 6.9. EUT was placed on non-conductive support inside semi-anechoic chamber. Measurements of fundamental transmissions were taken at 3m using the appropriate antenna.

4.5.3 Deviations

There were no deviations from the test methodology listed in the test plan for the occupied bandwidth test.

4.5.4 Final Test

The occupied bandwidth of the EUT was recorded to be within the tolerances specified by the standard.

4.5.5 Occupied Bandwidth Data

Table 7: Occupied Bandwidth

Orientation	Loop Position	99% OBW	Extreme conditions correction	Declared OBW	Limit	Result
		kHz	kHz	kHz		
X-Axis	0°	1.442308	1.923308	2.478	N/A	Pass
X-Axis	90°	1.362179	1.843179	2.478	N/A	Pass
Y-Axis	0°	1.201923	1.682923	2.478	N/A	Pass
Y-Axis	90°	1.201923	1.682923	2.478	N/A	Pass
Z-Axis	0°	1.282051	1.763051	2.478	N/A	Pass
Z-Axis	90°	1.201923	1.682923	2.478	N/A	Pass

4.5.6 Sample OBW Plot

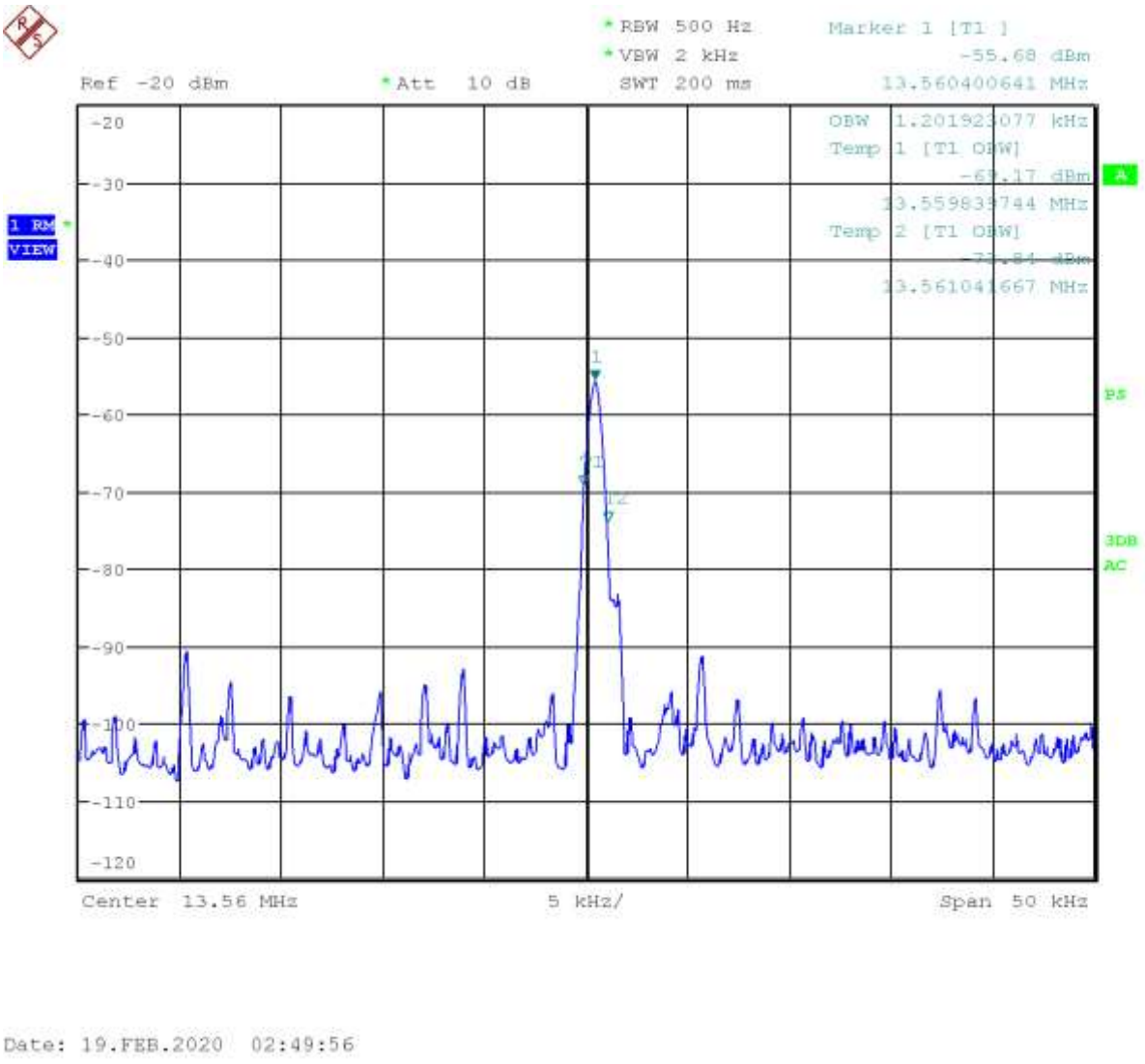


Figure 23 – Sample NFC OBW Plot

4.5.7 Test Setup Photos

"c-NFC-X.jpg"

Figure 24 – NFC Setup "X-axis"

"c-NFC-Y.jpg"

Figure 25 – NFC Setup "Y-axis"

"c-NFC-Z.jpg"

Figure 26 – NFC Setup "Z-axis"

4.6 Duty Cycle

This test evaluates the duty cycle of the EUT

4.6.1 Test Over View

Results	**Complies** (as tested per this report)				**Date**	01/20/2020	
Standard	RSS-210						
Product Model	JCEMDS			**Serial#**	JEMI-KZ10-LK73		
Configuration	See test plan for details.						
Test Set-up	N/A						
EUT Powered By	120V / 60Hz	**Temp**	--º C	**Humidity**	--%	**Pressure**	-- mbar
Perf. Criteria	Report result			**Perf. Verification**	Report result		
Mod to EUT	See Test Plan			**Test Performed By**	Alexander Sowinski		

4.6.2 Test Procedure

Duty cycle was provided by the customer: 100%.

4.6.3 Deviations

There were no deviations from the test methodology listed in the test plan for the duty cycle test.

4.6.4 Final Test

The duty cycle of the EUT was recorded to be within the tolerances specified by the standard.

