# TEST REPORT

FROM

SIEMIC, INC.
Accessing global markets

FOR

Zebra Technologies Corp.

Thermal Card Printer

Model: P330i

TO

47 CFR 15.225:2006 & RSS-210 Issue 6:2005

Test Report Serial No.:
SL07041702-ZBR-022/P330i

This report supersedes None

| | | |
|---|---|---|
| **Remarks:** | Equipment complied with the specification | [X ] |
| | Equipment did not comply with the specification | [ ] |

**This Test Report is Issued Under the Authority of:**

Kerwinn Corpuz

.....

*Tested by: Kerwinn Corpuz, Test Engineer*

Snell Leong

.....

*Reviewed by: Snell Leong, Reviewer*

Issue date: 01 May 2007
Manufacturer: Zebra Technologies Corp.

Registration No. 783147

Industry Canada
Industrie Canada
Registration No. 4842

MIC
Lab Code: KR0032

OFTA
電訊管理局
RTA No. D23/16V

VCCI
Registration No. 2195

Lab Code : U S 0 1 6 0

BSMI Code: SL2-IN-E-I130R

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# Executive Summary

The purpose of this test programme was to demonstrate compliance of the Zebra Technologies Corp., Thermal Card Printer, model P330i against the current 47 CFR 15.225:2006 & RSS-210 Issue 6:2005. The Thermal Card Printer demonstrated compliance with the 47 CFR 15.225:2006 & RSS-210 Issue 6:2005.

Zebra Technologies Corp. is the applicant and claimed manufacturer of this tested product. For the detailed description of this product, please refer to the Thermal Card Printer User Manual.

The equipment under test operating frequency is 13.56 MHz.

Note 1: This EUT has two radios installed, one is RFID and the other is Mifare. The two radios installed will not be operating at the same time when marketed.

Note 2: Radiated emissions above 30 MHz, both RFID and Mifare was transmitting at the same time just for testing purpose.

The test has demonstrated that this unit complies with stipulated standards.

# 1 Technical Details

| | |
|---|---|
| Purpose | Compliance testing of Thermal Card Printer with 47 CFR 15.225:2006 & RSS-210 Issue 6:2005 |
| Applicant / Client | Zebra Technologies Corp.<br>333 Corporate Woods Parkway<br>Vernon Hills, IL 60061 USA |
| Manufacturer | Zebra Technologies Corp. |
| Laboratory performing the tests | SIEMIC Labs<br>2206 Ringwood Avenue<br>San Jose, CA 95131 |
| Test location(s) | SIEMIC Labs<br>2206 Ringwood Avenue<br>San Jose, CA 95131 |
| Test report reference number | SL07041702-ZBR-022/P330i |
| Date EUT received | 25 April 2007 |
| Standard applied | 47 CFR 15.225:2006 & RSS-210 Issue 6:2005 |
| Dates of test (from – to) | 25 April 2007 to 30 April 2007 |
| No of Units: | 1 |
| Equipment Category: | DXX |
| Trade/Product Name: | P330i |
| Type/Model Name/No: | P330i |
| Technical Variants: | N/A |
| FCC ID No. | I28-P330I-MIFARE |
| IC ID No. | 3798A-P330IMIF |

# 2 Tests Required

The product was tested in accordance with the following specifications.
The test results recorded in this Test Report are exclusively referred to the tested sample(s).

| Test Standard | | Description | Pass / Fail |
|---|---|---|---|
| 47 CFR Part 15.225: 2006 | RSS 210 Issue 6: 2005 | | |
| 15.203 | | Antenna Requirement | Pass |
| 15.207(a) | RSSGen(7.2.2) | Conducted Emissions Voltage | Pass |
| 15.225(a) | RSS210(A2.6) | Limit in the band of 13.553 – 13.567 MHz | Pass |
| 15.225(b) | RSS210(A2.6) | Limit in the band of 13.410 – 13.553 MHz and 13.567 – 13.710 MHz | Pass |
| 15.225(c) | RSS210(A2.6) | Limit in the band of 13.110 – 13.410 MHz and 13.710 – 14.010 MHz | Pass |
| 15.225(d) | RSS210(A2.6) | Limit outside the band of 13.110 – 14.010 MHz | Pass |
| 15.225(e) | RSS210(A2.6) | Frequency Stability | Pass |
| 15.209 | RSS210(A8.5) | Radiated Emission Limits | Pass |
| ANSI C63.4: 2003 / RSS-Gen Issue 1: 2005 | | | |

