

## TEST REPORT

**Report Number: 3172421LEX-001**  
**Project Number: 3172421**

**Evaluation of the RFID Cash Deposit Board**  
**Model Number: 8000-011-001**

**FCC ID: W3U800011001**

**Tested to the Criteria in**  
**FCC Part 15 Subpart C (15.225),**  
**FCC Part 15 Subpart B (15.107 and 15.109),**

**For**

**Sargent and Greenleaf Inc.**

Test Performed by:  
Intertek  
731 Enterprise Drive  
Lexington, KY 40510

Test Authorized by:  
Sargent and Greenleaf Inc.  
One Security Drive  
Nicholasville, KY 40356

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## 1 JOB DESCRIPTION

### 1.1 Test Sample Information

The 8000-011-001 Cash Deposit Board (CDB) is designed specifically for and used exclusively for retail asset tracking via an RFID reader. In a typical application the CDB is permanently installed inside a compartment in a steel safe. The CDB is used to track details of assets as they are stored and removed from the safe compartment. Several CDB's can be used together in a multiple compartment safe and are coordinated by a host computer via a Universal Serial Bus. The CDB's also monitor open/closed status of the compartment door and control two types of door locks.

Company Information	
<b>Manufacturer:</b>	Sargent and Greenleaf Inc.
<b>Address:</b>	One Security Drive Nicholasville KY 40356
<b>Contact Name:</b>	Michael Clark
<b>Telephone Number:</b>	(859) 885-9411
<b>Email Address:</b>	mclark3@stanleyworks.com

Test sample	
<b>Model Number:</b>	8000-011-001
<b>Serial Number:</b>	Test Sample 1
<b>FCC ID:</b>	W3U800011001
<b>FCC Classification:</b>	Low Power Communication Device Transmitter (DXX)
<b>Antenna Type:</b>	PCB Antenna
<b>Antenna Location:</b>	On PCB
<b>Sample Receive Date:</b>	2/10/2009

Test Signal Mode	
<b>Test Commands:</b>	X
<b>Base Station Simulator:</b>	

## 1.2 System Support Equipment

A Dell laptop (Model Inspiron 1420) was used to configure the transmit mode of the RFID Cash Deposit Board prior to each test. It also provided DC power to the test sample via the USB connection. The laptop was powered via an AC power adapter (Dell Model PS-1650-05D) throughout the evaluation. No other support equipment was used.

## 1.3 Cables associated with EUT

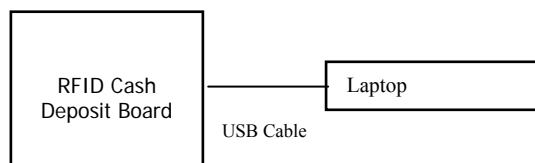
Table 1-1 contains the details of the cables associated with the EUT.

*Table 1-1: Interconnecting cables between modules of EUT*

Cables					
Description	Length	Shielding	Ferrites	Connection	
				From	To
DC Cable	6 ft.	None	Yes	Laptop	AC/DC Power Converter for Laptop
AC Power Cable	6 ft.	None	Yes	AC/DC Power Converter for Laptop	120VAC Power Source
USB Cable	3 ft.	Yes	Yes	EUT	Laptop

## 1.4 System Block Diagram

The diagram shown below details the interconnection of the EUT and its accessories during the testing.



## 1.5 Mode(s) of operation

The RFID Cash Deposit Board was powered via a USB cable (5VDC) connected to a laptop computer. The laptop was powered by an AC power adapter which was connected to 120VAC / 60Hz. A control program was used to force the RFID Cash Deposit Board to transmit at maximum output power during the evaluation.

## 1.6 Modifications required for compliance

In order to pass the conducted emission test ferrite beads had to be placed around the DC output and the AC input of the AC power adapter connected to the laptop computer (Fair-Rite part number 0431177081).

## 1.7 Related Submittal(s) Grants

None

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## 2 EXECUTIVE SUMMARY

Testing performed for: Sargent and Greenleaf Inc.

Equipment Under Test: Model 8000-011-001

Test Start Date: 2/10/2009

Test End Date: 5/6/2009

FCC Rule	Description Of Test	Result	Page
§2.1049	Measurement of 20dB Bandwidth	<b>Compliant</b>	8
§15.225(a), (b), and (c)	Radiated Spurious Emissions, In Band	<b>Compliant</b>	11
§15.225(d)	Radiated Spurious Emissions, Out Of Band	<b>Compliant</b>	13
§15.109	Receiver Spurious Emissions	<b>Compliant</b>	17
§15.107, §15.207	Power Line Conducted Emissions	<b>Compliant</b>	19
§15.225(e)	Frequency Stability	<b>Compliant</b>	23

### 3 TEST FACILITY

The INTERTEK-Lexington is located at 731 Enterprise Drive, Lexington Kentucky, 40510. The radiated emission test site is a 10-meter semi-anechoic chamber. The chamber meets the characteristics of CISPR 16-1: 1993 and ANSI C63.4: 1992. For measurements, a remotely controlled flush-mount metal-top turntable is used to rotate the EUT a full 360 degrees. A remote controlled non-conductive antenna mast is used to scan the antenna height from one to four meters.

The test site is listed with the FCC under registration number 485103. The test site is listed with Industry Canada under site number IC 2042M-1.



#### 3.1 Test Equipment

Description	Manufacturer	Model Number	Serial Number	Calibration due date
Environmental Chamber	Thermotron	SM-8-C	32692	1/29/2010
EMI Receiver	Rohde & Schwarz	ESI 26	1088.7490	8/28/2009
EMC Analyzer	Agilent Technologies	E7405	2142	9/5/2009
Bilog Antenna	ETS	3142C	00051864	12/24/2009
Loop Antenna	ETS	6502	3416	2/26/2010
LISN	Fischer Custom Communication	FCC-LISN-50-50-2M	1026	5/6/2009

## 4 MEASUREMENT OF 20DB BANDWIDTH

### 4.1 Test Procedure (FCC Rule: §2.1049)

The 20dB bandwidth measurement was performed with a spectrum analyzer connected to a receiving antenna. The test sample was made to transmit and the 20dB bandwidth was measured.

### 4.2 Test Results

The 20dB bandwidth test results are located in Table 4-1 and in Figure 4-1 through Figure 4-2.