4.6.5 Final Data

Duty cycle for EUT is reported as 100% (always on transmitters) for the NFC transmitters.

Appendix A

5 Test Plan

This test report is intended to follow the test plan outlined herein unless otherwise stated. The test plan provides product information, reference standards, and testing details. The product information below came via client, product manual, product itself and or the internet. Test procedure information will reference standards or internal TUV Rheinland NA procedures.

5.1 General Information

Client	Hubbell Incorporated (Delaware), Wiring Device Kellems Division
Address 1	40 Waterview Dr
Address 2	Shelton, CT, 06484
Contact Person	David Gellis
Telephone	(475)-882-4676
Fax	--
e-mail	dgellis@hubbell.com

5.2 Model(s) Name

JCEMDS

5.3 Type of Product

JumpCharge

5.4 Equipment Under Test (EUT) Description

EUT is desktop style battery charging and rental platform. User interface comprises NFC radio. Platform accepts, charges, and manages rental and return of proprietary battery modules.

5.5 Wireless

☒	**Yes**	☐	**No**

Unit:	Desktop (JEMI-KZ10-LK73)
Proposed FCC ID:	GX7-JCEMDSK3
Proposed IC ID:	10282A-JCEMDSK3
NFC FCC ID:	WQJ-VP4880 (uncertified)
NFC IC ID:	N/A
NFC Frequency:	13.56 MHz
NFC Antenna:	Loop Antenna, 0 dBi
NFC TX Power:	123.9 dBµV/m @ 3m (28.67 dBm EIRP)

5.6 General Product Information

Size	**H**	6”	**W**	18”	**L**	18”
Weight	5 lbs		**Fork-Lift Needed**		No	
Notes						

5.7 Modifications

"Internal Modifications with Arrows.jpg"

Figure 27 – Internal modifications to EUT

Modified Part	Serial number (if relevant)	Reason
AC Input: Ferrite core added	Laird / LBF159079-000	Radiated Emissions
AC Input: Ferrite core added	Laird / 28B0625-100	Radiated Emissions
DC Converter: Corners grounded	20 AWG wire	Radiated Emissions
Board Supply: Ferrite core added	Laird / 28A2736-0A2	Radiated Emissions