*Notes: Deviations to above standards are outlined in specific test sections if applicable.*
*Cable loss and external attenuation are compensated for in the measurement system when applicable.*

# 3 Antenna Requirement

**Requirement(s):** 47 CFR §15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna requirement must meet at least one of the following:

a) Antenna must be permanently attached to the device.

b) Antenna must use a unique type of connector to attach to the device.

c) Device must be professionally installed. Installer shall be responsible for ensuring that the correct antenna is employed with the device.

1) The RFID antenna is attached permanently to the device which meets the requirement.
2) The Mifare antenna has a unique connector and the antenna is installed inside on the chassis.

# 4 Measurements, Examinations and Derived Results

## 4.1 General observations

| Equipment serial number(s) | | |
|---|---|---|
| EUT: | Model number: | Serial number: |
| Thermal Card Printer | P330i | none |
| | | |

## 4.2 Test Results

### 4.2.1 Conducted Emissions Voltage

**Requirement(s):** 47 CFR §15.207 & RSS-Gen Issue 1(7.2.2)

**Procedures:**

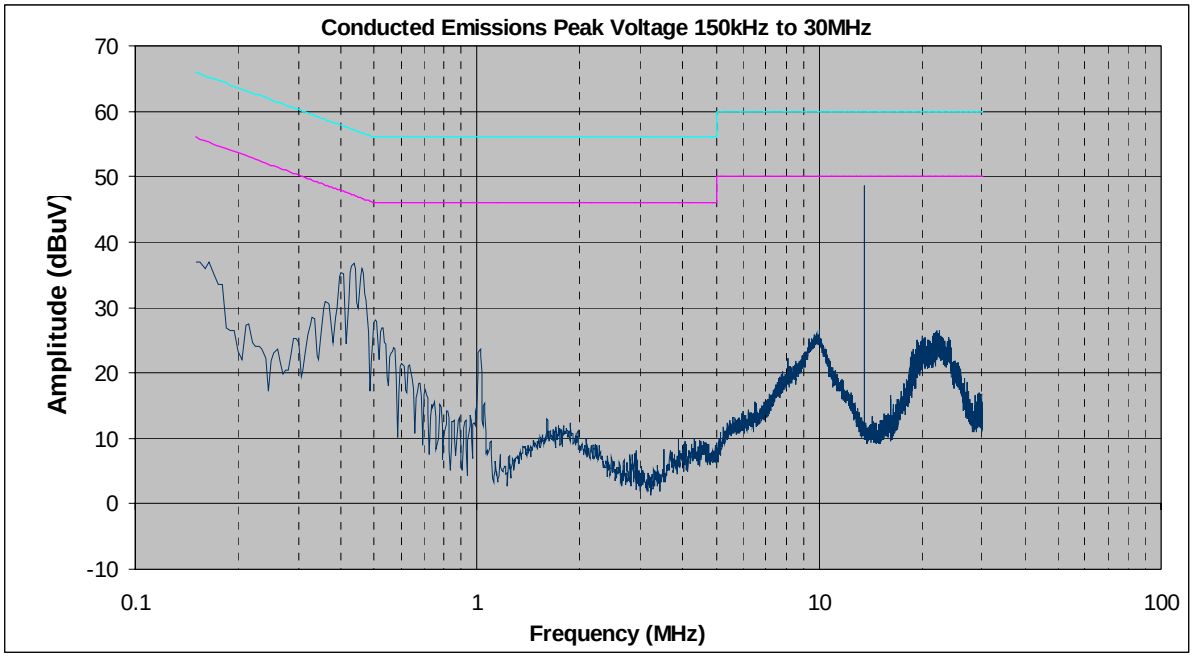
The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table. The power supply for the EUT was fed through a 50Ω/50μH EUT LISN, connected to filtered mains. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable. All other supporting equipment were powered separately from another mains.

