

TEST REPORT

Report Number: 102982605MIN-005C
Project Number: G102982605

Testing performed on the
R1
(Electronic Wall Mounted Access Control Reader, RFID)
FCC ID: 2AK5B-R1
IC: 22134-R1

to
47 CFR Part 15.225:2016
RSS- 210, Issue 9, 2016
RSS-Gen, Issue 4, 2014

For
Latchable Inc.

Test Performed by:
Intertek Testing Services NA, Inc.
7250 Hudson Blvd., Suite 100
Oakdale, MN 55128 USA

Test Authorized by:
Latchable Inc.
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Date of issue: June 22, 2017

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1.0 GENERAL DESCRIPTION

Model:	R1
Type of EUT:	Electronic Wall Mounted Access Control Reader, RFID
Serial Number:	FCC 1
FCC ID:	2AK5B-R1
IC:	22134-R1
Related Submittal(s) Grants:	This is composite device with the same ID under different section of FCC and ISED regulations.
Company:	Latchable Inc.
Customer:	Mr. Jim Griszbacher
Address:	450 West 33rd Street-12th Floor New York, NY 10001 USA
Phone:	(609) 922-3739
e-mail:	jim@latchaccess.com
Test Standards:	<input checked="" type="checkbox"/> 47 CFR, Part 15:2016, §15.225 <input checked="" type="checkbox"/> RSS-210, Issue 9, 2016 <input checked="" type="checkbox"/> RSS-Gen, Issue 4, 2014 <input type="checkbox"/> 47 CFR, Part 15:2016, §15.107 and §15.109, Class B, test method: ANSI C63.4-2014 <input checked="" type="checkbox"/> ICES-003, Issue 6:2016 <input type="checkbox"/> Other
Type of radio:	<input checked="" type="checkbox"/> Stand -alone <input type="checkbox"/> Module <input type="checkbox"/> Hybrid
Date Sample Submitted:	May 31, 2017
Test Work Started:	June 1, 2017
Test Work Completed:	June 21, 2017
Test Sample Conditions:	<input type="checkbox"/> Damaged <input type="checkbox"/> Poor (Usable) <input checked="" type="checkbox"/> Good

1.1 Product Description; Test Facility

Product Description:	RFID Transmitter
Operating Frequency	13.56MHz
Modulation:	FSK
Emission Designator:	13K8A1D
Antenna(s) Info:	The radio utilizes an integrated loop antenna with gain of 0dBi.
Antenna Installation:	<input type="checkbox"/> User <input checked="" type="checkbox"/> Professional <input type="checkbox"/> Factory
Transmitter Power Configuration:	<input type="checkbox"/> Internal battery <input checked="" type="checkbox"/> 120VAC via SL Power ME10A1203B01 AC Adapter <input type="checkbox"/> 100-240VAC <input type="checkbox"/> 230VAC <input type="checkbox"/> 400VAC <input type="checkbox"/>  VDC <input type="checkbox"/> Other:  0.2 Amp. <input type="checkbox"/> 50Hz <input checked="" type="checkbox"/> 60Hz
Special Test Arrangement:	None
Test Facility Accreditation:	A2LA (Certificate No. 1427.01)
Test Methodology:	Measurements performed according to the procedures in ANSI C63.10-2013

1.2 EUT Configuration

The equipment under test was operated during the measurement under the following conditions:

- Standby
- Continuous (See below)
- Continuous un-modulated
- Test program (customer specific)
- [Redacted]

Operating modes of the EUT:

No.	Description
1	Continuous modulated mode

Cables:

No.	Type	Length	Designation	Note
1	Ethernet cable	24cm	Unshielded CAT5	
2	Multi-conductor I/O cable	26cm	Unshielded, with DC power input, relay contacts, RS-485 communications interface, and additional inputs for peripheral devices	

Support equipment/Services:

No.	Item	Description
1	AC wall adapter	SL Power ME10A1203B01 AC/DC Adapter

Note: Electronic Wall Mounted Access Control Reader (NFC) is transmitter only, and has no receiver portion.

1.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

- Normal**

Temperature: 15-35°C

Humidity: 30-60%

Atmospheric pressure: 86-106kPa

- Extreme**

Temperature: -20 to +50°C

Primary Supply Voltage: ± 15%

1.4 Measurement uncertainty

The expanded uncertainty ($k = 2$) for radiated emissions from 30 to 1000 MHz has been determined to be:
 ± 4 dB at 10m and ± 5.4 dB at 3m

The expanded uncertainty ($k = 2$) for radiated emissions above 1GHz has been determined to be:
 ± 6.4 dB at 3m

The expanded uncertainty ($k = 2$) for conducted emissions from 150 kHz to 30 MHz has been determined to be:

± 2.6 dB

1.5 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 emissions reading on the EMI Receiver.

The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where: FS = Field Strength in dB(μ V/m)

RA = Receiver Amplitude in dB(μ V)

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB(m^{-1})

AG = Amplifier Gain in dB

Assume a receiver reading of 48.1 dB(μ V) is obtained. The antenna factor of 7.4 dB(m^{-1}) and cable factor of 1.6 dB is added and amplifier gain of 16.0 dB is subtracted giving field strength of 41.1 dB(μ V/m).

$$RA = 48.1 \text{ dB}(\mu\text{V})$$

$$AF = 7.4 \text{ dB}(m^{-1})$$

$$CF = 1.6 \text{ dB}$$

$$AG = 16.0 \text{ dB}$$

$$FS = RA + AF + CF - AG$$

$$FS = 48.1 + 7.4 + 1.6 - 16.0$$

$$FS = 41.1 \text{ dB}(\mu\text{V}/\text{m})$$

General notes: None

2.0 TEST SUMMARY

Referring to the performance criteria and the operating mode during the tests specified in this report, the equipment complies with the requirements according to the following standards.