*Table 4-1: 20dB Bandwidth Measurements*

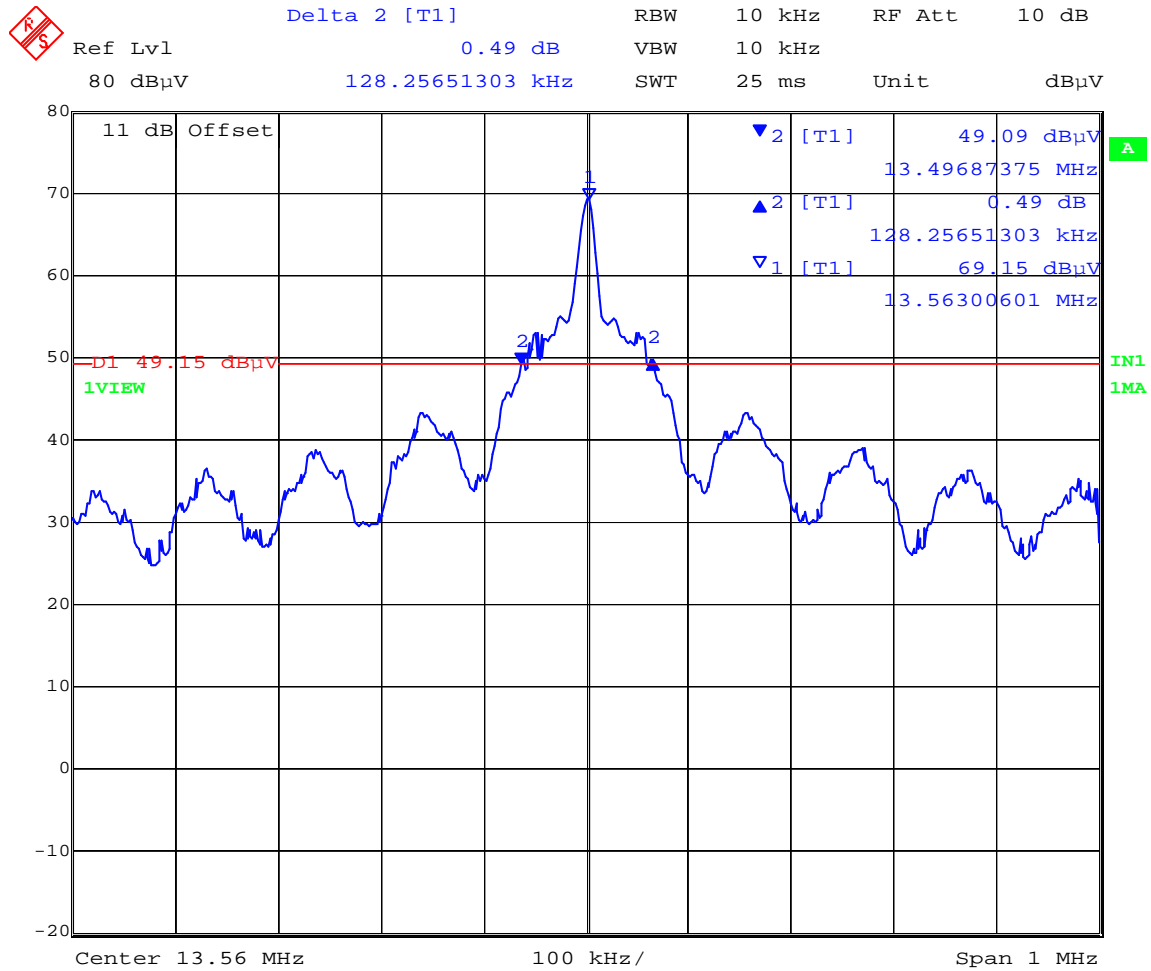
Mode	Frequency (MHz)	20dB Bandwidth
With Tag Present	13.56	128.25kHz
Without Tag Present	13.56	128.25kHz



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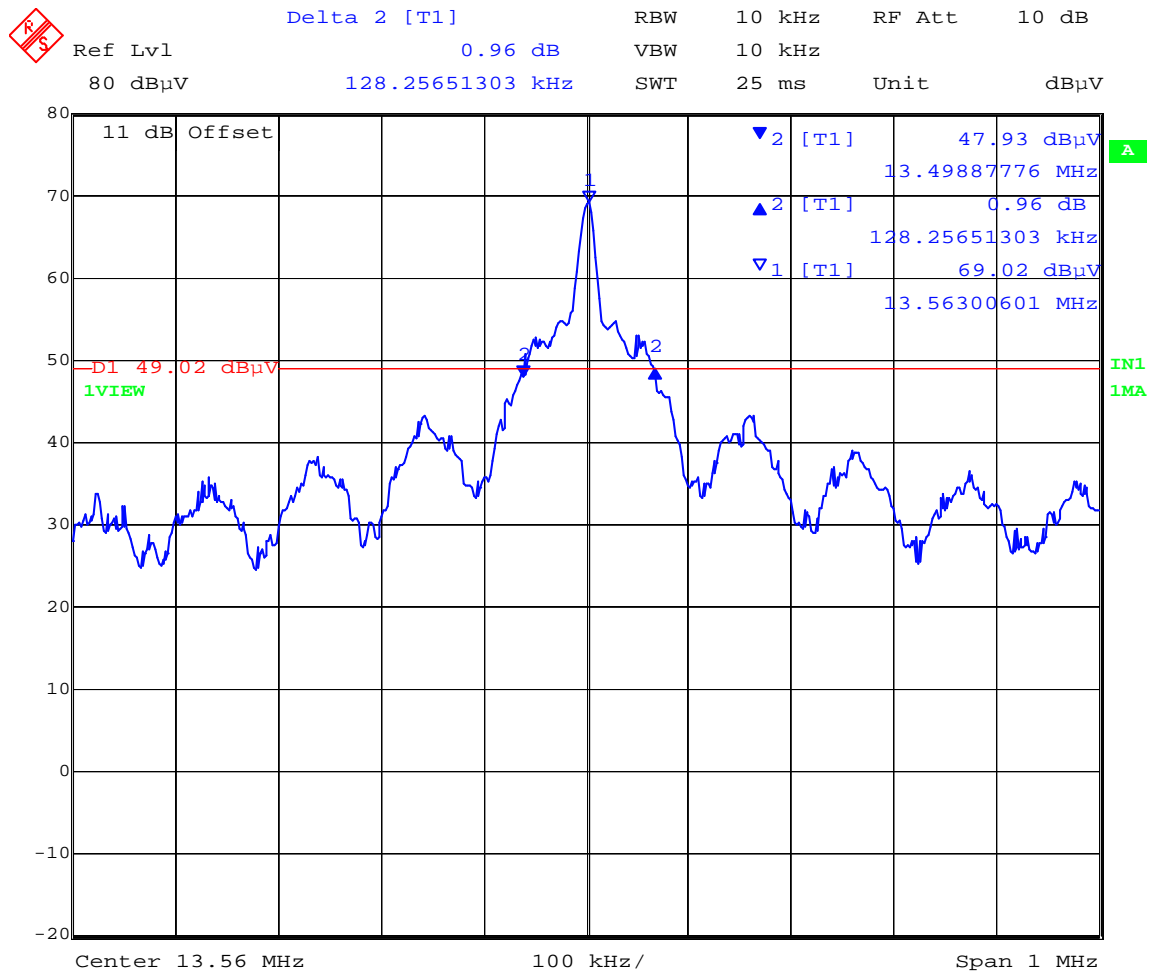
FCC ID: W3U800011001