The EUT was switched on and allowed to warm up to its normal operating condition. A scan was made on the NEUTRAL line over the required frequency range using an EMI test receiver. High peaks, relative to the limit line, were then selected. The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10kHz. Quasi-peak and Average measurements were made. The procedure was then repeated for the PHASE line.

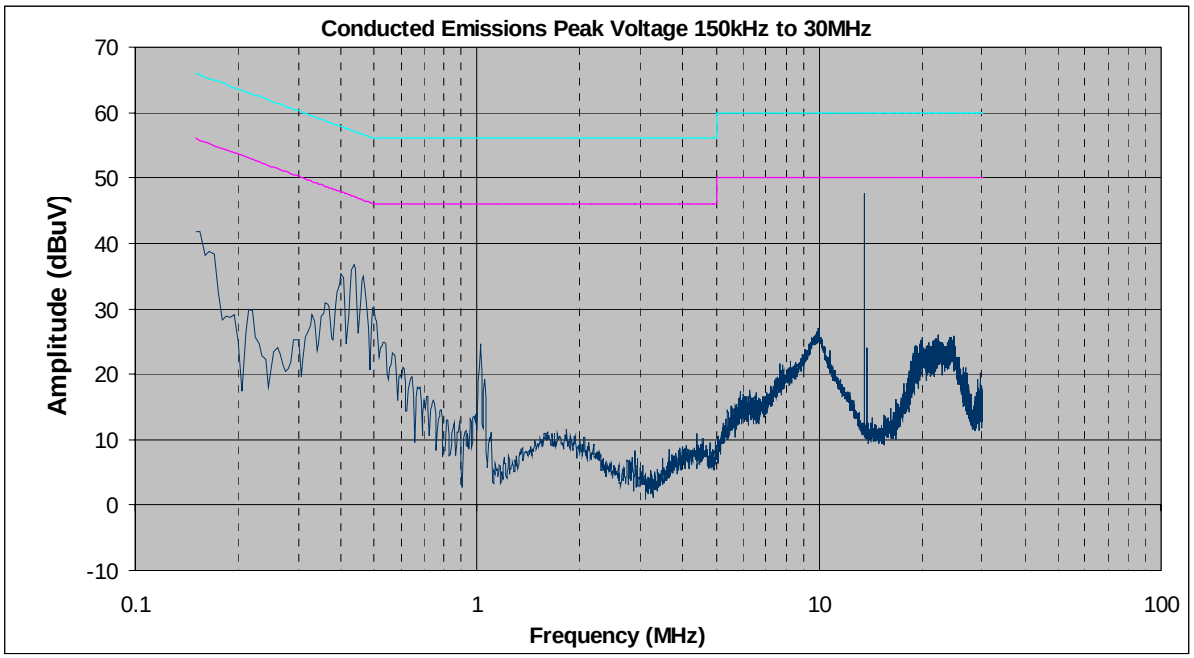
**Results:**

**Note 1: Preliminary tests made with RFID then Mifare and reported the worse case. Below result is Mifare radio.**

**Note 2:** Quasi-Peak Limit  Average Limit




**Neutral Line Plot at 120Vac, 60Hz**




**Phase Line Plot at 120Vac, 60Hz**

| LINE | FREQ (MHz) | Corrected Amplitude (dBµV) PK | Limit (dBµV) QP | Margin (dB) QP | Corrected Amplitude (dBµV) PK | Limit (dBµV) AVG | Margin (dB) AVG |
|---|---|---|---|---|---|---|---|
| Neutral | 0.435 | 35.5 | 57.16 | -21.66 | 36.1 | 47.16 | -11.06 |
| Neutral | 13.56 | 47.1 | 60 | -12.9 | 47.4 | 50 | -3 |
| Neutral | 22.77 | 27.9 | 60 | -32.1 | 25.5 | 50 | -24.5 |
| Phase | 0.44 | 38.9 | 57.06 | -18.16 | 36.0 | 47.06 | -11.06 |
| Phase | 7.895 | 21.1 | 60 | -38.9 | 21.3 | 50 | -28.7 |
| Phase | 13.56 | 31.2 | 60 | -28.8 | 30.5 | 50 | -19.5 |