TEST SPECIFICATION	TEST PARAMETERS	RESULT
15.225(a)(b)(c) / RSS-210 A2.6(a)(b)(c)	Field strength within the band of operation	Pass
15.225(d) / RSS-210 A2.6(d)	Out of band emissions	Pass
15.215(c) / RSS- Gen 4.6.1	Bandwidth of the emission	Pass
15.225(e) / RSS-210 A2.6	Frequency tolerance	Pass
15.207/RSS-Gen 7.2.2	Transmitter Power Line conducted emissions	Pass
15.109/ICES-003	Receiver/digital device radiated emissions	N/A
15.107/ ICES-003	Receiver/digital device conducted emissions	N/A

3.0 TEST CONDITIONS AND RESULTS

3.1 Field strength within the band of operation

Test location: OATS Anechoic Chamber Other

Test distance: 10 meters 3 meters

Test result: **Pass**

Max. Emissions margin at fundamental: 79.7dB below the limits

Max. margin of harmonics and spurious emissions: 46.1dB below the limits

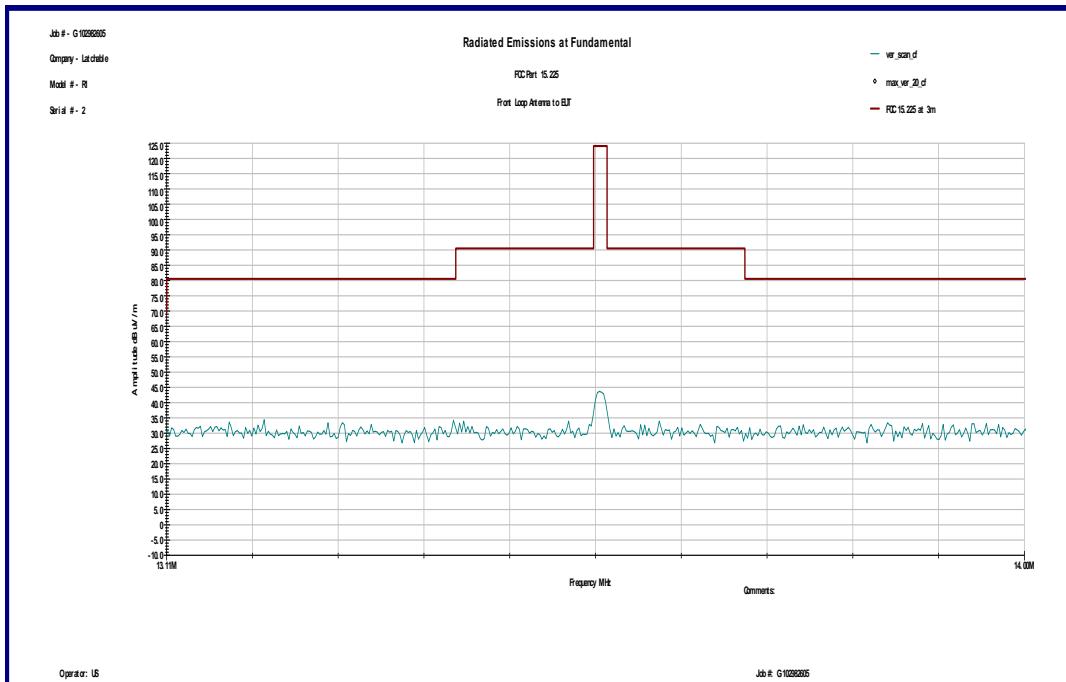
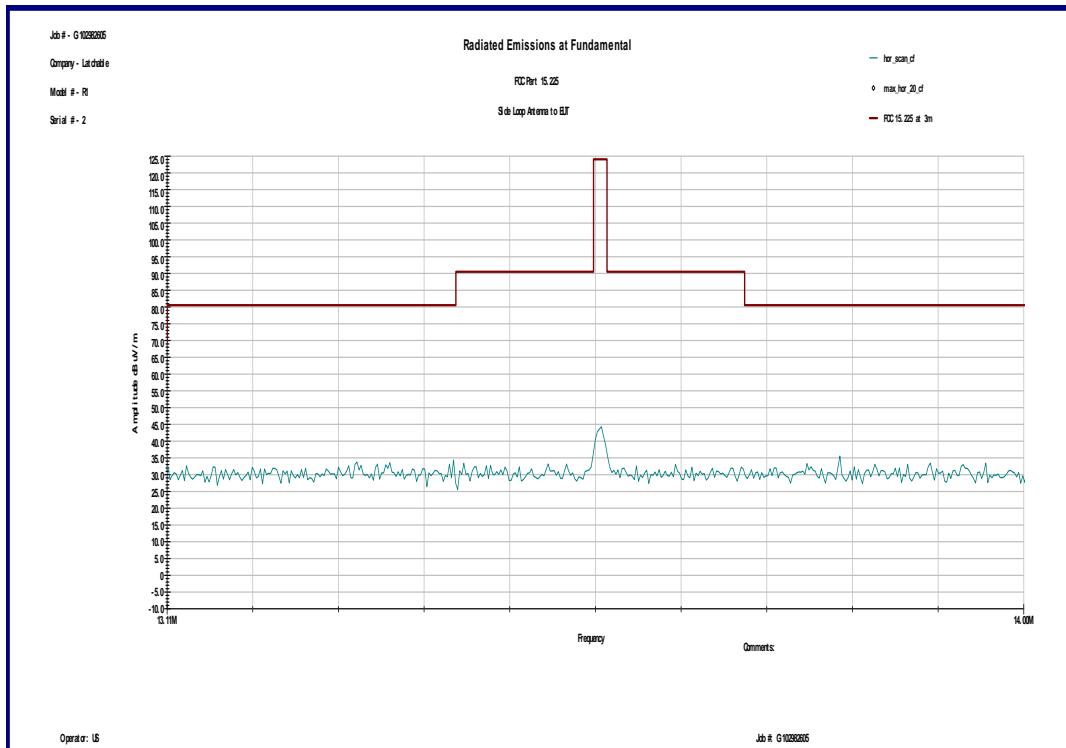
Notes:

