

# Magtek Incorporated

## TEST REPORT FOR

### Flexible/Modular Hybrid Secure Card Reader

Model: DynaFlex Pro\*

\*(See Appendix A for Manufacturer's Declaration)

#### Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.207 & 15.225  
(13.110-14.010 MHz)

Report No.: 103582-16

Date of issue: April 10, 2020



Test Certificate # 803.01

This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

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## ADMINISTRATIVE INFORMATION

### Test Report Information

**REPORT PREPARED FOR:**

Magtek Incorporated  
1710 Apollo Court  
Seal Beach, CA 90740

**REPORT PREPARED BY:**

Darcy Thompson  
CKC Laboratories, Inc.  
5046 Sierra Pines Drive  
Mariposa, CA 95338

REPRESENTATIVE: Kevin Gin  
Customer Reference Number: 30009494

Project Number: 103582

**DATE OF EQUIPMENT RECEIPT:**

January 16, 2020

**DATE(S) OF TESTING:**

January 16 – February 4, 2020

### Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the equipment provided by the client, tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.



**Steve Behm**  
*Director of Quality Assurance & Engineering Services*  
*CKC Laboratories, Inc.*

## Test Facility Information



Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):  
CKC Laboratories, Inc.  
110 Olinda Place  
Brea, CA 92823

## Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.12

## Site Registration & Accreditation Information

Location	*NIST CB #	FCC	Japan
Canyon Park, Bothell, WA	US0081	US1022	A-0136
Brea, CA	US0060	US1025	A-0136
Fremont, CA	US0082	US1023	A-0136
Mariposa, CA	US0103	US1024	A-0136

\*CKC's list of NIST designated countries can be found at: <https://standards.gov/cabs/designations.html>

## SUMMARY OF RESULTS

### Standard / Specification: FCC Part 15 Subpart C - 15.225

Test Procedure	Description	Modifications	Results
15.215(c)	Occupied Bandwidth	Mod. #1	Pass
15.225(a)-(c)	Field Strength of Fundamental	Mod. #1	Pass
15.225(e)	Frequency Stability	Mod. #1	Pass
15.225(d)	Field Strength of Spurious Emissions	Mod. #1	Pass
15.207	AC Conducted Emissions	Mod. #1	Pass

NA = Not Applicable

ISO/IEC 17025 Decision Rule
The declaration of pass or fail herein is based upon assessment to the specification(s) listed above, including where applicable, assessment of measurement uncertainties. For performance related tests, equipment was monitored for specified criteria identified in that section of testing.

## Modifications During Testing

This list is a summary of the modifications made to the equipment during testing.

Summary of Conditions
Modification #1 - Installing two 7mm ferrites (manufacturer: Wellcn, model: 8541634656) on both ends of the USB cable.

**Modifications listed above must be incorporated into all production units.**

## Conditions During Testing

This list is a summary of the conditions noted to the equipment during testing.

Summary of Conditions
None

## EQUIPMENT UNDER TEST (EUT)

During testing, numerous configurations may have been utilized. The configurations listed below support compliance to the standard(s) listed in the Summary of Results section.

### Configuration 1

#### *Equipment Tested:*

Device	Manufacturer	Model #	S/N
Flexible/Modular Hybrid Secure Card Reader	Magtek Incorporated	DynaFlex Pro	AP4

#### *Support Equipment:*

Device	Manufacturer	Model #	S/N
Laptop	Dell	latitude	Tag1283
Laptop power adapter	Dell	DA130PE1-00	NA

## General Product Information:

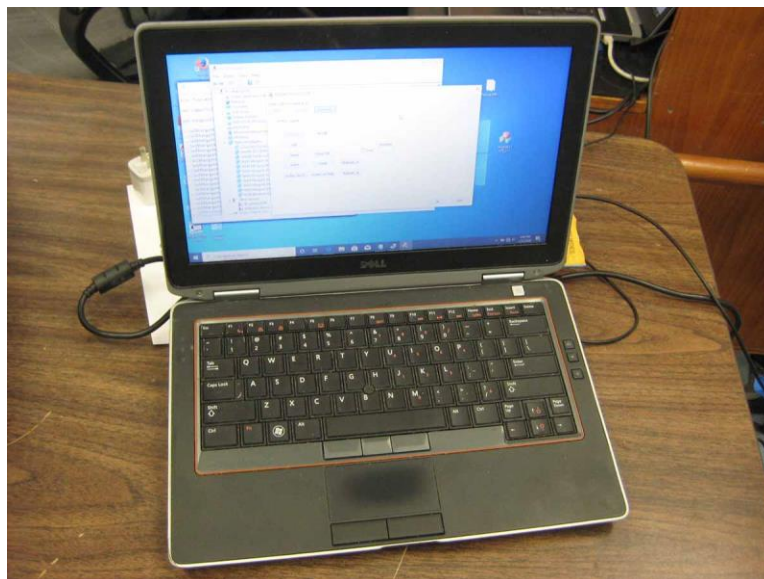
Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Modulation Type(s):	OOK
Maximum Duty Cycle:	98%
Antenna Type(s) and Gain:	2.4 inch x 3.7 in loop, NA
Antenna Connection Type:	Integral
Nominal Input Voltage:	5Vdc USB/ 3.7Vdc battery
Firmware / Software used for Test:	Apollo_Main_K81

**EUT and Accessory Photo(s)**



EUT

**Support Equipment Photo(s)**



Laptop

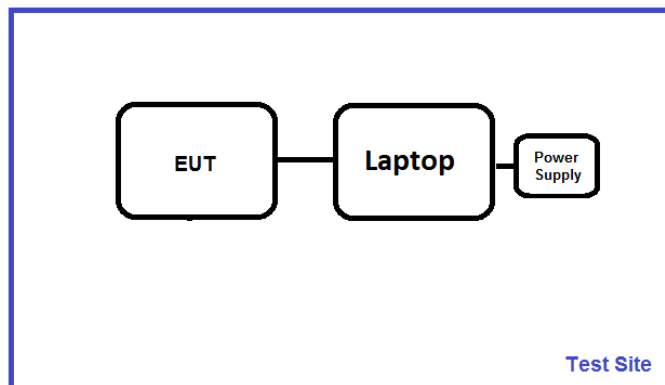




Laptop power adapter

### Block Diagram of Test Setup(s)

#### Test Setup Block Diagram





## FCC Part 15 Subpart C

### 15.215(c) Occupied Bandwidth (20dB BW)

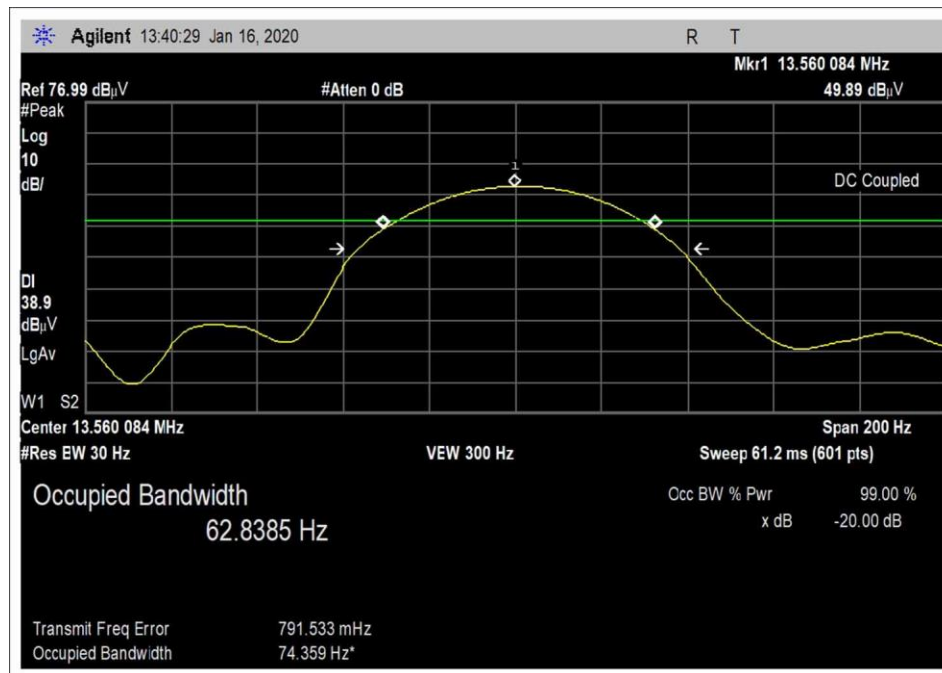
Test Setup/Conditions			
Test Location:	Brea Lab A	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2013)	Test Date(s):	1/16/2020
Configuration:	1		
Test Setup:	<p>The EUT is placed on Styrofoam platform, connected to a support laptop via USB cable which also charges the EUT.</p> <p>Device (AP4) has a single modular approved BLE module FCCID: QQQBGM13P, IC:5123A-BGM13P installed.</p> <p>The 13.56MHz NFC radio under evaluation is placed in constant transmit mode. Operating at rated input power.</p> <p>Note: RBW / measured BW not at 1-5 % ratio due to CW nature of the emission.</p> <p>Modification #1 was in place during testing.</p>		