**Conducted Emission Table**

***Note: PK = peak; QP = quasi-peak; AVG = average detector.***

**Tested By: Kerwinn Corpuz**

**Date Tested: 25 April 2007**

### 4.2.2 Radiated Emissions within the Band of 13.110 – 14.010 MHz

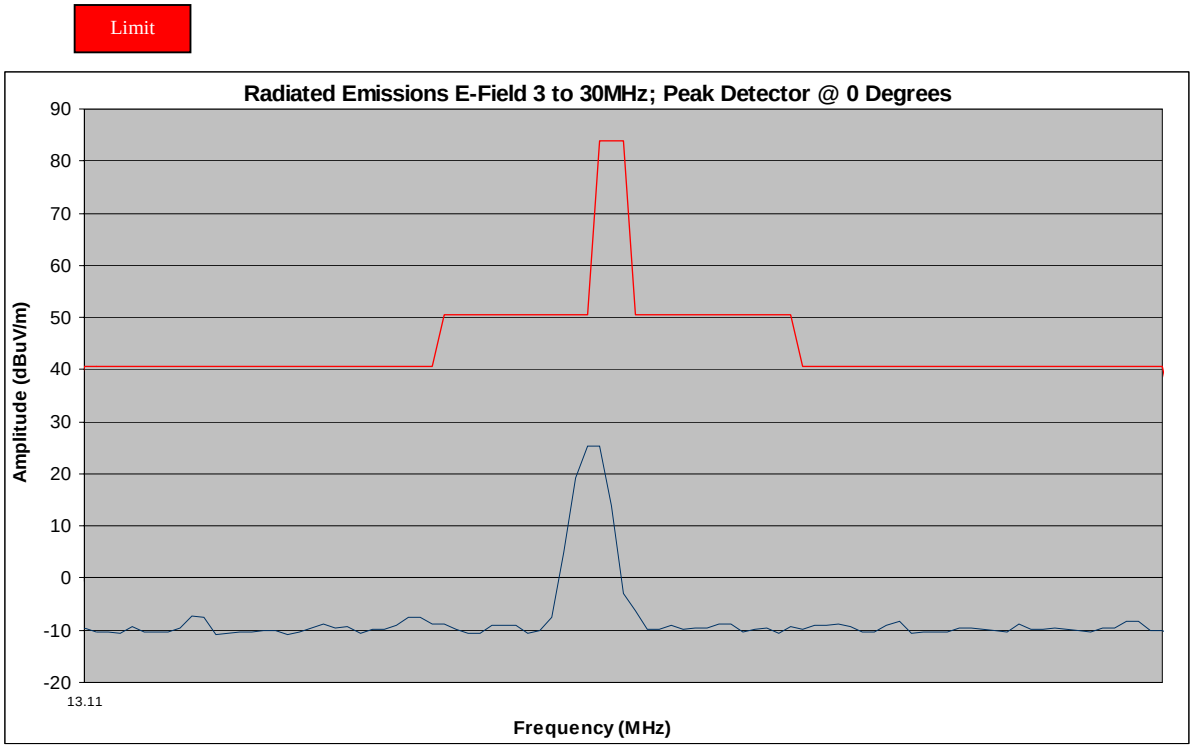
**Requirement(s):** 47 CFR §15.225(a) – (c) & RSS-210 (A2.6)

**Procedures:** Radiated emissions were measured according to ANSI C63.4. The EUT was set to transmit at the highest output power. The EUT was set 3 meter away from the measuring antenna. The loop antenna was positioned 1 meter above the ground from the center of the loop. The measuring bandwidth was set to 10 kHz.