1. The Emissions testing was performed in the anechoic chamber at 3m measurement distance (see Table 3.1 and Graphs 3.1.1 - 3.1.2).
2. Measurements were taken with RBW=9 kHz

Date:	June 1, 2017	Result: Pass
Tested by:	Uri Spector	
Standard:	FCC 15.225(a)(b)(c) / RSS-210 A2.6(a)(b)(c)	
Test Point:	Enclosure with antenna	
Operation mode:	See page 5	
Environmental Conditions:	23.7°C; 40.6%(RH); 97.7kPa	
Equipment Verification:	<input checked="" type="checkbox"/>	
Note:	None	

Table 3.1

Frequency	Ant.	Peak Reading dB μ V	Ant.Factor dB1/m	Total at 3m dB μ V/m	Limit dB μ V/m	Margin dB
	Orientation					
13.110 MHz	Front	-3.5	35.2	31.7	80.5	-48.8
13.410 MHz	Front	-1.0	35.2	34.2	80.5	-46.3
13.553 MHz	Front	0.9	35.2	36.1	90.5	-54.4
13.560 MHz	Front	8.5	35.2	43.7	124.0	-80.3
13.567 MHz	Front	4.8	35.2	40.0	90.5	-50.5
13.710 MHz	Front	-3.4	35.2	31.8	80.5	-48.7
14.010 MHz	Front	-6.0	35.1	29.1	80.5	-51.4
13.110 MHz	Side	-4.6	35.2	30.6	80.5	-49.9
13.410 MHz	Side	-0.8	35.2	34.4	80.5	-46.1
13.553 MHz	Side	0.9	35.2	36.1	90.5	-54.4
13.560 MHz	Side	9.1	35.2	44.3	124.0	-79.7
13.567 MHz	Side	3.6	35.2	38.8	90.5	-51.7
13.710 MHz	Side	-3.2	35.2	32.0	80.5	-48.5
14.010 MHz	Side	-5.5	35.1	29.6	80.5	-50.9

Graph 3.1.1

Graph 3.1.2


3.2 Field strength outside of the band of operation

Test location: OATS Anechoic Chamber Other

Test distance: 10 meters 3 meters

Frequency range of measurements: 0.15MHz-1000MHz

Test result: **Pass**

Max. margin of spurious emissions: 8.5dB below the limits

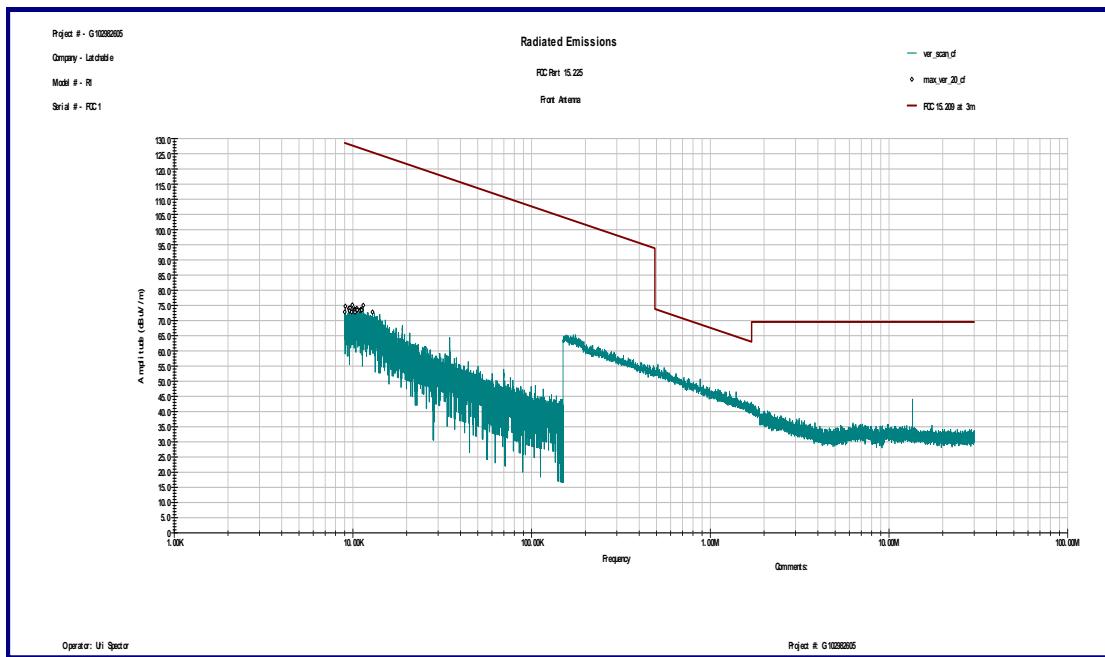
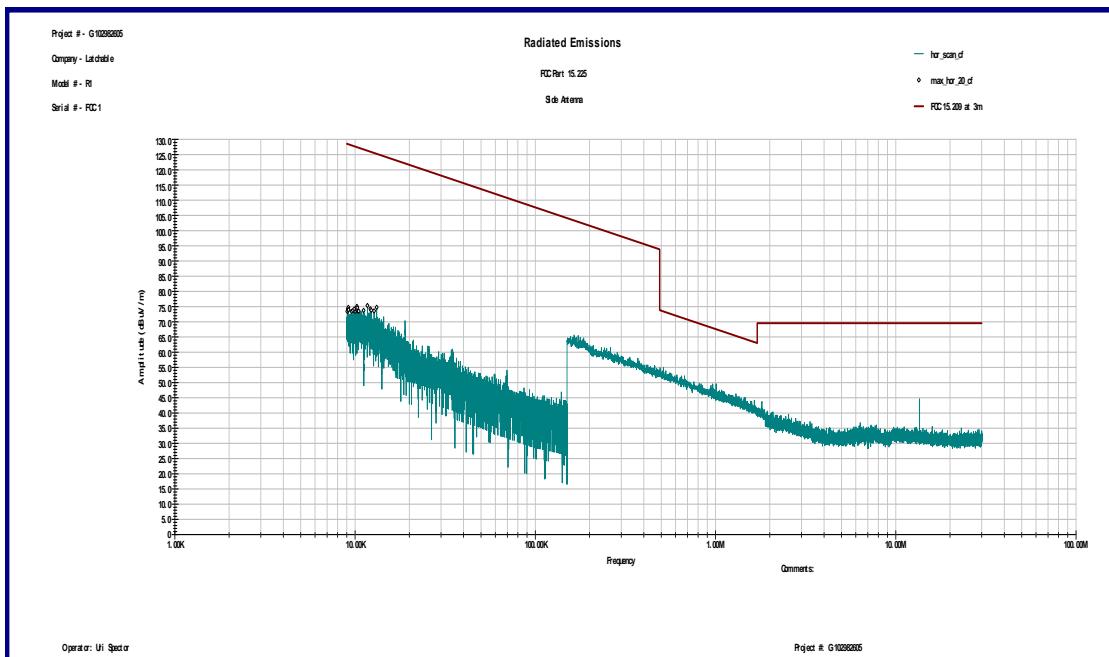
Notes: The Emissions test in frequency range from 150kHz to 30MHz was performed in the Anechoic chamber at 3m measurement distance (see Graph 3.2.1); no emissions above the ambient were detected.