Environmental Conditions			
Temperature (°C)	20	Relative Humidity (%):	51

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02869	Spectrum Analyzer	Agilent	E4440A	7/25/2019	7/25/2020
P05198	Cable	Belden	8268	12/4/2018	12/4/2020
00314	Loop Antenna	EMCO	6502	5/13/2018	5/13/2020

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
13.56	1	OOK	0.074	None	NA

## Plot(s)



-20dB 99%BW

Test Setup Photo(s)



## 15.225(a)-(c) Field Strength of Fundamental

### Test Data Summary - Voltage Variations

Frequency (MHz)	Modulation / Ant Port	V <sub>Minimum</sub> (dBuV/m@ 30m)	V <sub>Nominal</sub> (dBuV/m@ 30m)	V <sub>Maximum</sub> (dBuV/m@ 30m)	Max Deviation from V <sub>Nominal</sub> (dB)	Limit (dBuV/m @ 30m)	Result
13.56	OOK	41.8	41.8	41.8	0	≤84	Pass

Test performed using operational mode with the highest output power, representing worst case.

### Parameter Definitions:

Measurements performed at input voltage V<sub>Nominal</sub> ± 15%.

Parameter	Value
V <sub>Nominal</sub> :	5VDC
V <sub>Minimum</sub> :	4.25 VDC
V <sub>Maximum</sub> :	5.75 VDC

### Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA • 714 993 6112  
 Customer: **Magtek Incorporated**  
 Specification: **15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter)**  
 Work Order #: **103582** Date: 1/16/2020  
 Test Type: **Radiated Scan** Time: 11:39:38  
 Tested By: E. Wong Sequence#: 1  
 Software: EMITest 5.03.12

#### Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

#### Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

#### Test Conditions / Notes:

The EUT is placed on Styrofoam platform, connected to a support laptop via USB cable which also charges the EUT.

Device (AP4) has a single modular approved BLE module FCCID: QOQBGM13P IC:5123A-BGM13P installed.

The 13.56MHz NFC radio under evaluation is placed in constant transmit mode.  
Operating at rated input power.

Frequency range of measurement = 9 kHz- 1 GHz.

9 kHz -150 kHz;RBW=200 Hz,VBW=200 Hz;150 kHz-30 MHz;RBW=9 kHz,VBW=9 kHz;30 MHz-1000 MHz;RBW=120 kHz,VBW=120 kHz,

Test environment conditions:

Temperature: 20°C

Relative Humidity: 51 %

Pressure: 99.3kPa

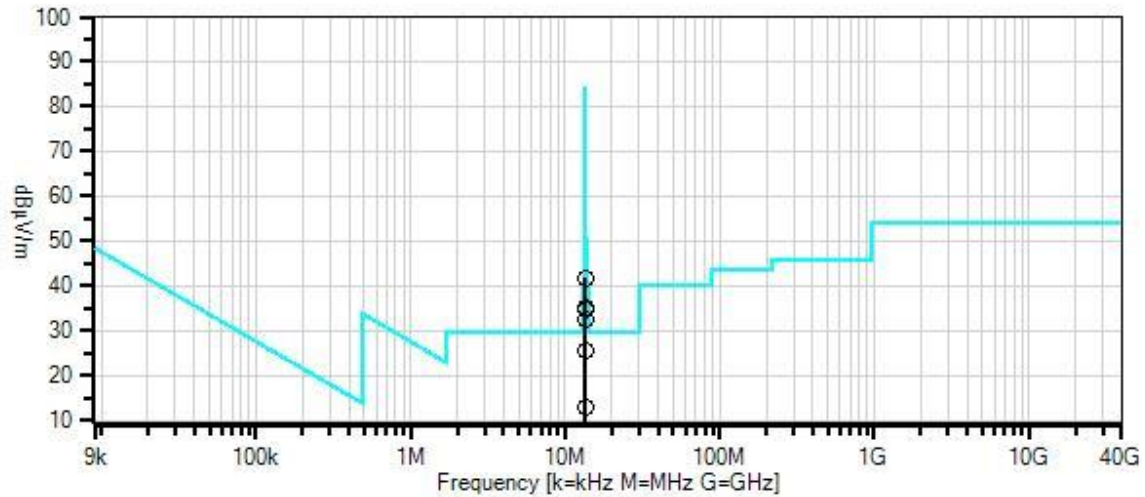
Site A

ANSI C63.10-2013

Emission profile of the EUT rotated along three orthogonal axes was investigated.  
Recorded data represent worse case emission.

Modification #1 was in place during testing.

Magtek Incorporated W/O#: 103582 Sequence#: 1 Date: 1/16/2020  
 15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter) Test Distance: 3 Meters Vert



- Readings
- Peak Readings
- × QP Readings
- \* Average Readings
- ▼ Ambient
- Software Version: 5.03.12
- 1 - 15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter)

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	7/25/2019	7/25/2020
T2	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/4/2018	12/4/2020
T3	AN00314	Loop Antenna	6502	5/13/2018	5/13/2020

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB $\mu$ V	T1 dB	T2 dB	T3 dB		Dist Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
1	13.560M	72.7	+0.0	+0.6	+8.5		-40.0	41.8	84.0	-42.2	Paral
									Y_max		
2	13.560M	72.4	+0.0	+0.6	+8.5		-40.0	41.5	84.0	-42.5	Paral
									Z		
3	13.560M	66.1	+0.0	+0.6	+8.5		-40.0	35.2	84.0	-48.8	Perpe
									Z		
4	13.560M	65.7	+0.0	+0.6	+8.5		-40.0	34.8	84.0	-49.2	Perpe
									Y		
5	13.560M	65.5	+0.0	+0.6	+8.5		-40.0	34.6	84.0	-49.4	Groun
									Z		
6	13.560M	63.6	+0.0	+0.6	+8.5		-40.0	32.7	84.0	-51.3	Groun
									Y		
7	13.560M	63.5	+0.0	+0.6	+8.5		-40.0	32.6	84.0	-51.4	Groun
									X		
8	13.560M	56.5	+0.0	+0.6	+8.5		-40.0	25.6	84.0	-58.4	Paral
									X		
9	13.560M	43.9	+0.0	+0.6	+8.5		-40.0	13.0	84.0	-71.0	Perpe
									X		



Test Setup Photo(s)



## 15.225(e) Frequency Stability

Test Setup/Conditions			
Test Location:	Brea Lab A	Test Engineer:	Don Nguyen
Test Method:	ANSI C63.10 (2013)	Test Date(s):	1/23/2020
Configuration:	1		
Test Setup:	<p>The EUT is placed in temperature chamber next to near field probe. An external DC power supply is used to vary USB voltage.</p> <p>The EUT is set to transmit constantly at 13.56MHz.</p> <p>Modification #1 was in place during testing.</p>		