The limit is converted from microvolts/meter to decibel microvolts/meter.

Sample Calculation: Corrected Amplitude = Raw Amplitude(dBµV/m) + ACF(dB) + Cable Loss(dB) – Distance Correction Factor

**Results:** **Loop Antenna Positioned at 0 degrees with Mifare activated.**

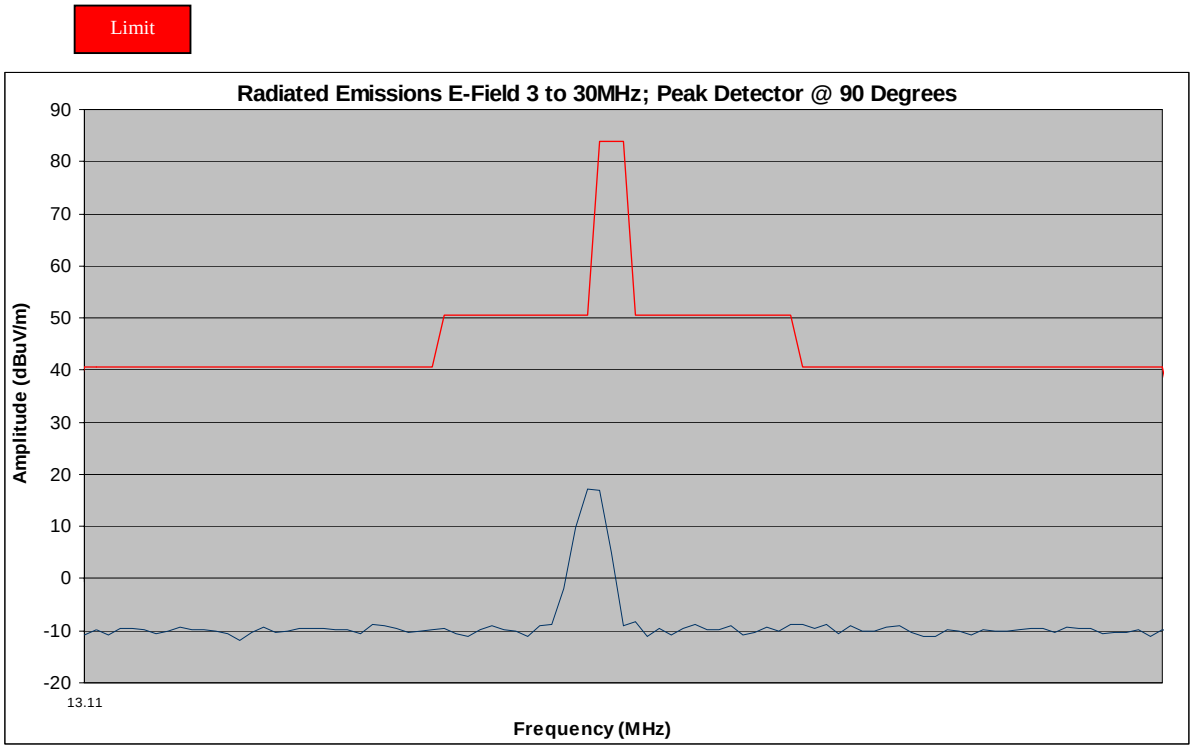



**Radiated Emissions Plot**

| Frequency | Raw Amplitude @ 3m | Antenna Factor | Cable Loss | Distance Correction Factor | Corrected Amplitude @ 3m | Limit @ 30m | Margin |
|---|---|---|---|---|---|---|---|
| (MHz) | (dBµV/m) | (dB) | (dB) | (dB) | (dBµV/m) | (dBµV/m) | (dBµV/m) |
| 13.56 | 27.5 | 35.62 | 0.28 | 40 | 23.4 | 84 | -60.6 |