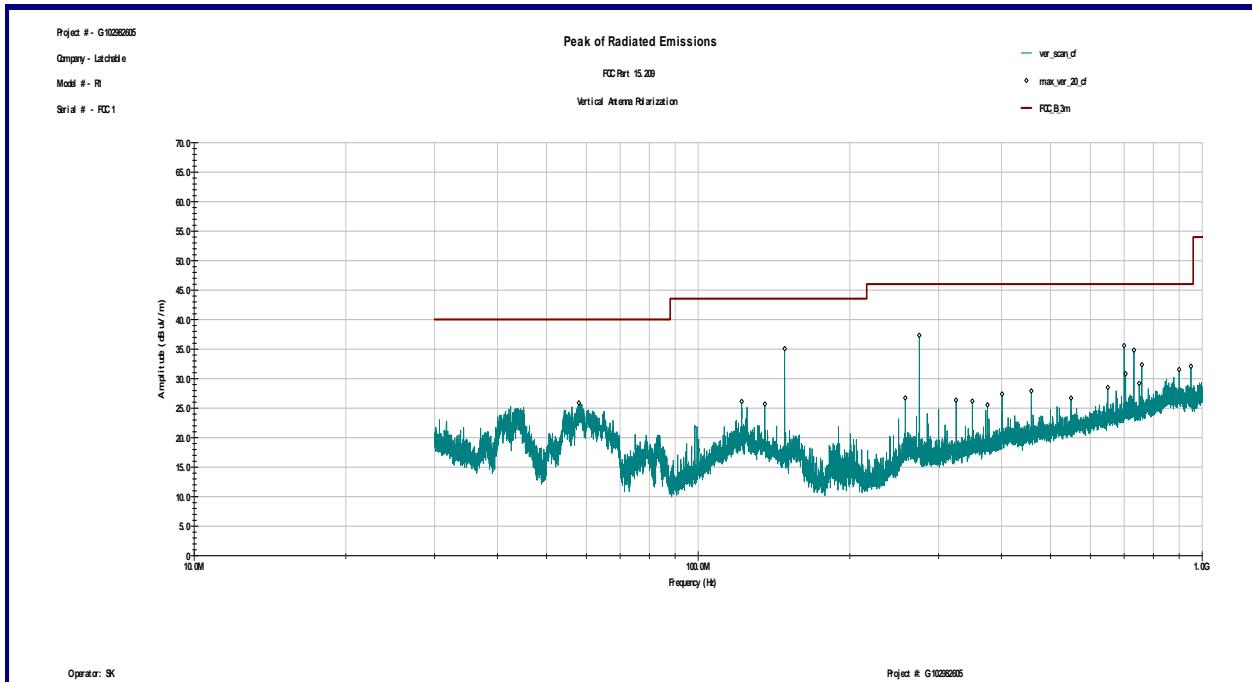
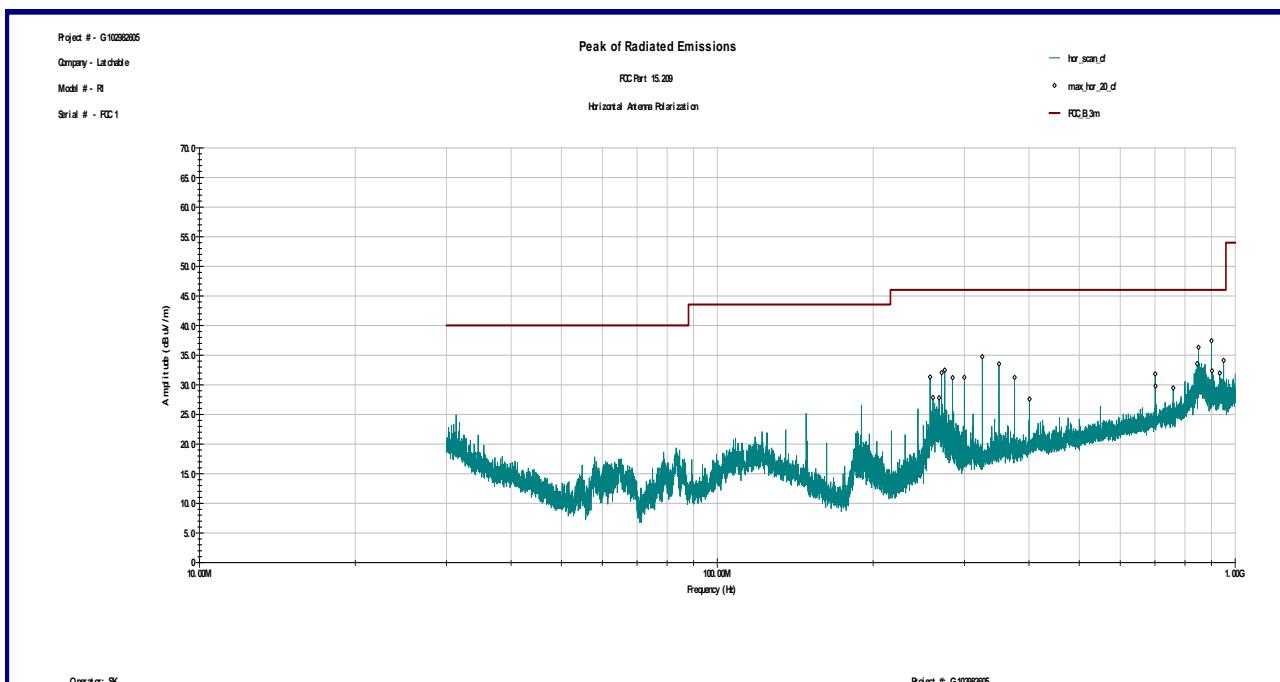
The Emissions test in frequency range from 30MHz to 1GHz was performed in the Anechoic chamber at 3m measurement distance (see Tables 3.2.1 and Graph 3.2.2).