Environmental Conditions			
Temperature (°C)	22.2	Relative Humidity (%):	40

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02869	Spectrum Analyzer	Agilent	E4440A	7/25/2019	7/25/2020
01878	Temperature Chamber	Thermotron Corp.	S 1.2 Mini-Max	3/26/2019	3/26/2021
P05947	Thermometer	Fluke	51	5/11/2018	5/11/2020
P07338	Cable	Pomona	2249-Y-240	12/24/2019	12/24/2021

### Test Data Summary

Temperature (°C)	Voltage	Frequency (MHz)	Deviation (%)	Limit (%)	Results
-20	V <sub>Nominal</sub>	13.560244	0.000317	±0.01	Pass
-10	V <sub>Nominal</sub>	13.560242	0.000302	±0.01	
0	V <sub>Nominal</sub>	13.560235	0.000251	±0.01	
10	V <sub>Nominal</sub>	13.560218	0.000125	±0.01	
20	V <sub>Minimum</sub>	13.560201	0	±0.01	
20	V <sub>Nominal</sub>	13.560201	0	±0.01	
20	V <sub>Maximum</sub>	13.560201	0	±0.01	
30	V <sub>Nominal</sub>	13.560170	-0.00023	±0.01	
40	V <sub>Nominal</sub>	13.560136	-0.00048	±0.01	
50	V <sub>Nominal</sub>	13.560149	-0.00038	±0.01	
Nominal Frequency:		13.560201			

### Parameter Definitions:

Measurements performed at input voltage V<sub>Nominal</sub> ± 15%.

Parameter	Value
V <sub>Nominal</sub> :	5VDC
V <sub>Minimum</sub> :	4.25 VDC
V <sub>Maximum</sub> :	5.75 VDC

Test Setup Photo(s)



## 15.225(d) Radiated Emissions & Band Edge

### Test Setup / Conditions/ Data

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA • 714 993 6112  
 Customer: **Magtek Incorporated**  
 Specification: **15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter)**  
 Work Order #: **103582** Date: 2/4/2020  
 Test Type: **Maximized Emissions** Time: 09:41:57  
 Tested By: Don Nguyen Sequence#: 3  
 Software: EMITest 5.03.12

#### Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

#### Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

#### Test Conditions / Notes:

The EUT is placed on Styrofoam platform, connected to a support laptop via USB cable which also charges the EUT.

Device (AP4) has a single modular approved BLE module FCCID: QOQBGM13P IC:5123A-BGM13P installed.

The 13.56MHz NFC radio under evaluation is placed in constant transmit mode.  
 Operating at rated input power.

The manufacturer declares the highest EUT frequency generated or used is 2480MHz.

Frequency range of measurement = 9kHz- 13 GHz.  
 9 kHz -150 kHz;RBW=200 Hz,VBW=600 Hz;  
 150 kHz-30 MHz;RBW=9 kHz,VBW=27 kHz;  
 30 MHz-1000 MHz;RBW=120 kHz,VBW=360 kHz,  
 1000-13000MHz;RBW=1MHz,VBW=3MHz,

Test environment conditions:

Temperature: 18.3°C  
 Relative Humidity: 30%  
 Pressure: 99.5kPa

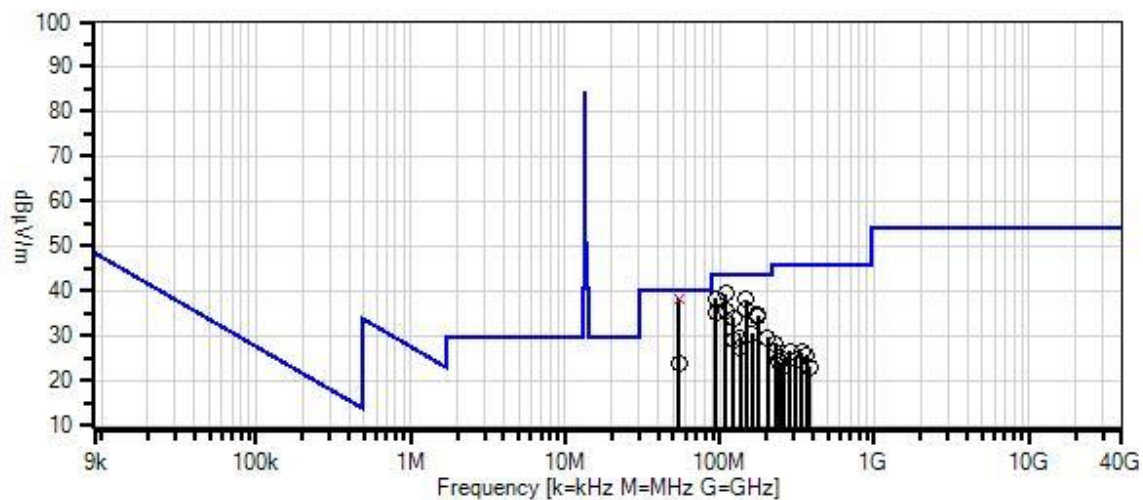
Site A

ANSI C63.10:2013

Emission profile of the EUT rotated along three orthogonal axes was investigated.  
 Recorded data represent worse case emission.

Modification #1 was in place during testing.

Magtek Incorporated WO#: 103582 Sequence#: 3 Date: 2/4/2020  
 15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter) Test Distance: 3 Meters Horiz



- Readings
- Peak Readings
- × QP Readings
- \* Average Readings
- ▼ Ambient
- Software Version: 5.03.12
- 1 - 15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter)

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	7/25/2019	7/25/2020
T2	AN01995	Biconilog Antenna	CBL6111C	4/23/2018	4/23/2020
T3	ANP05275	Attenuator	1W	4/5/2018	4/5/2020
T4	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/4/2018	12/4/2020
T5	AN00309	Preamplifier	8447D	12/24/2019	12/24/2021
T6	ANP05050	Cable	RG223/U	12/24/2018	12/24/2020
	AN00786	Preamplifier	83017A	5/12/2018	5/12/2020
	AN00849	Horn Antenna	3115	3/14/2018	3/14/2020
	ANP07139	Cable	ANDL1-PNMNM-48	3/4/2019	3/4/2021
	ANP07244	Cable	32022-29094K-29094K-24TC	7/5/2018	7/5/2020
	AN03367	Horn Antenna	62-GH-62-25.	8/1/2019	8/1/2021
	AN00314	Loop Antenna	6502	5/13/2018	5/13/2020

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBμV	T5 dB	T6 dB	dB	dB	Table	dBμV/m	dBμV/m	dB	Ant
1	54.240M	51.9	+0.0	+7.1	+6.0	+1.3	+0.0	38.3	40.0	-1.7	Vert
	QP		-28.1	+0.1							
^	54.240M	53.2	+0.0	+7.1	+6.0	+1.3	+0.0	39.6	40.0	-0.4	Vert
			-28.1	+0.1							
3	108.480M	48.7	+0.0	+10.8	+6.0	+1.8	+0.0	39.4	43.5	-4.1	Vert
			-28.0	+0.1							
4	94.920M	48.9	+0.0	+9.4	+6.0	+1.8	+0.0	38.2	43.5	-5.3	Vert
			-28.0	+0.1							
5	149.160M	46.3	+0.0	+11.3	+6.0	+2.2	+0.0	38.0	43.5	-5.5	Vert
			-28.0	+0.2							
6	149.160M	44.4	+0.0	+11.3	+6.0	+2.2	+0.0	36.1	43.5	-7.4	Horiz
			-28.0	+0.2							
7	108.480M	45.0	+0.0	+10.8	+6.0	+1.8	+0.0	35.7	43.5	-7.8	Horiz
			-28.0	+0.1							
8	94.920M	45.7	+0.0	+9.4	+6.0	+1.8	+0.0	35.0	43.5	-8.5	Horiz
			-28.0	+0.1							
9	176.280M	44.6	+0.0	+9.4	+6.0	+2.4	+0.0	34.6	43.5	-8.9	Horiz
			-28.0	+0.2							
10	176.280M	44.4	+0.0	+9.4	+6.0	+2.4	+0.0	34.4	43.5	-9.1	Vert
			-28.0	+0.2							
11	122.040M	42.2	+0.0	+11.8	+6.0	+1.9	+0.0	34.0	43.5	-9.5	Vert
			-28.0	+0.1							
12	162.720M	39.4	+0.0	+10.5	+6.0	+2.3	+0.0	30.4	43.5	-13.1	Horiz
			-28.0	+0.2							
13	162.720M	39.2	+0.0	+10.5	+6.0	+2.3	+0.0	30.2	43.5	-13.3	Vert
			-28.0	+0.2							
14	203.400M	39.3	+0.0	+9.4	+6.0	+2.6	+0.0	29.5	43.5	-14.0	Horiz
			-28.0	+0.2							
15	135.600M	37.4	+0.0	+11.8	+6.0	+2.1	+0.0	29.5	43.5	-14.0	Horiz
			-28.0	+0.2							