Figure 4-1: 20dB Bandwidth, No Tag Present



Date: 13.APR.2009 14:18:42

Figure 4-2: 20dB Bandwidth, Tag Present



Date: 13.APR.2009 14:21:31

**5 RADIATED SPURIOUS EMISSIONS, IN BAND****5.1 Test Procedure for FCC Rule §15.225(a), (b), (c)**

The RFID Cash Deposit Board was placed on a non-conductive table and set to continuously transmit at its highest output power level. The spurious emission test was performed with a tag present and repeated without the tag present. The procedures from ANSI C63.4 were used for the radiated measurements from 9kHz – 1GHz as outlined below:

Procedure for Frequencies Less Than 30MHz:

The 13.11MHz – 14.01MHz range was measured with a loop antenna positioned 3 meters from the EUT with the center of the loop 1m above the reference ground plane. During the tests, the antenna and EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. Final measurements were performed using CISPR quasi-peak detection.

**5.2 In-Band Radiated Spurious Emissions Criteria**

§ 15.225 Operation within the band 13.110–14.010 MHz.

(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

The radiated emission limits from §15.225 were adjusted for a 3m test distance as shown in Table 6-1. The limits were adjusted using a 40dB/decade extrapolation factor as specified in §15.31(f)(2).

*Table 5-1: Radiated Emission Limit for FCC §15.225 (a), (b), and (c)*

§15.225	Frequency (MHz)	Field Strength Limits (uV/m)	Measurement Distance (Meters)	Field Strength Limits, (dB µV/m)	Field Strength Limits, (dB µV/m) @ 3m
(a)	13.553 to 13.567	15,848	30	84	124
(b)	13.410 to 13.553 13.567 to 13.710	334	30	50.47	90.47
(c)	13.110 to 13.410 13.710 to 14.010	106	30	40.5	80.5

### 5.3 Test Results

The 8000-011-001 RFID Cash Deposit Board met the in band radiated spurious emission criteria of FCC §15.225(a), (b), and (c). The test data is shown in Table 5-2.

*Table 5-2: In Band Radiated Spurious Emissions (Quasi-Peak Detection)<sup>1 2</sup>*

TX Mode	Frequency	Polarity (H/V)	Cab. (dB)	Ant. (dB)	Corr. Reading. (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Azimuth (deg)	Tower (cm)	Results
No Tag	13.559 MHz	NA	0.37	10.72	69.33	124	-54.67	237	100	<b>Compliant</b>
Tag Present	13.559 MHz	NA	0.37	10.72	70.32	124	-53.68	293	100	<b>Compliant</b>

The final amplitude is computed from the measured receiver amplitude by adding a correction factor associated with the Antenna and cable loss as shown in the formula below.

$$FM = RA + CF + AF \text{ where, } FM = \text{Final Measurement, } RA = \text{Receiver Amplitude, } CF = \text{Cable Factor, and } AF = \text{Antenna Factor}$$

<sup>1</sup> Other than the fundamental emission, there were no emissions in the 13.11MHz – 14.01MHz range within 40dB of the limit.

<sup>2</sup> These readings represent the worst case with the test sample positioned in orthogonal x, y, and z directions.

## 6 RADIATED SPURIOUS EMISSIONS, OUT OF BAND

### 6.1 Test Procedure for FCC Rule §15.225(d)

The RFID Cash Deposit Board was placed on a non-conductive table and set to continuously transmit at its highest output power level. The spurious emission test was performed with a tag present and repeated without the tag present. The procedures from ANSI C63.4 were used for the radiated measurements from 9kHz – 1GHz as outlined below:

#### Procedure for Frequencies Less Than 30MHz:

The 9kHz - 30MHz range was measured with a loop antenna positioned 3 meters from the EUT with the center of the loop 1m above the reference ground plane. During the tests, the antenna and EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. Final measurements were performed using CISPR quasi-peak detection.

#### Procedure for Frequencies Greater Than 30MHz:

The 30MHz – 1GHz range was measured with a bilog antenna positioned 3 meters from the EUT. During the tests, the antenna height, polarity, and EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. Final measurements were performed using CISPR quasi-peak detection.

### 6.2 Out of Band Radiated Spurious Emissions Criteria

§15.225(d): The field strength of any emissions appearing outside the 13.110 – 14.010MHz band shall not exceed the general radiated emission limits in §15.209.

All testing was performed with a measurement distance of 3m. The general radiated emission limits from §15.209 were adjusted for a 3m test distance below 30MHz as shown in Table 6-1. The limits were adjusted using a 40dB/decade extrapolation factor as specified in §15.31(f)(2).

*Table 6-1: Radiated Emission Limit for FCC §15.209(a)*

Frequency (MHz)	Field Strength Limits (uV/m)	Measurement Distance (Meters)	Field Strength Limits, (dB µV/m)	Field Strength Limits, (dB µV/m) @ 3m
0.009 to 0.490	2400/F (kHz)	300	48.5 to 13.8	128.5 to 93.8
0.490 to 1.705	24000/F (kHz)	30	33.7 to 22.9	73.7 to 62.9
1.705 to 30	30	30	29.5	49.5
30 to 88	100	3	40.0	40.0
88 to 216	150	3	43.5	43.5
216 to 960	200	3	46.0	46.0
960 and up	500	3	54.0	54.0

### 6.3 Test Results

The 8000-011-001 RFID Cash Deposit Board met the out of band radiated spurious emission criteria of FCC §15.209 and §15.225(d). The test data is shown in Table 6-1 and Table 6-2. The graphical scans are shown in Figure 6-1 through Figure 6-4

*Table 6-2: Out of Band Radiated Spurious Emissions (Without Tag)*

Frequency	Polarity (H/V)	Cab. (dB)	Ant. (dB)	Corr. Reading. (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Azimuth (deg)	Tower (cm)	Results
203.38 MHz	H	3.11	10.64	32.91	43.5	-10.61	24	146	Compliant
298.3 MHz	H	3.71	13.83	39.51	46.0	-6.51	24	99	Compliant
406.79 MHz	H	4.31	16.78	36.64	46.0	-9.38	57	99	Compliant
433.9 MHz	H	4.47	16.91	36.48	46.0	-9.54	66	99	Compliant
495.25 MHz	V	4.72	17.69	30.09	46.0	-15.93	-5	237	Compliant
663.89 MHz	V	5.48	19.68	34.68	46.0	-11.34	154	100	Compliant