Date:	June 19, 2017	Result: Pass
Tested by:	Uri Spector	
Standard:	FCC 15.225(d) / RSS-210 A2.6(d)	
Test Point:	Enclosure with antenna	
Operation mode:	See page 5	
Environmental Conditions:	24°C; 42%(RH); 98.1kPa	
Equipment Verification:	<input checked="" type="checkbox"/>	
Note:	Frequency Range: 30-1000MHz	

Table 3.2.1

Frequency MHz	Antenna Polarity	Peak Reading dB μ V	Total C.F. dB1/m	Total at 3m dB μ V/m	Limit dB μ V/m	Margin dB
148.5 MHz	V	18.6	16.5	35.1	43.5	-8.5
274.67 MHz	V	18.5	18.8	37.3	46.0	-8.7
700.04 MHz	V	9.6	25.9	35.6	46.0	-10.4
705.12 MHz	V	4.8	26.1	30.8	46.0	-15.2
732.26 MHz	V	8.2	26.7	34.8	46.0	-11.2
759.39 MHz	V	5.8	26.6	32.4	46.0	-13.7
900.03 MHz	V	2.9	28.6	31.5	46.0	-14.5
950.1 MHz	V	3.4	28.7	32.1	46.0	-13.9
325.01 MHz	H	14.6	20.1	34.7	46.0	-11.3
350.03 MHz	H	12.8	20.7	33.5	46.0	-12.5
700.98 MHz	H	5.9	26.0	31.8	46.0	-14.2
844.85 MHz	H	5.8	27.8	33.6	46.0	-12.5
849.97 MHz	H	8.5	27.8	36.3	46.0	-9.7
900.03 MHz	H	8.9	28.6	37.4	46.0	-8.6
902.35 MHz	H	3.7	28.7	32.4	46.0	-13.7
934.07 MHz	H	3.0	29.0	32.0	46.0	-14.1
950.1 MHz	H	5.4	28.7	34.1	46.0	-11.9

Graph 3.2.1
Front antenna orientation

Side antenna orientation


Graph 3.2.2
Vertical antenna polarization

Horizontal antenna polarization


3.3 Frequency Tolerance

Test location: OATS Anechoic Chamber Other

Test date: June 2, 2017

Tested by: Uri Spector

Test result: Pass

Test Parameter		Measured Deviation (Hz)	Maximum Allowed Deviation (Hz)	Test Result
Temperature °C	Voltage V			
-20	120	12.1	±1356	Pass
-10		8.2	±1356	Pass
0		4.5	±1356	Pass
10		3.3	±1356	Pass
20		0	±1356	Pass
30		-1.9	±1356	Pass
40		-2.6	±1356	Pass
50		-3.4	±1356	Pass
20	102	0	±1356	Pass
	108	0	±1356	Pass
	114	0	±1356	Pass
	120	0	±1356	Pass
	126	0	±1356	Pass
	132	0	±1356	Pass
	138	0	±1356	Pass

Notes: None

3.4 Bandwidth of Emissions**Test location:** OATS Anechoic Chamber Other**Test distance:** 10 meters 3 meters**Test result:** **Pass**