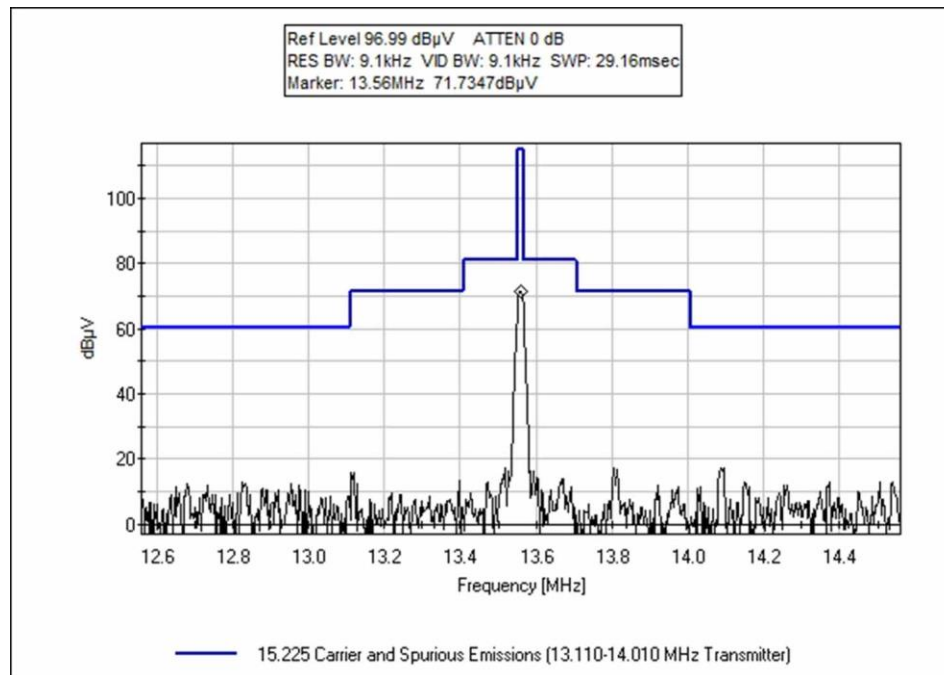
16	122.040M	37.1	+0.0 -28.0	+11.8 +0.1	+6.0	+1.9	+0.0	28.9	43.5	-14.6	Horiz
17	54.240M	37.4	+0.0 -28.1	+7.1 +0.1	+6.0	+1.3	+0.0	23.8	40.0	-16.2	Horiz
18	135.600M	35.0	+0.0 -28.0	+11.8 +0.2	+6.0	+2.1	+0.0	27.1	43.5	-16.4	Vert
19	230.520M	35.6	+0.0 -27.9	+11.5 +0.2	+6.0	+2.8	+0.0	28.2	46.0	-17.8	Horiz
20	284.760M	31.9	+0.0 -27.9	+13.2 +0.3	+6.0	+3.1	+0.0	26.6	46.0	-19.4	Horiz
21	339.000M	30.1	+0.0 -27.9	+14.4 +0.3	+6.0	+3.4	+0.0	26.3	46.0	-19.7	Horiz
22	230.520M	33.7	+0.0 -27.9	+11.5 +0.2	+6.0	+2.8	+0.0	26.3	46.0	-19.7	Vert
23	366.120M	28.5	+0.0 -27.9	+15.1 +0.3	+6.0	+3.6	+0.0	25.6	46.0	-20.4	Horiz
24	311.880M	29.4	+0.0 -27.9	+13.7 +0.3	+6.0	+3.3	+0.0	24.8	46.0	-21.2	Horiz
25	257.640M	30.6	+0.0 -27.9	+13.0 +0.2	+6.0	+2.9	+0.0	24.8	46.0	-21.2	Horiz
26	244.080M	30.5	+0.0 -27.9	+12.5 +0.2	+6.0	+2.9	+0.0	24.2	46.0	-21.8	Horiz
27	379.680M	25.6	+0.0 -27.9	+15.4 +0.3	+6.0	+3.6	+0.0	23.0	46.0	-23.0	Horiz
28	257.640M	28.7	+0.0 -27.9	+13.0 +0.2	+6.0	+2.9	+0.0	22.9	46.0	-23.1	Vert



### Band Edge Summary

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @30m)	Limit (dBuV/m @30m)	Results
13.110	OOK	Integral	-12.0	≤29.5	Pass
14.010	OOK	Integral	-24.3	≤29.5	Pass

### Band Edge Plots



### Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA • 714 993 6112  
 Customer: **Magtek Incorporated**  
 Specification: **15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter)**  
 Work Order #: **103582** Date: 1/17/2020  
 Test Type: **Radiated Scan** Time: 14:48:03  
 Tested By: E. Wong Sequence#: 1  
 Software: EMITest 5.03.12

#### *Equipment Tested:*

Device	Manufacturer	Model #	S/N
Configuration 1			

#### *Support Equipment:*

Device	Manufacturer	Model #	S/N
Configuration 1			

#### *Test Conditions / Notes:*

The EUT is placed on Styrofoam platform, connected to a support laptop via USB cable which also charges the EUT.  
 Device (AP4) has a single modular approved BLE module FCCID: QOQBGM13P IC:5123A-BGM13P installed.  
 The 13.56MHz NFC radio under evaluation is placed in constant transmit mode.  
 Operating at rated input power.

The manufacturer declares the highest EUT frequency generated or used is 12MHz  
 Frequency range of measurement = 13.11-14.01MHz  
 RBW=9 kHz,VBW=27 kHz

Test environment conditions:  
 Temperature: 20°C  
 Relative Humidity: 51%  
 Pressure: 99.3kPa

Site A  
 ANSI C63.10-2013

Emission profile of the EUT rotated along three orthogonal axes was investigated.  
 Recorded data represent worse case emission.

Modification #1 was in place during testing.

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	7/25/2019	7/25/2020
T2	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/4/2018	12/4/2020
T3	AN00314	Loop Antenna	6502	5/13/2018	5/13/2020

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB $\mu$ V	T1 dB	T2 dB	T3 dB	Dist Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
1	13.110M	18.8	+0.0	+0.6	+8.6	-40.0	-12.0	29.5 Y_bandedge L	-41.5	Paral
2	14.010M	6.6	+0.0	+0.6	+8.5	-40.0	-24.3	29.5 Y_bandedge H	-53.8	Paral