*Table 6-3: Out of Band Radiated Spurious Emissions (With Tag)*

Frequency	Polarity (H/V)	Cab. (dB)	Ant. (dB)	Corr. Reading. (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Azimuth (deg)	Tower (cm)	Results
298.3 MHz	H	3.71	13.83	39.24	46.0	-6.78	24	100	Compliant
406.78 MHz	H	4.31	16.79	32.88	46.0	-13.14	24	100	Compliant
433.9 MHz	H	4.47	16.91	35.62	46.0	-10.4	75	100	Compliant
833.8 MHz	H	6.15	22.9	28.2	46.0	-17.82	50	100	Compliant
495.29 MHz	V	4.72	17.69	32.3	46.0	-13.72	50	99	Compliant
833.58 MHz	V	6.15	22	30.72	46.0	-15.3	177	100	Compliant

The final quasi peak or average amplitude is computed from the measured receiver amplitude by adding a correction factor associated with the Antenna and cable loss as shown in the formula below.

$$FM = RA + CF + AF \text{ where, } FM = \text{Final Measurement, } RA = \text{Receiver Amplitude, } CF = \text{Cable Factor, and } AF = \text{Antenna Factor}$$

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Figure 6-1: Out of Band Radiated Spurious Emissions (Below 30MHz Transmitting Without Tag)<sup>3</sup>

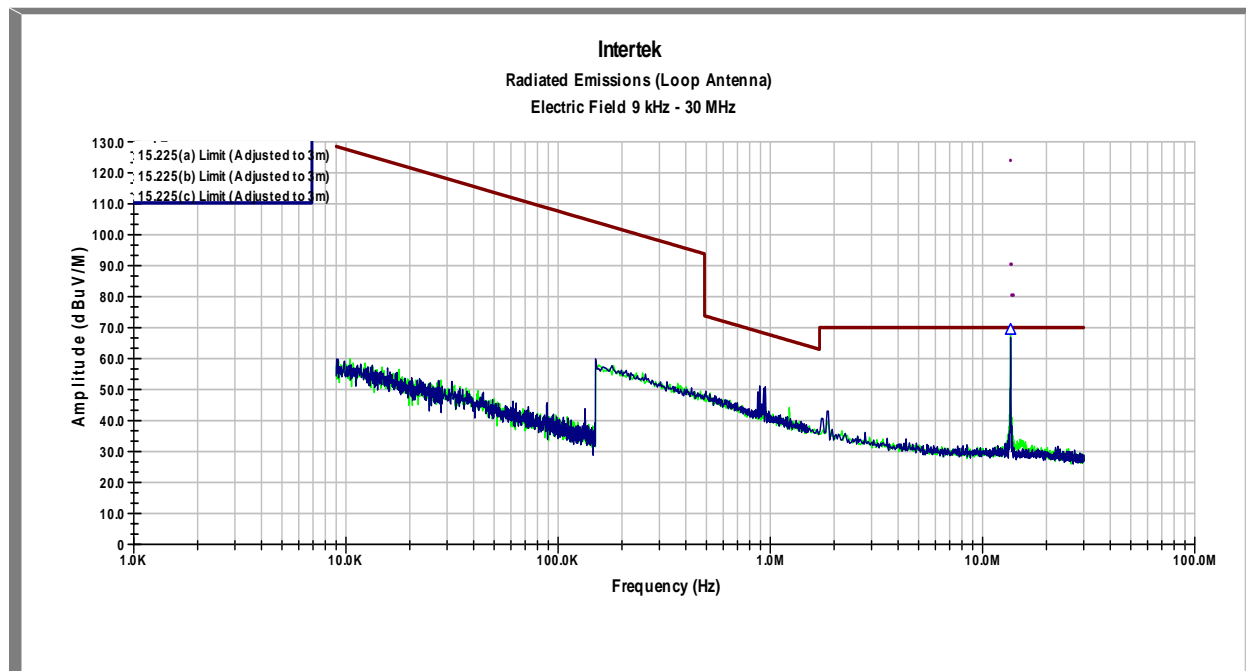
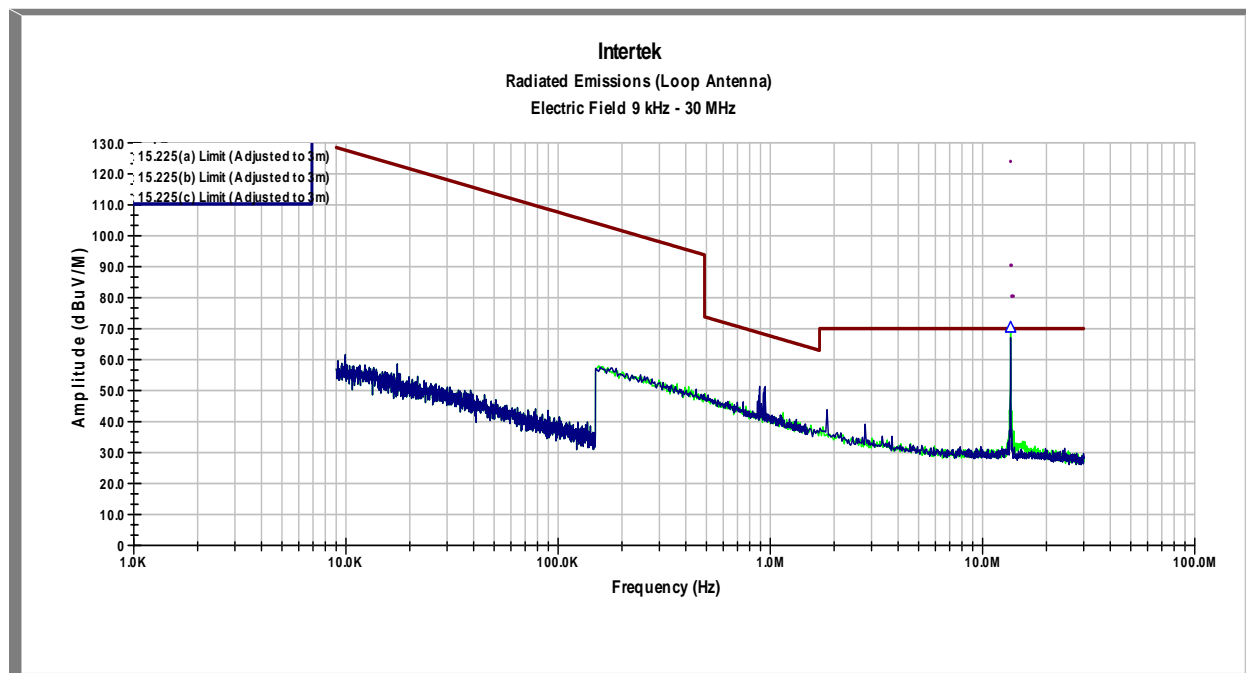


Figure 6-2: Out of Band Radiated Spurious Emissions (Below 30MHz Transmitting With Tag)<sup>3</sup>



<sup>3</sup> The emission appearing at 13.56MHz in these graphs is the wanted fundamental signal coming from the test sample. It is not a spurious emission.