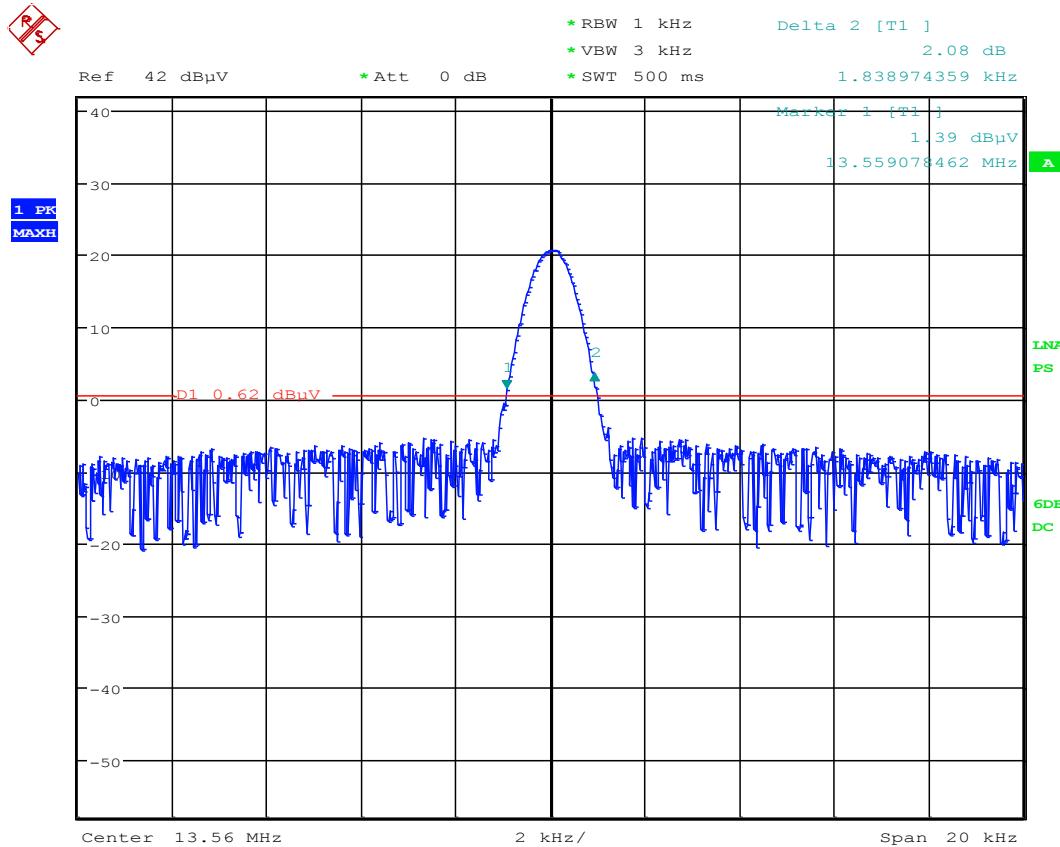
Center Frequency of operation MHz	Measured 20dB bandwidth kHz	Measured 99% bandwidth kHz
13.56	1.8	13.8

Graphs 3-4-1 and 3-4-2 are show bandwidth of emissions

Notes: The bandwidth of emissions is contained within the frequency band of operation