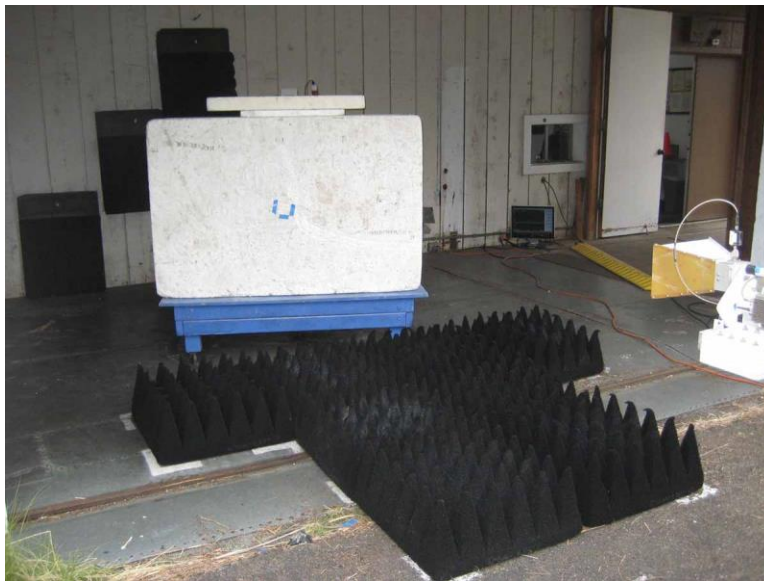
**Test Setup Photo(s)**



Below 1GHz



Below 1GHz



Above 1GHz

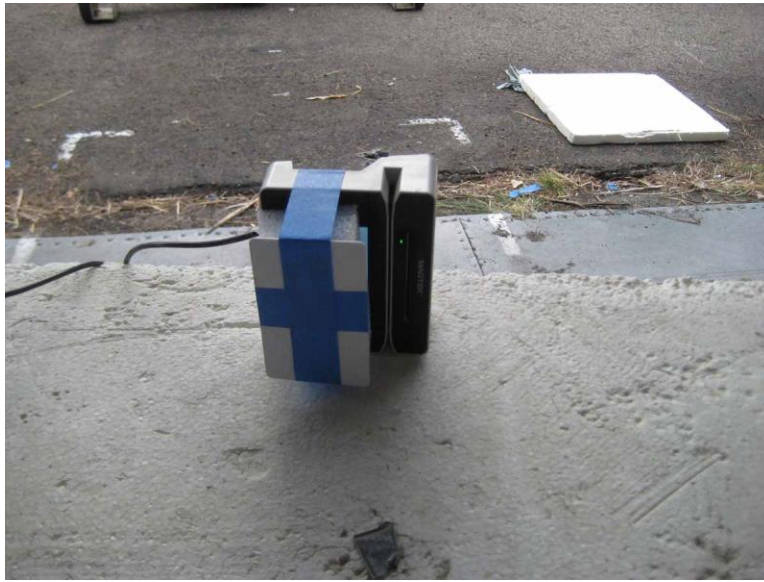


X-Axis



Y-Axis





Z-Axis

## 15.207 AC Conducted Emissions

### Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA • 714 -993 -6112  
 Customer: **Magtek Incorporated**  
 Specification: **15.207 AC Mains - Average**  
 Work Order #: **103582** Date: 1/21/2020  
 Test Type: **Conducted Emissions** Time: 15:03:27  
 Tested By: Don Nguyen Sequence#: 10  
 Software: EMITest 5.03.12 120V 60Hz

#### Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

#### Support Equipment:

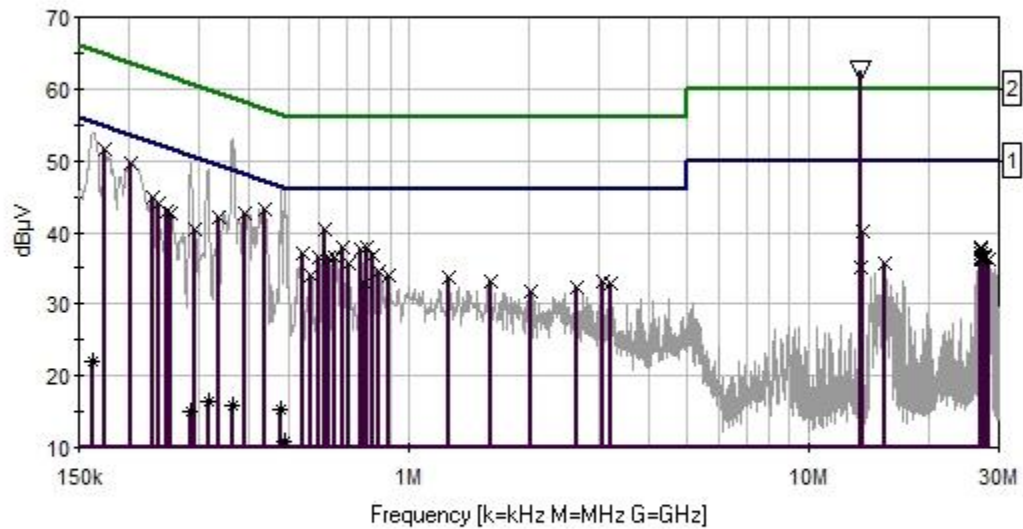
Device	Manufacturer	Model #	S/N
Configuration 1			

#### Test Conditions / Notes:

The EUT is placed on tabletop and connected to a support laptop via USB port. A credit card is on top of the EUT and the software ApolloFCC is running on the laptop to display transactions via NFC.  
 Operating frequency: 13.56MHz.  
  
 Frequency range of measurement = 150kHz-30MHz  
 RBW=9kHz, VBW=30kHz  
  
 Test environmental conditions:  
 Temperature: 19.6°C  
 Relative Humidity: 51%  
 Atmospheric Pressure: 99.4kPa  
  
 Site A  
  
 ANSI C63.10:2013



Magtek Incorporated WO#: 103582 Sequence#: 10 Date: 1/21/2020  
15.207 AC Mains - Average Test Lead: 120V 60Hz L1-Line



— Sweep Data  
— 2 - 15.207 AC Mains - Quasi-peak  
× Peak Readings  
▽ Ambient  
— 1 - 15.207 AC Mains - Average Readings  
\* Average Readings  
Software Version: 5.03.12

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP07545	Attenuator	SA18N10W-06	1/18/2019	1/18/2021
T2	ANP07338	Cable	2249-Y-240	12/24/2019	12/24/2021
T3	AN02869	Spectrum Analyzer	E4440A	7/25/2019	7/25/2020
T4	AN02610	High Pass Filter	HE9615-150K-50-720B	10/22/2019	10/22/2021
T5	AN00847.1	50uH LISN-Line 1	3816/2NM	3/11/2019	3/11/2020
	AN00847.1	50uH LISN-Line 2	3816/2NM	3/11/2019	3/11/2020

**Measurement Data:** Reading listed by frequency. Test Lead: L1-Line

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBμV	dB	dB	dB	dB	Table	dBμV	dBμV	dB	Ant
1	162.363k	47.4	+5.8 +0.1	+0.0	+0.0	+0.5	+0.0	53.8	55.3	-1.5	L1-Li
2	162.363k	15.5	+5.8 +0.1	+0.0	+0.0	+0.5	+0.0	21.9	55.3	-33.4	L1-Li
	Ave										
3	173.998k	45.3	+5.8 +0.1	+0.0	+0.0	+0.3	+0.0	51.5	54.8	-3.3	L1-Li
4	201.632k	43.6	+5.8 +0.1	+0.0	+0.0	+0.2	+0.0	49.7	53.5	-3.8	L1-Li
5	230.720k	38.8	+5.8 +0.1	+0.0	+0.0	+0.2	+0.0	44.9	52.4	-7.5	L1-Li
6	237.265k	37.9	+5.8 +0.1	+0.0	+0.0	+0.2	+0.0	44.0	52.2	-8.2	L1-Li
7	248.900k	37.0	+5.8 +0.1	+0.0	+0.0	+0.1	+0.0	43.0	51.8	-8.8	L1-Li
8	255.445k	36.6	+5.8 +0.1	+0.0	+0.0	+0.1	+0.0	42.6	51.6	-9.0	L1-Li
9	285.988k	43.7	+5.8 +0.1	+0.0	+0.0	+0.1	+0.0	49.7	50.6	-0.9	L1-Li
10	285.988k	9.0	+5.8 +0.1	+0.0	+0.0	+0.1	+0.0	15.0	50.6	-35.6	L1-Li
	Ave										
11	291.805k	34.5	+5.8 +0.1	+0.0	+0.0	+0.1	+0.0	40.5	50.5	-10.0	L1-Li
12	315.803k	42.8	+5.8 +0.1	+0.0	+0.0	+0.1	+0.0	48.8	49.8	-1.0	L1-Li
13	315.803k	10.4	+5.8 +0.1	+0.0	+0.0	+0.1	+0.0	16.4	49.8	-33.4	L1-Li
	Ave										
14	334.710k	36.2	+5.8 +0.0	+0.0	+0.0	+0.1	+0.0	42.1	49.3	-7.2	L1-Li
15	362.344k	9.9	+5.8 +0.0	+0.0	+0.0	+0.2	+0.0	15.9	48.7	-32.8	L1-Li
	Ave										
16	362.344k	46.9	+5.8 +0.0	+0.0	+0.0	+0.2	+0.0	52.9	48.7	+4.2	L1-Li
17	392.160k	36.6	+5.8 +0.1	+0.0	+0.0	+0.2	+0.0	42.7	48.0	-5.3	L1-Li
18	435.792k	37.1	+5.8 +0.1	+0.0	+0.0	+0.2	+0.0	43.2	47.1	-3.9	L1-Li