**Radiated Emissions Table**

**Results:** **Loop Antenna Positioned at 90 degrees with Mifare activated.**

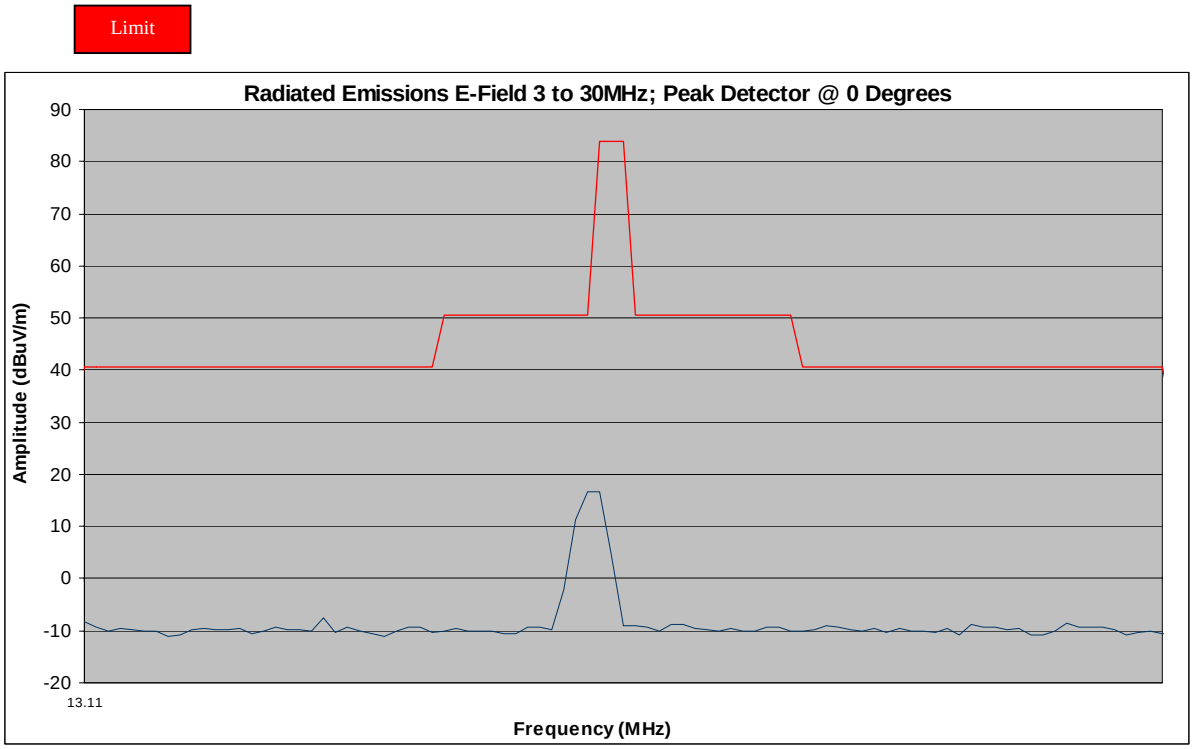



**Radiated Emissions Plot**

| Frequency | Raw Amplitude @ 3m | Antenna Factor | Cable Loss | Distance Correction Factor | Corrected Amplitude @ 3m | Limit @ 30m | Margin |
|---|---|---|---|---|---|---|---|
| (MHz) | (dBµV/m) | (dB) | (dB) | (dB) | (dBµV/m) | (dBµV/m) | (dBµV/m) |
| 13.56 | 16.9 | 35.62 | 0.28 | 40 | 12.8 | 84 | -71.2 |