5.8 EUT Electrical Power Information

5.8.1 Electrical Power Type

☒	**AC**	☐	**DC**	☐	**Batteries**	☐	**Host -**

5.8.2 Electrical Power Information

Name	**Type**	**Voltage**		**Frequency**	**Current**	**Notes**
		min	**max**			
AC Input	AC	108	132	60Hz	4.2A	
Notes						

5.9 EUT Modes of Operation during Testing

EUT operation comprises a charging mode (all possible batteries present and charging at max power) and a no-load mode (no batteries present, no charging power being delivered). During testing, all device transmitters are active on a nominal frequency and transmitting at maximum output power.

5.10 EUT Clock/Oscillator Frequencies

Please specify the maximum clock frequency used in the product – 5.825 GHz

In the table below, please specify other clock frequencies and sensitive operating frequencies in the product.

Clock Frequencies & Sensitive Frequencies
13.56 MHz
2.402-2.48 GHz
2.412-2.462 GHz
2.422-2.452 GHz
5.18-5.24 GHz
5.19-5.23 GHz
5.21 GHz
5.745-5.825 GHz
5.755-5.795 GHz
5.775 GHz

5.11 Electrical Support Equipment

Type	Manufacturer	Model	Connected To
Batteries	JUMPCHARGE	JCBATTERY	EUT Battery Slots

5.12 Non - Electrical Support Equipment

Item	Notes
Gas	N/A
Water	N/A
Air	N/A

5.13 EUT Equipment/Cabling Information

EUT Port	Connected To	Location	Cable Type		
			Length	Shielded	Bead
AC	AC Main	Rear	3m	Yes	
Ethernet	N/A	Rear	25’	Yes	

5.14 Emissions

5.14.1 Carrier Field Strength

5.14.1.1 Carrier Field Strength Test Set-up

Standard	FCC 15.225; RSS-210			**TUV Test Procedure**	MS-0005082
Limit	124 dBµV/m	**Emissions Verification**			Emissions Under Limit
Frequency Range	13.56 MHz	**Ant Dist**	3m	**Det**	QP
Scan #1	Final Scan				
Configuration	See Appendix A, EUT Configuration				
EUT Powered By	See Appendix A, EUT Electrical Power Information				
Notes	None				

5.14.2 Out-of-Band Emissions

5.14.2.1 Out-of-Band Emissions Test Set-up

Standard	FCC 15.225; RSS-210			**TUV Test Procedure**	MS-0005082
Limit (Frequency)	13.11 < f < 13.41 MHz 13.71 < f < 14.01 MHz 13.41 < f < 13.553 MHz 13.567 < f < 13.71 MHz 13.553 < f < 13.567 MHz	**Limit (Level)**			80.5 dBµV/m 80.5 dBµV/m 90.5 dBµV/m 90.5 dBµV/m 124 dBµV/m
Frequency Range	13.11 – 14.01 MHz	**Ant Dist**	3m	**Det**	QP
Scan #1	Final Scan				
Configuration	See Appendix A, EUT Configuration				
EUT Powered By	See Appendix A, EUT Electrical Power Information				
Notes	None				

5.14.3 Transmitter Spurious Emissions

5.14.3.1 Transmitter Spurious Emissions Test Set-up

Standard	FCC 15.209; FCC 15.225; RSS-210			**TUV Test Procedure**	MS-0005082
Limit (Frequency)	9 < f < 490 kHz	**Limit (Level)**			Decreasing logarithmically from 128.5 to 93.8 dBµV/m
	490 < f < 1705 kHz				Decreasing logarithmically from 73.8 to 62.9 dBµV/m
	1.705 < f < 13.11 MHz				69.5 dBµV/m
	13.11 < f < 14.01 MHz				See 5.14.2.1
	14.01 < f < 30 MHz				69.5 dBµV/m
	30 < f < 88 MHz				40 dBµV/m
	88 < f < 216 MHz				43.5 dBµV/m
	216 < f < 960 MHz				46 dBµV/m
	f > 960 MHz				54 dBµV/m
Frequency Range	9k – 30 MHz	**Ant Dist**	3m	**Det**	QP
	30 – 1000 MHz	**Ant Dist**	3m	**Det**	QP
Scan #1	Final Scan				
Configuration	See Appendix A, EUT Configuration				
EUT Powered By	See Appendix A, EUT Electrical Power Information				
Notes	None				