Figure 6-3: Out of Band Radiated Spurious Emissions (Above 30MHz Transmitting Without Tag)

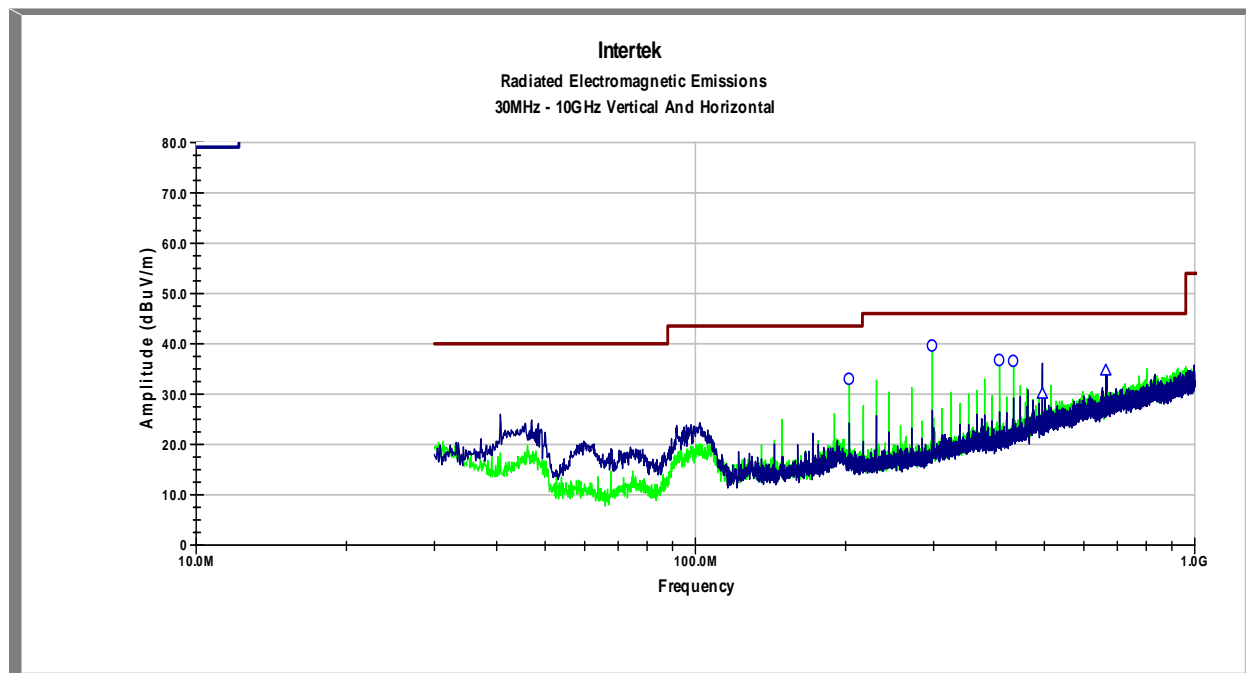
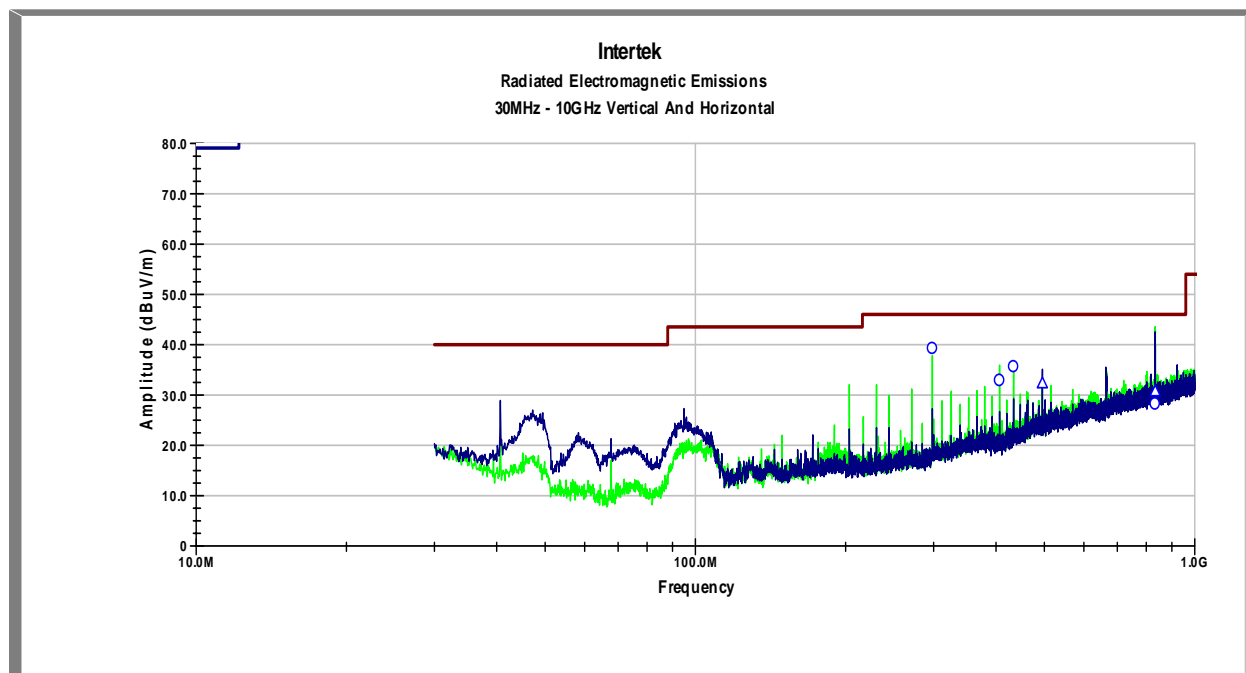


Figure 6-4: Out of Band Radiated Spurious Emissions (Above 30MHz Transmitting With Tag)





## 7 RECEIVER SPURIOUS EMISSIONS

### 7.1 Test Procedure (FCC §15.109)

Measurements are made over the frequency range of 30 MHz to five times the highest frequency operating within the device. The measuring receiver meets the requirements of CISPR 16 and the measuring antenna correlates to a balanced dipole. From 30 to 1000 MHz, a quasi-peak detector was used for measurement. Above 1000 MHz average measurements were performed.

Measurements of the radiated field are made with the antenna located at a distance of 3 meters from the EUT. If the field-strength measurements at 3m cannot be made because of high ambient noise level or for other reasons, measurements may be made at a closer distance, for example 1m. An inverse proportionality factor of 20 dB per decade should be used to normalize the measured data to the specified distance for determining compliance.