19	479.424k	9.1	+5.8	+0.0	+0.0	+0.3	+0.0	15.3	46.3	-31.0	L1-Li
	Ave		+0.1								
20	479.424k	39.7	+5.8	+0.0	+0.0	+0.3	+0.0	45.9	46.3	-0.4	L1-Li
			+0.1								
21	490.332k	4.8	+5.8	+0.0	+0.0	+0.3	+0.0	11.0	46.2	-35.2	L1-Li
	Ave		+0.1								
22	490.332k	40.1	+5.8	+0.0	+0.0	+0.3	+0.0	46.3	46.2	+0.1	L1-Li
			+0.1								
23	544.873k	31.0	+5.8	+0.0	+0.0	+0.3	+0.0	37.2	46.0	-8.8	L1-Li
			+0.1								
24	570.325k	27.7	+5.8	+0.1	+0.0	+0.3	+0.0	34.0	46.0	-12.0	L1-Li
			+0.1								
25	600.141k	30.2	+5.8	+0.1	+0.0	+0.3	+0.0	36.5	46.0	-9.5	L1-Li
			+0.1								
26	616.866k	34.0	+5.8	+0.1	+0.0	+0.3	+0.0	40.3	46.0	-5.7	L1-Li
			+0.1								
27	629.956k	30.1	+5.8	+0.1	+0.0	+0.3	+0.0	36.4	46.0	-9.6	L1-Li
			+0.1								
28	653.227k	30.1	+5.8	+0.1	+0.0	+0.3	+0.0	36.4	46.0	-9.6	L1-Li
			+0.1								
29	682.315k	31.5	+5.8	+0.1	+0.0	+0.3	+0.0	37.8	46.0	-8.2	L1-Li
			+0.1								
30	706.313k	29.3	+5.8	+0.1	+0.0	+0.3	+0.0	35.6	46.0	-10.4	L1-Li
			+0.1								
31	763.035k	31.3	+5.8	+0.1	+0.0	+0.3	+0.0	37.6	46.0	-8.4	L1-Li
			+0.1								
32	779.033k	26.7	+5.8	+0.1	+0.0	+0.3	+0.0	33.0	46.0	-13.0	L1-Li
			+0.1								
33	787.033k	31.5	+5.8	+0.1	+0.0	+0.3	+0.0	37.8	46.0	-8.2	L1-Li
			+0.1								
34	816.121k	30.4	+5.8	+0.1	+0.0	+0.3	+0.0	36.7	46.0	-9.3	L1-Li
			+0.1								
35	848.118k	28.3	+5.8	+0.1	+0.0	+0.3	+0.0	34.6	46.0	-11.4	L1-Li
			+0.1								
36	894.216k	27.6	+5.8	+0.1	+0.0	+0.3	+0.0	33.9	46.0	-12.1	L1-Li
			+0.1								
37	1.268M	27.4	+5.8	+0.1	+0.0	+0.2	+0.0	33.6	46.0	-12.4	L1-Li
			+0.1								
38	1.604M	27.1	+5.8	+0.1	+0.0	+0.2	+0.0	33.3	46.0	-12.7	L1-Li
			+0.1								
39	2.034M	25.6	+5.8	+0.1	+0.0	+0.2	+0.0	31.8	46.0	-14.2	L1-Li
			+0.1								
40	2.638M	26.0	+5.8	+0.1	+0.0	+0.2	+0.0	32.2	46.0	-13.8	L1-Li
			+0.1								
41	3.076M	27.0	+5.8	+0.1	+0.0	+0.2	+0.0	33.2	46.0	-12.8	L1-Li
			+0.1								
42	3.195M	26.9	+5.8	+0.1	+0.0	+0.1	+0.0	33.0	46.0	-13.0	L1-Li
			+0.1								
43	13.560M	56.0	+5.8	+0.3	+0.0	+0.2	+0.0	62.5	50.0	+12.5	L1-Li
	Ambient		+0.2						NFC fundamental frequency		

44	13.560M	28.3	+5.8 +0.1	+0.3	+0.0	+0.2	+0.0	35.1	50.0 Antenna is terminated with 24ohm	-14.9	L1-Li
45	13.770M	33.6	+5.8 +0.2	+0.3	+0.0	+0.2	+0.0	40.1	50.0	-9.9	L1-Li
46	15.490M	29.3	+5.8 +0.2	+0.3	+0.0	+0.2	+0.0	35.8	50.0	-14.2	L1-Li
47	26.917M	31.0	+5.8 +0.4	+0.4	+0.0	+0.2	+0.0	37.8	50.0	-12.2	L1-Li
48	26.937M	29.4	+5.8 +0.4	+0.4	+0.0	+0.2	+0.0	36.2	50.0	-13.8	L1-Li
49	26.992M	30.7	+5.8 +0.4	+0.4	+0.0	+0.2	+0.0	37.5	50.0	-12.5	L1-Li
50	27.026M	30.4	+5.8 +0.4	+0.4	+0.0	+0.2	+0.0	37.2	50.0	-12.8	L1-Li
51	27.095M	29.6	+5.8 +0.4	+0.4	+0.0	+0.2	+0.0	36.4	50.0	-13.6	L1-Li
52	27.273M	29.5	+5.8 +0.4	+0.4	+0.0	+0.2	+0.0	36.3	50.0	-13.7	L1-Li
53	27.410M	29.5	+5.8 +0.4	+0.5	+0.0	+0.2	+0.0	36.4	50.0	-13.6	L1-Li
54	27.526M	29.5	+5.8 +0.4	+0.5	+0.0	+0.2	+0.0	36.4	50.0	-13.6	L1-Li
55	27.670M	29.5	+5.8 +0.4	+0.5	+0.0	+0.2	+0.0	36.4	50.0	-13.6	L1-Li
56	27.773M	29.8	+5.8 +0.4	+0.5	+0.0	+0.2	+0.0	36.7	50.0	-13.3	L1-Li
57	28.260M	29.2	+5.8 +0.4	+0.5	+0.0	+0.2	+0.0	36.1	50.0	-13.9	L1-Li

Test Location: CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA • 714 993 6112  
 Customer: **Magtek Incorporated**  
 Specification: **15.207 AC Mains - Average**  
 Work Order #: **103582** Date: 1/21/2020  
 Test Type: **Conducted Emissions** Time: 14:58:47  
 Tested By: Don Nguyen Sequence#: 9  
 Software: EMITest 5.03.12 120V 60Hz

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 1			

***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 1			

***Test Conditions / Notes:***

The EUT is placed on tabletop and connected to a support laptop via USB port. A credit card is on top of the EUT and the software ApolloFCC is running on the laptop to display transactions via NFC.  
 Operating frequency: 13.56MHz.