5.14.4 Frequency Stability

5.14.4.1 Frequency Stability Test Set-up

Standard	FCC 15.225; RSS-210	**TUV Test Procedure**	MS-0005180
Limit	± 0.01% Transmit Frequency	**Stability Verification**	Stability Under Limit
EUT Powered By	85% Nominal Voltage: 102 VAC / 60 Hz 115% Nominal Voltage: 138 VAC / 60 Hz		
Ambient Temperature	-20°C to 50°C		
Scan #1	Frequency Stability		
Configuration	See Appendix A, EUT Configuration		
Notes	None		

5.14.5 Occupied Bandwidth

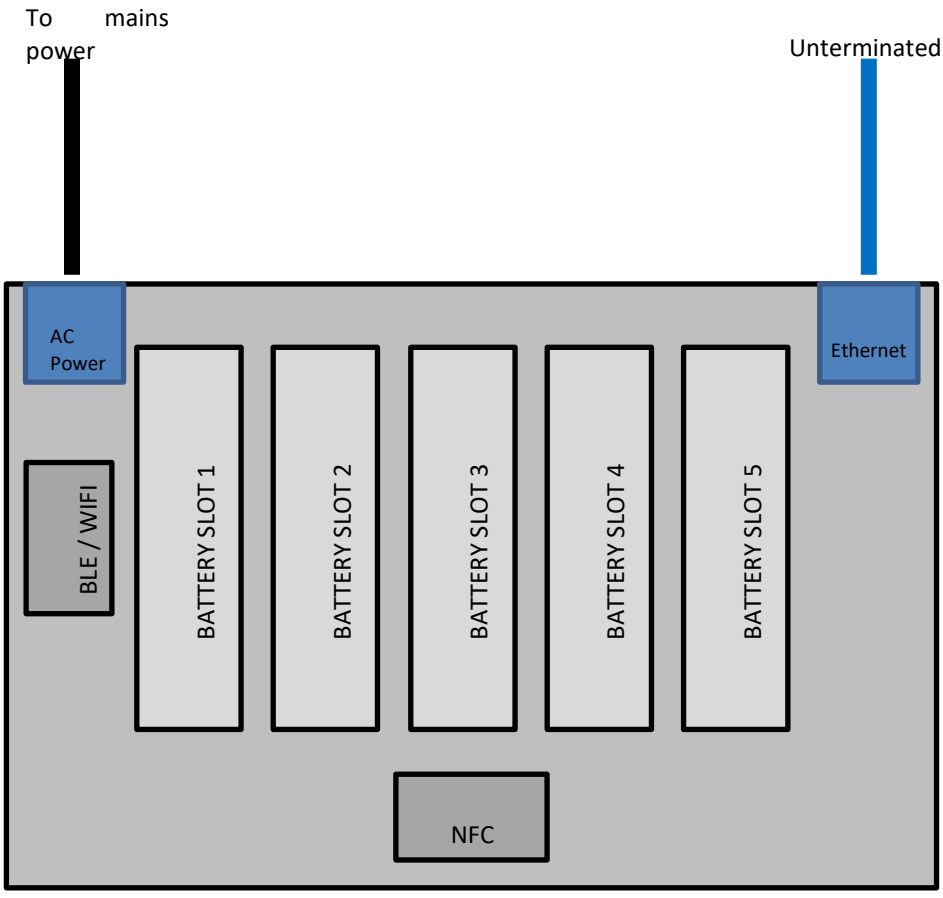
5.14.5.1 Occupied Bandwidth Test Set-up

Standard	FCC 15.215; RSS-210	**TUV Test Procedure**	MS-0005180
Limit	N/A	**Stability Verification**	Report result
EUT Powered By	120V/60Hz		
Scan #1	Occupied Bandwidth		
Configuration	See Appendix A, EUT Configuration		
Notes	None		

5.15 EUT Configuration

Configuration	Description
Charge Mode	All possible batteries installed, maximum charge power
No-Load	No batteries installed
Notes	All configurations are the same except as noted above

5.16 Block Diagram



END OF REPORT