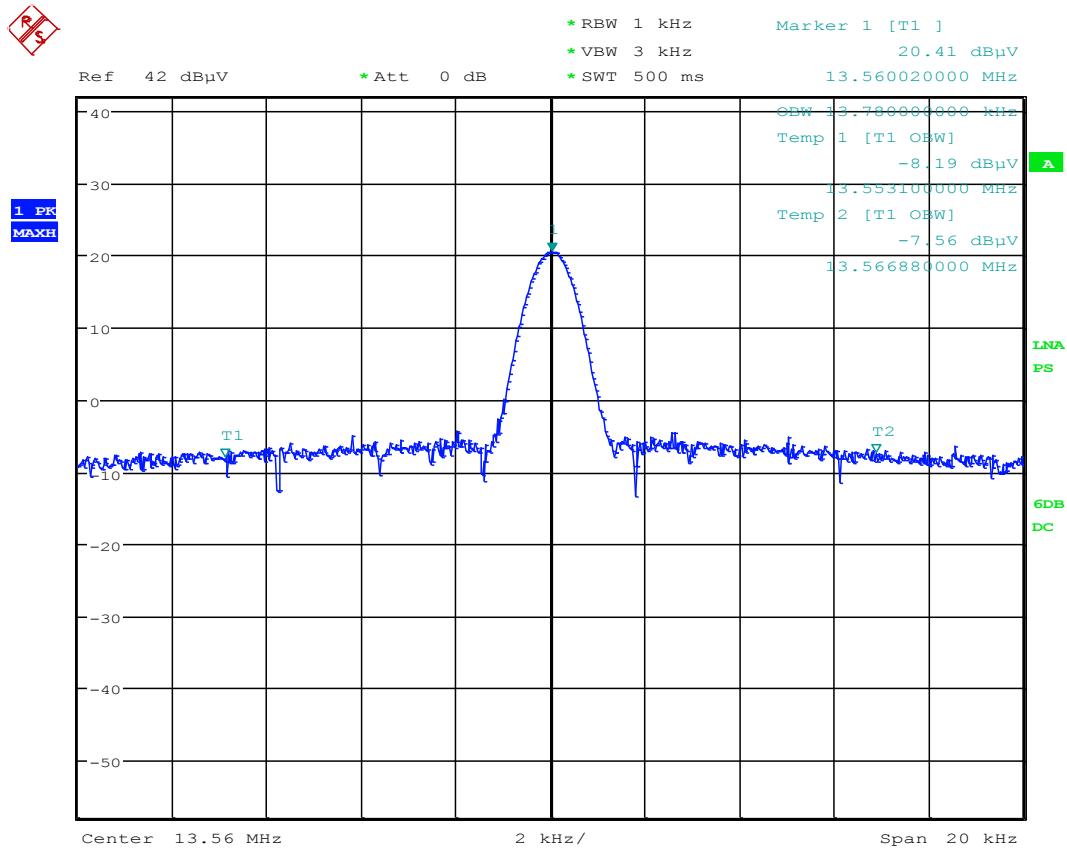
Graph 3.4.1

RS



Date: 2.JUN.2017 11:50:54

Graph 3.4.2



Date: 2.JUN.2017 11:56:54



3.5 Transmitter power line conducted emissions

Test location: OATS Anechoic Chamber Other

Test result: **Pass**

Frequency range: 0.15MHz-30MHz

Max. Emissions margin: 11.2dB below the limits

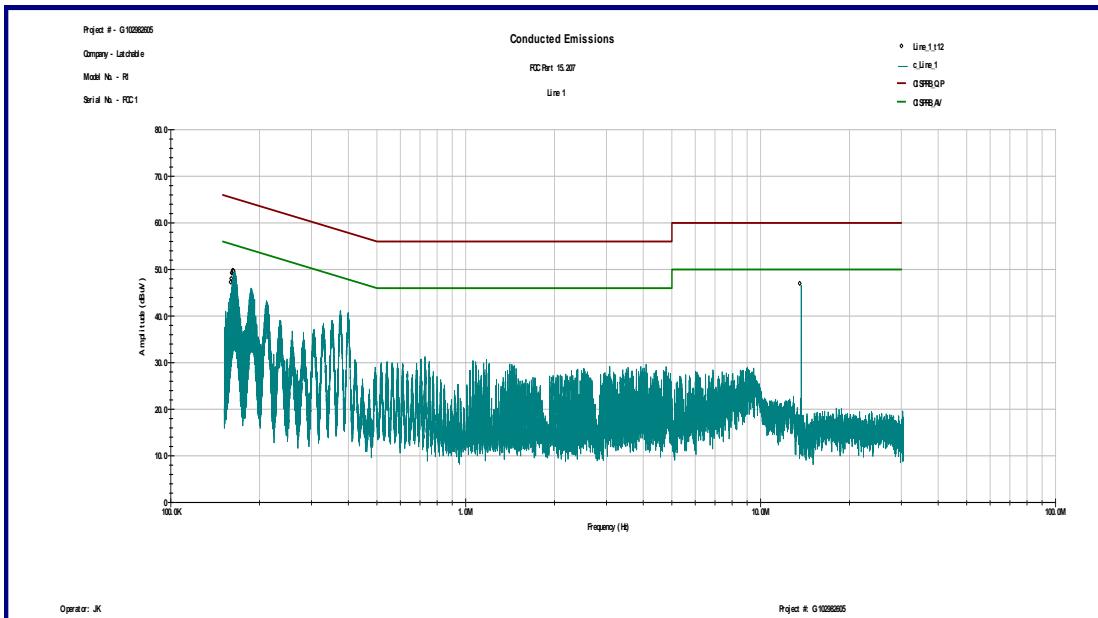
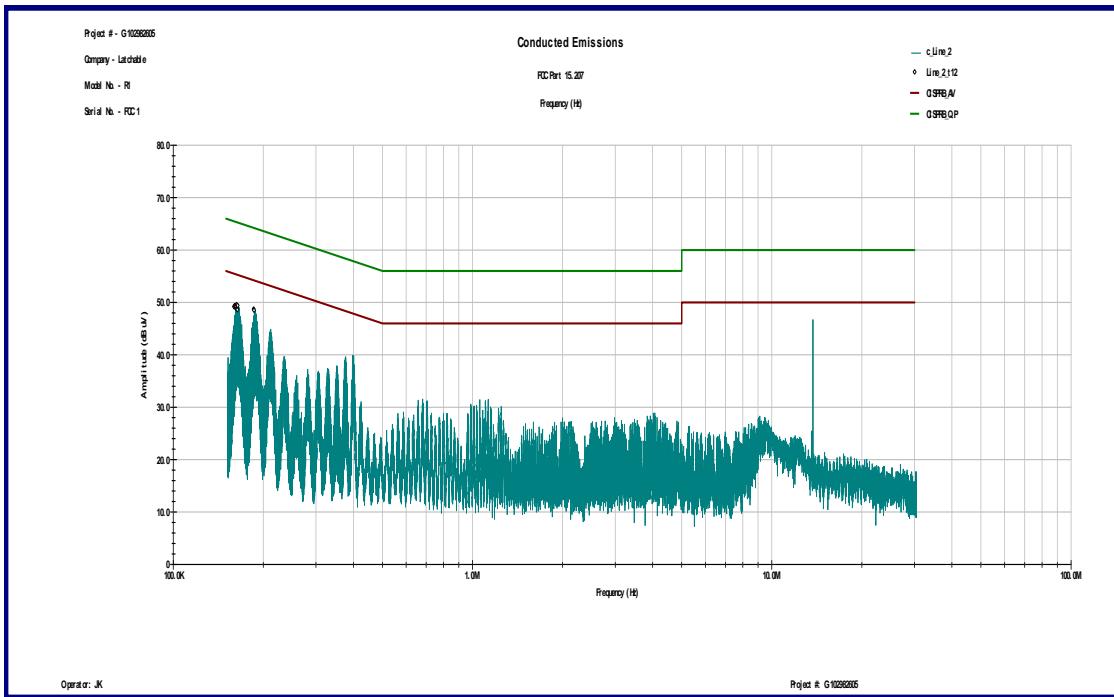
Notes: The fundamental transmitting frequency of 13.56MHz was excluded from the table.