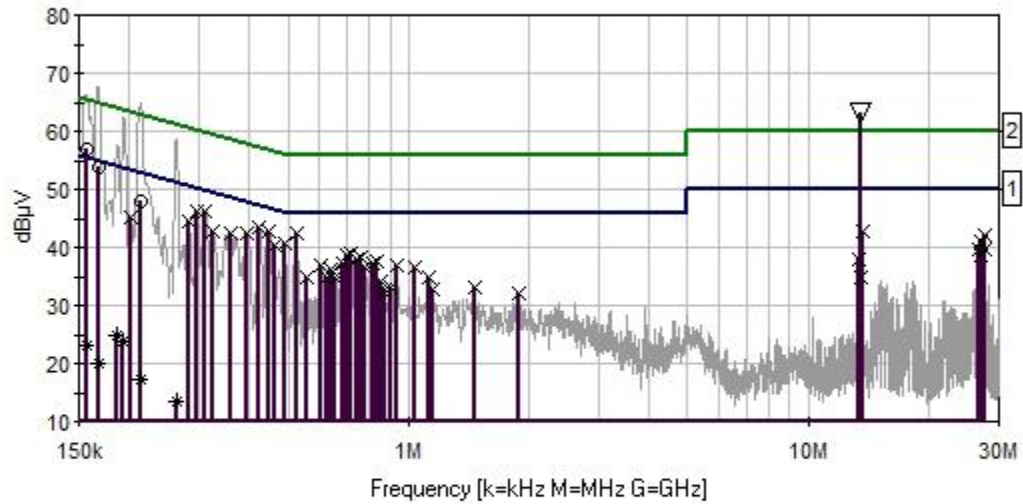
Frequency range of measurement = 150kHz-30MHz  
 RBW=9kHz, VBW=30kHz

Test environmental conditions:  
 Temperature: 19.6°C  
 Relative Humidity: 51%  
 Atmospheric Pressure: 99.4kPa

Site A

ANSI C63.10:2013

Magtek Incorporated WO#: 103582 Sequence#: 9 Date: 1/21/2020  
15.207 AC Mains - Average Test Lead: 120V 60Hz L2-Neutral



—	Sweep Data	—	1 - 15.207 AC Mains - Average
—	2 - 15.207 AC Mains - Quasi-peak	—	Readings
x	Peak Readings	o	QP Readings
*	Average Readings	▽	Ambient

Software Version: 5.03.12

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP07545	Attenuator	SA18N10W-06	1/18/2019	1/18/2021
T2	ANP07338	Cable	2249-Y-240	12/24/2019	12/24/2021
T3	AN02869	Spectrum Analyzer	E4440A	7/25/2019	7/25/2020
T4	AN02610	High Pass Filter	HE9615-150K-50-720B	10/22/2019	10/22/2021
	AN00847.1	50uH LISN-Line 1	3816/2NM	3/11/2019	3/11/2020
T5	AN00847.1	50uH LISN-Line 2	3816/2NM	3/11/2019	3/11/2020

**Measurement Data:** Reading listed by frequency. Test Lead: L2-Neutral

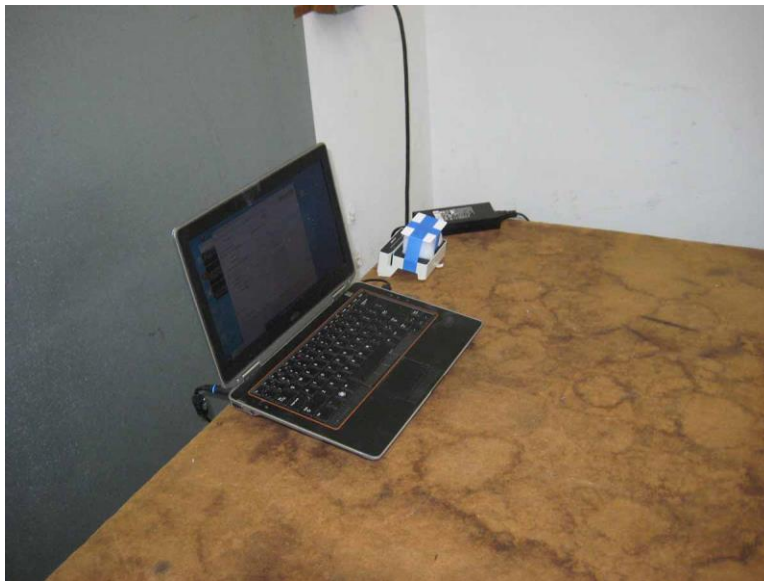
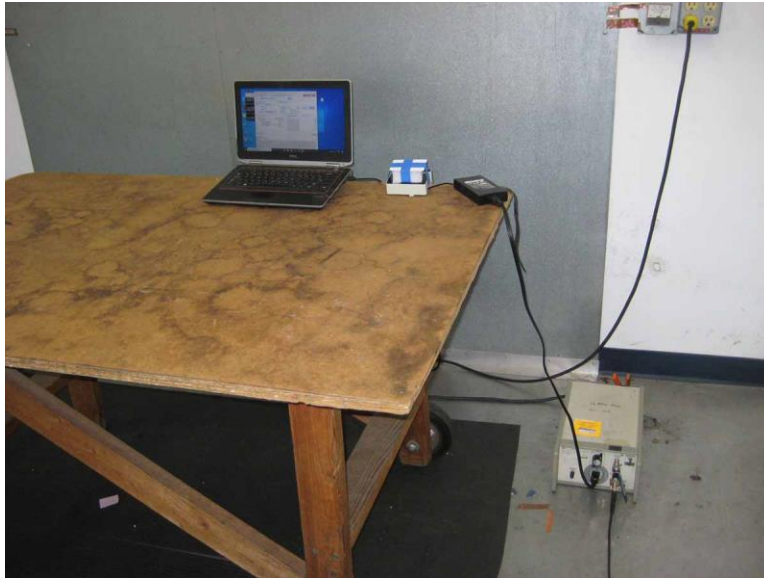
#	Freq MHz	Rdng dBμV	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	156.545k	59.9	+5.8 +0.0	+0.0	+0.0	+0.6	+0.0	66.3	55.6	+10.7	L2-Ne
2	156.545k Ave	16.8	+5.8 +0.0	+0.0	+0.0	+0.6	+0.0	23.2	55.6	-32.4	L2-Ne
3	156.545k QP	50.6	+5.8 +0.0	+0.0	+0.0	+0.6	+0.0	57.0	65.6	-8.6	L2-Ne
4	167.453k	61.6	+5.8 +0.0	+0.0	+0.0	+0.3	+0.0	67.7	55.1	+12.6	L2-Ne
5	167.453k QP	47.6	+5.8 +0.0	+0.0	+0.0	+0.3	+0.0	53.7	65.1	-11.4	L2-Ne
6	167.453k Ave	13.8	+5.8 +0.0	+0.0	+0.0	+0.3	+0.0	19.9	55.1	-35.2	L2-Ne
7	186.360k Ave	18.9	+5.8 +0.0	+0.0	+0.0	+0.2	+0.0	24.9	54.2	-29.3	L2-Ne
8	186.360k	51.5	+5.8 +0.0	+0.0	+0.0	+0.2	+0.0	57.5	54.2	+3.3	L2-Ne
9	194.360k	56.3	+5.8 +0.0	+0.0	+0.0	+0.2	+0.0	62.3	53.8	+8.5	L2-Ne
10	194.360k Ave	17.7	+5.8 +0.0	+0.0	+0.0	+0.2	+0.0	23.7	53.8	-30.1	L2-Ne
11	202.359k	39.2	+5.8 +0.0	+0.0	+0.0	+0.2	+0.0	45.2	53.5	-8.3	L2-Ne
12	213.994k Ave	11.3	+5.8 +0.0	+0.0	+0.0	+0.2	+0.0	17.3	53.0	-35.7	L2-Ne
13	213.994k QP	42.0	+5.8 +0.0	+0.0	+0.0	+0.2	+0.0	48.0	63.0	-15.0	L2-Ne
14	213.994k	58.7	+5.8 +0.0	+0.0	+0.0	+0.2	+0.0	64.7	53.0	+11.7	L2-Ne
15	262.717k	52.6	+5.8 +0.0	+0.0	+0.0	+0.1	+0.0	58.5	51.3	+7.2	L2-Ne
16	262.717k Ave	7.4	+5.8 +0.0	+0.0	+0.0	+0.1	+0.0	13.3	51.3	-38.0	L2-Ne
17	283.079k	38.5	+5.8 +0.0	+0.0	+0.0	+0.1	+0.0	44.4	50.7	-6.3	L2-Ne
18	296.168k	40.3	+5.8 +0.0	+0.0	+0.0	+0.1	+0.0	46.2	50.3	-4.1	L2-Ne