The antenna is adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.

The antenna-to-EUT azimuth is varied during the measurement to find the maximum field-strength readings.

The antenna-to-EUT polarization (horizontal and vertical) is varied during the measurements to find the maximum field-strength readings.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Equipment setup for radiated disturbance tests followed the guidelines of ANSI C63.4.

### 7.2 Receiver Spurious Emissions Criteria

All testing was performed with a measurement distance of 3m and are shown in Table 7-1

*Table 7-1 Radiated Emission Limit for FCC §15.109(a)*

Frequency (MHz)	Field Strength Limits (uV/m)	Measurement Distance (Meters)	Field Strength Limits, (dB µV/m)
30 to 88	100	3	40.0
88 to 216	150	3	43.5
216 to 960	200	3	46.0
960 and up	500	3	54.0

### 7.3 Test Results

The 8000-011-001 RFID Cash Deposit Board is **compliant** with the radiated disturbance requirements of FCC §15.109 for a class B device. The table in Figure 7-1 and the graph in Figure 7-2 show that there are no emissions above the limits specified in §15.109.

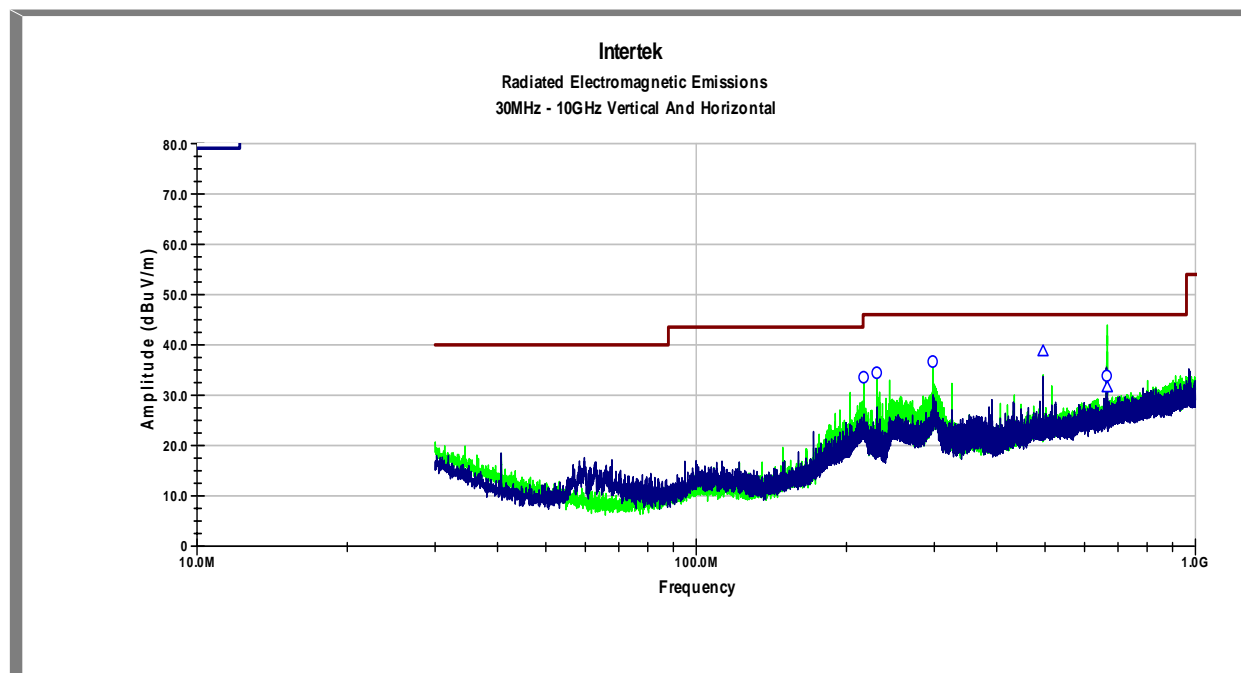
Figure 7-1: FCC §15.109 Receiver Spurious Emission (Quasi-Peak Readings)

Frequency	Polarity (H/V)	Cab. (dB)	Ant. (dB)	Corr. Reading. (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Azimuth (deg)	Tower (cm)	Results
216.96 MHz	H	1.98	11.3	33.45	46.02	-12.57	103	126	Compliant
230.51 MHz	H	2.03	11.83	34.31	46.02	-11.71	71	107	Compliant
298.31 MHz	H	2.3	13.83	36.55	46.02	-9.47	90	99	Compliant
666.25 MHz	H	3.53	20.85	33.73	46.02	-12.29	340	122	Compliant
495.25 MHz	V	3.04	17.69	38.73	46.02	-7.29	279	100	Compliant
666.2 MHz	V	3.53	19.75	31.59	46.02	-14.43	118	99	Compliant

The final quasi peak amplitude is computed from the measured receiver amplitude by adding a correction factor associated with the Antenna and cable loss as shown in the formula below.

FM = RA + CF + AF where, FM = Final Measurement, RA = Receiver Amplitude, CF = Cable Factor, and AF = Antenna Factor

Figure 7-2: FCC §15.109 Receiver Spurious Emission (Vertical and Horizontal)



## 8 POWER LINE CONDUCTED EMISSIONS

### 8.1 Test Procedure (FCC §15.207 and §15.107)

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

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

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

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

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

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

Floor standing EUTs are placed on a horizontal metal ground plane and isolated from the ground plane by 3 to 12 mm of insulating material. The metal ground plane extends at least 0.5m beyond the boundaries of the EUT and has minimum dimensions of 2m by 2m.

Equipment setup for conducted disturbance tests followed the guidelines of ANSI C63.4.

### 8.2 Power Line Conducted Emissions Criteria

The RF energy radiated back onto the public utility (AC Power Lines) shall not exceed the values in the following table when measured with the corresponding detector function.

*Table 8-1 Conducted Emission Limit for FCC §15.207(a) and §15.107(a)*

Frequency Range (MHz)	FCC Part 15.207(a) Quasi Peak Limit (dBuV)	FCC Part 15.207(a) Average Limit (dBuV)
0.15 – 0.5 MHz	66 to 56	56 to 46
0.5 – 5.0 MHz	56	46
5.0 - 30 MHz	60	50

### 8.3 Test Results

The 8000-011-001 RFID Cash Deposit Board met the power line conducted emission requirements of §15.207 and §15.107. See Figure 8-1 for tabular data with the device in transmit and receive modes. See Figure 8-2 through Figure 8-4 for graphical results of the device in transmit and receive modes. The test was performed on the AC input to the laptop computer providing the DC voltage to the 8000-011-001 RFID Cash Deposit Board.