Date:	June 2, 2017	Result: Pass
Tested by:	Uri Spector	
Standard:	FCC Part 15.207	
Test Point:	Power Line	
Operation mode:	See page 5	
Environmental Conditions:	24°C; 41%(RH); 97.9kPa	
Equipment Verification:	<input checked="" type="checkbox"/>	
Note:	EUT was powered at 120VAC, 60Hz	

Table 3.5.1

Line 1							
Frequency MHz	QP dB μ V	AVG dB μ V	Cable Loss dB	QP Lim dB μ V	AVG Lim dB μ V	QP Margin dB	AVG Margin dB
0.162	47.8	37.3	0.1	65.4	55.4	-17.5	-18.0
0.209	41.8	35.8	0.1	63.2	53.2	-21.4	-17.4
0.325	37.5	35.2	0.1	59.6	49.6	-22.0	-14.3
0.394	39.2	36.5	0.1	58.0	48.0	-18.6	-11.3
1.185	29.5	20.8	0.2	56.0	46.0	-26.3	-25.0
9.374	23.5	17.9	0.7	60.0	50.0	-35.8	-31.4

Line 2							
Frequency MHz	QP dB μ V	AVG dB μ V	Cable Loss dB	QP Lim dB μ V	AVG Lim dB μ V	QP Margin dB	AVG Margin dB
0.163	47.9	37.3	0.1	65.3	55.3	-17.3	-17.9
0.209	42.1	35.9	0.1	63.2	53.2	-21.1	-17.3
0.325	37.6	35.2	0.1	59.6	49.6	-21.9	-14.3
0.395	40.1	36.6	0.1	58.0	48.0	-17.7	-11.2
1.161	29.9	20.6	0.2	56.0	46.0	-25.9	-25.2
4.345	27.0	21.9	0.5	56.0	46.0	-28.5	-23.6

Graph 3.5.1
Line 1

Line 2


3.6 Receiver/digital device radiated emissions**Test location:** OATS Anechoic Chamber**Test distance:** 10 meters 3 meters**Test result:** N/A**Frequency range:** 30MHz-1000MHz**Max. Emissions margin:**  dB below the limits**Notes:** EUT does not contain a Receiver portion.



3.7 Receiver/digital device conducted emissions

Test location: OATS Anechoic Chamber Other

Test result: **N/A**

Frequency range: 0.15MHz-30MHz

Max. Emissions margin:  dB below the limits

Notes: EUT does not contain a Receiver portion.

3.8 SAR Test Exclusion Calculation

RF Exposure requirements are described in FCC KDB 447498 D01 v05r02, Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

Annex C of this document set SAR Test Exclusions for devices operated in frequency range below 100MHz, which are based on the power at the EUT output RF power according to the Table below

MHz	< 50	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	mm
100	237	474	481	487	494	501	507	514	521	527	534	541	547	554	561	567	mW
50	308	617	625	634	643	651	660	669	677	686	695	703	712	721	729	738	
10	474	948	961	975	988	1001	1015	1028	1041	1055	1068	1081	1095	1108	1121	1135	
1	711	1422	1442	1462	1482	1502	1522	1542	1562	1582	1602	1622	1642	1662	1682	1702	
0.1	948	1896	1923	1949	1976	2003	2029	2056	2083	2109	2136	2163	2189	2216	2243	2269	
0.05	1019	2039	2067	2096	2125	2153	2182	2211	2239	2268	2297	2325	2354	2383	2411	2440	
0.01	1185	2370	2403	2437	2470	2503	2537	2570	2603	2637	2670	2703	2737	2770	2803	2837	

The EUT Output Power (W) can be calculated using the formula:

$$P = (E \times d)^2 / 30G, \text{ where}$$

E – field strength in V/m,

D – field strength measurement distance in m,

G – numerical value of antenna gain.

The EUT Output Power can be calculated based on technical characterization and operation of the EUT.

$$\text{The power calculation is } P = (0.000164^2) / 30 \times 1 = 0.000008 \text{ mW}$$

The Minimum SAR Test Exclusion Threshold power for frequency range 10-50MHz per the Table above is 308mW.

The EUT calculated power of 0.000008mW is below the Minimum SAR Test Exclusion Threshold power of 308mW, and also below the Minimum Exemption Limits for SAR Routine Evaluation of RSS-102 (section 2.5) is 345mW.

Therefore, the transmitter is exempt from SAR testing.

4.0 TEST EQUIPMENT

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NO.	INTERTEK ID	LAST CAL DATE	CAL DUE	USED
Spectrum Analyzer	R & S	ESU	100398	25283	03/21/2017	03/21/2018	<input checked="" type="checkbox"/>
Bicono-Log Antenna	Teseq	CBL6112D	32859	25289	10/03/2016	10/03/2017	<input checked="" type="checkbox"/>
Loop Antenna	ETS	6512	00060486	19942	01/03/2017	01/03/2018	<input checked="" type="checkbox"/>
LISN	COM-Power	Li-215A	191970	172315	06/13/2016	06/13/2017	<input checked="" type="checkbox"/>
System	Quantum Change	TILE! Instrument Control	Ver. 3.4.K.29	15259	VBU	VBU	<input checked="" type="checkbox"/>

5.0 Revision History

REVISION LEVEL	DATE	REPORT NUMBER	PREPARED	REVIEWED	NOTES
0	06-22-2017	102982605MIN-005C	US	NS	Original Issue