19	311.440k	40.2	+5.8 +0.0	+0.0	+0.0	+0.1	+0.0	46.1	49.9	-3.8	L2-Ne
20	323.802k	37.0	+5.8 +0.0	+0.0	+0.0	+0.1	+0.0	42.9	49.6	-6.7	L2-Ne
21	359.435k	36.3	+5.8 +0.0	+0.0	+0.0	+0.2	+0.0	42.3	48.7	-6.4	L2-Ne
22	395.796k	36.4	+5.8 +0.0	+0.0	+0.0	+0.2	+0.0	42.4	47.9	-5.5	L2-Ne
23	423.429k	37.3	+5.8 +0.0	+0.0	+0.0	+0.2	+0.0	43.3	47.4	-4.1	L2-Ne
24	449.609k	36.5	+5.8 +0.0	+0.0	+0.0	+0.3	+0.0	42.6	46.9	-4.3	L2-Ne
25	461.244k	34.4	+5.8 +0.0	+0.0	+0.0	+0.3	+0.0	40.5	46.7	-6.2	L2-Ne
26	491.060k	34.5	+5.8 +0.0	+0.0	+0.0	+0.3	+0.0	40.6	46.1	-5.5	L2-Ne
27	524.511k	36.4	+5.8 +0.0	+0.0	+0.0	+0.3	+0.0	42.5	46.0	-3.5	L2-Ne
28	555.781k	28.5	+5.8 +0.0	+0.1	+0.0	+0.3	+0.0	34.7	46.0	-11.3	L2-Ne
29	605.958k	30.6	+5.8 +0.0	+0.1	+0.0	+0.3	+0.0	36.8	46.0	-9.2	L2-Ne
30	625.593k	28.7	+5.8 +0.0	+0.1	+0.0	+0.3	+0.0	34.9	46.0	-11.1	L2-Ne
31	637.228k	30.1	+5.8 +0.0	+0.1	+0.0	+0.3	+0.0	36.3	46.0	-9.7	L2-Ne
32	644.500k	29.7	+5.8 +0.0	+0.1	+0.0	+0.3	+0.0	35.9	46.0	-10.1	L2-Ne
33	657.590k	28.6	+5.8 +0.0	+0.1	+0.0	+0.3	+0.0	34.8	46.0	-11.2	L2-Ne
34	689.587k	31.2	+5.8 +0.0	+0.1	+0.0	+0.3	+0.0	37.4	46.0	-8.6	L2-Ne
35	700.495k	32.5	+5.8 +0.0	+0.1	+0.0	+0.3	+0.0	38.7	46.0	-7.3	L2-Ne
36	715.039k	32.8	+5.8 +0.0	+0.1	+0.0	+0.3	+0.0	39.0	46.0	-7.0	L2-Ne
37	741.219k	31.9	+5.8 +0.0	+0.1	+0.0	+0.3	+0.0	38.1	46.0	-7.9	L2-Ne
38	757.944k	32.1	+5.8 +0.0	+0.1	+0.0	+0.3	+0.0	38.3	46.0	-7.7	L2-Ne
39	776.852k	30.4	+5.8 +0.0	+0.1	+0.0	+0.3	+0.0	36.6	46.0	-9.4	L2-Ne
40	813.212k	31.0	+5.8 +0.0	+0.1	+0.0	+0.3	+0.0	37.2	46.0	-8.8	L2-Ne
41	835.755k	31.5	+5.8 +0.0	+0.1	+0.0	+0.3	+0.0	37.7	46.0	-8.3	L2-Ne
42	854.663k	27.9	+5.8 +0.0	+0.1	+0.0	+0.3	+0.0	34.1	46.0	-11.9	L2-Ne
43	870.661k	26.6	+5.8 +0.0	+0.1	+0.0	+0.3	+0.0	32.8	46.0	-13.2	L2-Ne
44	877.205k	25.7	+5.8 +0.0	+0.1	+0.0	+0.3	+0.0	31.9	46.0	-14.1	L2-Ne

45	902.721k	27.1	+5.8 +0.0	+0.1	+0.0	+0.2	+0.0	33.2	46.0	-12.8	L2-Ne
46	940.996k	30.7	+5.8 +0.0	+0.1	+0.0	+0.2	+0.0	36.8	46.0	-9.2	L2-Ne
47	1.035M	30.5	+5.8 +0.0	+0.1	+0.0	+0.2	+0.0	36.6	46.0	-9.4	L2-Ne
48	1.128M	28.6	+5.8 +0.0	+0.1	+0.0	+0.2	+0.0	34.7	46.0	-11.3	L2-Ne
49	1.149M	26.8	+5.8 +0.0	+0.1	+0.0	+0.2	+0.0	32.9	46.0	-13.1	L2-Ne
50	1.464M	27.1	+5.8 +0.0	+0.1	+0.0	+0.2	+0.0	33.2	46.0	-12.8	L2-Ne
51	1.881M	25.8	+5.8 +0.1	+0.1	+0.0	+0.2	+0.0	32.0	46.0	-14.0	L2-Ne
52	13.427M	31.5	+5.8 +0.2	+0.3	+0.0	+0.2	+0.0	38.0	50.0	-12.0	L2-Ne
53	13.560M Ambient	56.7	+5.8 +0.2	+0.3	+0.0	+0.2	+0.0	63.2	50.0 NFC fundamental frequency	+13.2	L2-Ne
54	13.560M	28.0	+5.8 +0.2	+0.3	+0.0	+0.2	+0.0	35.0	50.0 Antenna is terminated with 24ohm	-15.0	L2-Ne
55	13.652M	36.4	+5.8 +0.2	+0.3	+0.0	+0.2	+0.0	42.9	50.0	-7.1	L2-Ne
56	26.875M	32.7	+5.8 +0.6	+0.4	+0.0	+0.2	+0.0	39.7	50.0	-10.3	L2-Ne
57	26.944M	31.5	+5.8 +0.6	+0.4	+0.0	+0.2	+0.0	38.5	50.0	-11.5	L2-Ne
58	27.074M	33.9	+5.8 +0.6	+0.4	+0.0	+0.2	+0.0	40.9	50.0	-9.1	L2-Ne
59	27.574M	32.7	+5.8 +0.6	+0.5	+0.0	+0.2	+0.0	39.8	50.0	-10.2	L2-Ne
60	27.711M	34.8	+5.8 +0.6	+0.5	+0.0	+0.2	+0.0	41.9	50.0	-8.1	L2-Ne

Test Setup Photo(s)



## APPENDIX A: MANUFACTURER DECLARATION

The following models have been tested by CKC Laboratories:

**DynaFlex Pro with USB/Bluetooth, DynaFlex Pro with USB/802.11**

The manufacturer states that the following additional models do not affect their EMC characteristics, and therefore they meet the level of testing equivalent to the tested models.

**DynaFlex USB only, DynaFlex with USB/Bluetooth, DynaFlex Pro USB only**

## SUPPLEMENTAL INFORMATION

### Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

Uncertainties reported are worst case for all CKC Laboratories' sites and represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .

Compliance is deemed to occur provided measurements are below the specified limits.

### Emissions Test Details

#### TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

#### CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in  $\text{dB}\mu\text{V}/\text{m}$ , the spectrum analyzer reading in  $\text{dB}\mu\text{V}$  was corrected by using the following formula. This reading was then compared to the applicable specification limit. Individual measurements were compared with the displayed limit value in the margin column. The margin was calculated based on subtracting the limit value from the corrected measurement value; a positive margin represents a measurement exceeding the limit, while a negative margin represents a measurement less than the limit.

SAMPLE CALCULATIONS		
	Meter reading	( $\text{dB}\mu\text{V}$ )
+	Antenna Factor	( $\text{dB}/\text{m}$ )
+	Cable Loss	( $\text{dB}$ )
-	Distance Correction	( $\text{dB}$ )
-	Preamplifier Gain	( $\text{dB}$ )
=	Corrected Reading	( $\text{dB}\mu\text{V}/\text{m}$ )

## TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

## SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or caret ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

### Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

### Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

### Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point, the measuring device is set into the linear mode and the scan time is reduced.