In order to obtain these passing results, the power cables (both DC and AC) connecting to the AC power adapter for the laptop had to be fitted with ferrite beads (Fair-Rite part number 0431177081). The test results presented in the following exhibits were obtained with the ferrite beads in place.

*Figure 8-1: FCC §15.107 and §15.207 Power Line Conducted Emissions*

Operating Mode	Line	Frequency (MHz)	Quasi-Peak (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Delta (dB)	Average (dBuV)	Average Limit (dBuV)	Average Delta (dB)	Results
Tag Present	Line 1	393.0 KHz	42.61	58	-15.39	24.28	48	-23.72	Compliant
	Line 1	634.9 KHz	41.49	56	-14.51	28.61	46	-17.39	Compliant
	Line 1	13.559 MHz	46.89	60	-13.11	42.18	50	-7.82	Compliant
	Line 2	393.0 KHz	42.39	58	-15.61	24.01	48	-23.99	Compliant
	Line 2	634.9 KHz	39.91	56	-16.09	27.16	46	-18.84	Compliant
	Line 2	13.559 MHz	47.58	60	-12.42	43.2	50	-6.8	Compliant
No Tag	Line 1	402.0 KHz	45.72	57.81	-12.1	25.4	47.81	-22.42	Compliant
	Line 1	798.0 KHz	39.08	56	-16.92	25.94	46	-20.06	Compliant
	Line 1	13.559 MHz	45.01	60	-14.99	42.33	50	-7.67	Compliant
	Line 2	402.0 KHz	44.81	57.81	-13.01	24.76	47.81	-23.06	Compliant
	Line 2	798.0 KHz	37.44	56	-18.56	24.11	46	-21.89	Compliant
	Line 2	13.559 MHz	44.56	60	-15.44	41.85	50	-8.15	Compliant
Receive Mode	Line 1	150.0 KHz	47.01	66	-18.99	31.25	56	-24.75	Compliant
	Line 1	372.5 KHz	43.91	58.44	-14.54	41.63	48.44	-6.82	Compliant
	Line 1	744.0 KHz	44.13	56	-11.87	41.19	46	-4.81	Compliant
	Line 1	1.0041 MHz	41.47	56	-14.53	33.12	46	-12.88	Compliant
	Line 1	1.5967 MHz	41.31	56	-14.69	36.05	46	-9.95	Compliant
	Line 1	2.077 MHz	34.21	56	-21.79	26.84	46	-19.16	Compliant
	Line 2	150.0 KHz	44.4	66	-21.6	30.19	56	-25.81	Compliant
	Line 2	372.5 KHz	43.25	58.44	-15.2	40.88	48.44	-7.57	Compliant
	Line 2	744.0 KHz	43.98	56	-12.02	41.04	46	-4.96	Compliant
	Line 2	1.0041 MHz	41.06	56	-14.94	32.68	46	-13.32	Compliant
	Line 2	1.5967 MHz	41.75	56	-14.25	36.28	46	-9.72	Compliant
	Line 2	1.967 MHz	41.68	56	-14.32	36.52	46	-9.48	Compliant

The final quasi peak or average amplitude is computed from the measured receiver amplitude by adding a correction factor associated with the LISN and cable loss as shown in the formula below.

$$FM = RA + CF + LF \text{ where, } FM = \text{Final Measurement, } RA = \text{Receiver Amplitude, } CF = \text{Cable Factor, and } LF = \text{LISN Factor}$$

Figure 8-2: FCC §15.207 Power Line Conducted Emissions (Tag Present)

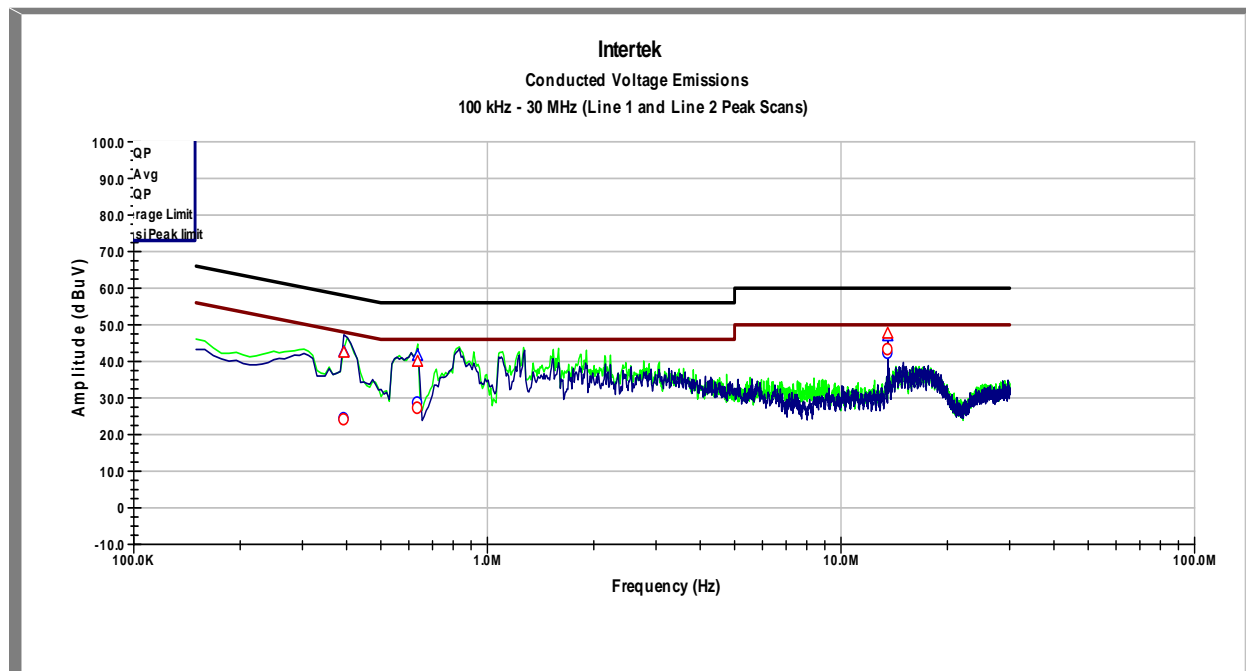


Figure 8-3: FCC §15.207 Power Line Conducted Emissions (No Tag)

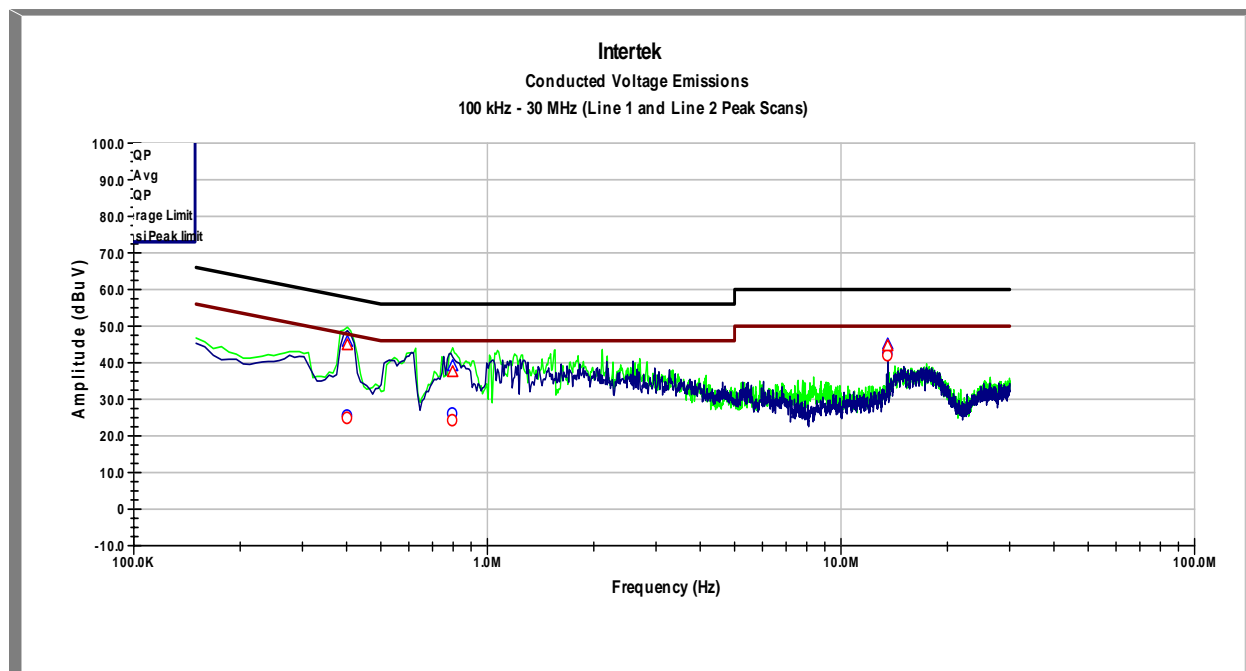
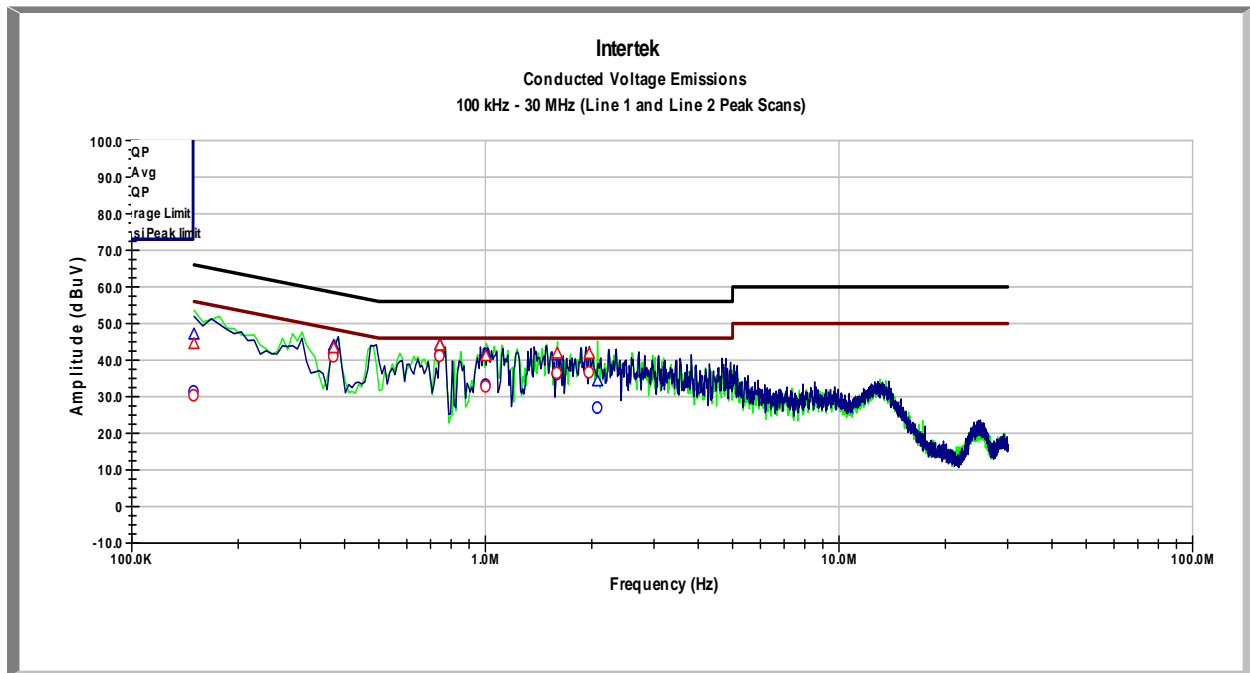


Figure 8-4: FCC §15.107 Power Line Conducted Emissions (Receive Mode)



## 9 FREQUENCY STABILITY

### 9.1 Test Procedure for FCC Rule §15.225(e)

The RFID Cash Deposit Board was placed inside an environmental chamber and connected to the laptop computer. A near field probe, also located inside the environmental chamber was used to measure the wanted signal from the RFID Cash Deposit Board. The probe was connected to a spectrum analyzer with an onboard frequency counter. The frequency was recorded at 10 degree intervals from +50C to -20C and at 85% and 115% power supply voltage.

### 9.2 Frequency Stability Criteria

§15.225 (e) The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

### 9.3 Test Results

The 8000-011-001 RFID Cash Deposit Board met the frequency stability criteria of FCC §15.225(e). The test data is shown in Table 9-1.

*Table 9-1: Frequency Stability Measurements*

Operating Frequency:		13,560,000 Hz	
Reference Voltage:		5.00 Vdc	
Deviation Limit ( $\pm 0.01\%$ ):		<b>1,356 Hz</b>	
Voltage (%)	Temp (Centigrade)	Freq. (Hz)	Freq. Dev. (Hz)
100	-20	13,559,250.6	<b>-749</b>
100	-10	13,559,289.2	<b>-711</b>
100	0	13,559,300.5	<b>-700</b>
100	10	13,559,236.4	<b>-764</b>
100	20	13,559,272.5	<b>-728</b>
85	20	13,559,259.1	<b>-741</b>
115	20	13,559,283.5	<b>-717</b>
100	25	13,559,298.3	<b>-702</b>
100	30	13,559,250.9	<b>-749</b>
100	40	13,559,238.8	<b>-761</b>
100	50	13,559,201.5	<b>-799</b>