**Radiated Emissions Table**

**Results:** **Loop Antenna Positioned at 0 degrees with RFID activated.**

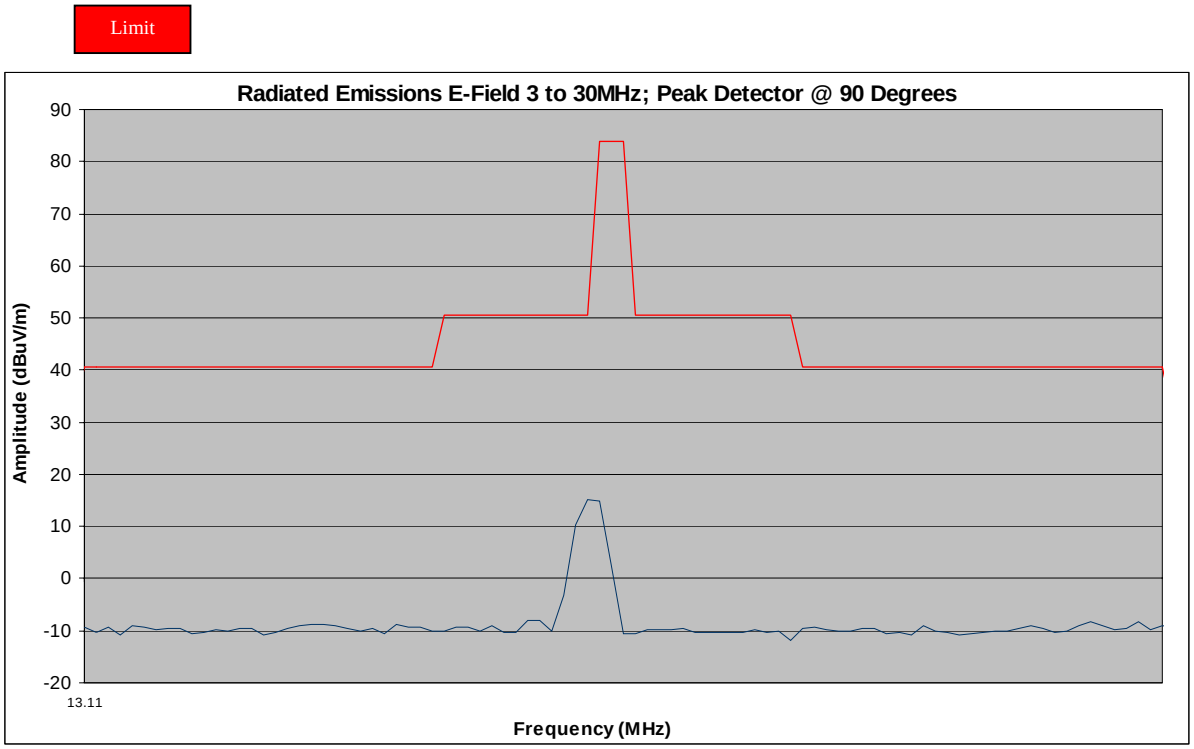



**Radiated Emissions Plot**

| Frequency | Raw Amplitude @ 3m | Antenna Factor | Cable Loss | Distance Correction Factor | Corrected Amplitude @ 3m | Limit @ 30m | Margin |
|---|---|---|---|---|---|---|---|
| (MHz) | (dBµV/m) | (dB) | (dB) | (dB) | (dBµV/m) | (dBµV/m) | (dBµV/m) |
| 13.56 | 16.6 | 35.62 | 0.28 | 40 | 12.5 | 84 | -71.5 |

**Radiated Emissions Table**

**Results:** **Loop Antenna Positioned at 90 degrees with RFID activated.**




**Radiated Emissions Plot**

| Frequency | Raw Amplitude @ 3m | Antenna Factor | Cable Loss | Distance Correction Factor | Corrected Amplitude @ 3m | Limit @ 30m | Margin |
|---|---|---|---|---|---|---|---|
| (MHz) | (dBµV/m) | (dB) | (dB) | (dB) | (dBµV/m) | (dBµV/m) | (dBµV/m) |
| 13.56 | 14.9 | 35.62 | 0.28 | 40 | 10.8 | 84 | -73.2 |

**Radiated Emissions Table**

**Tested By: Kerwinn Corpuz**

**Date Tested: 26 April 2007**

### 4.2.3 Radiated Emissions < 30 MHz (outside 13.110 – 14.010 MHz)

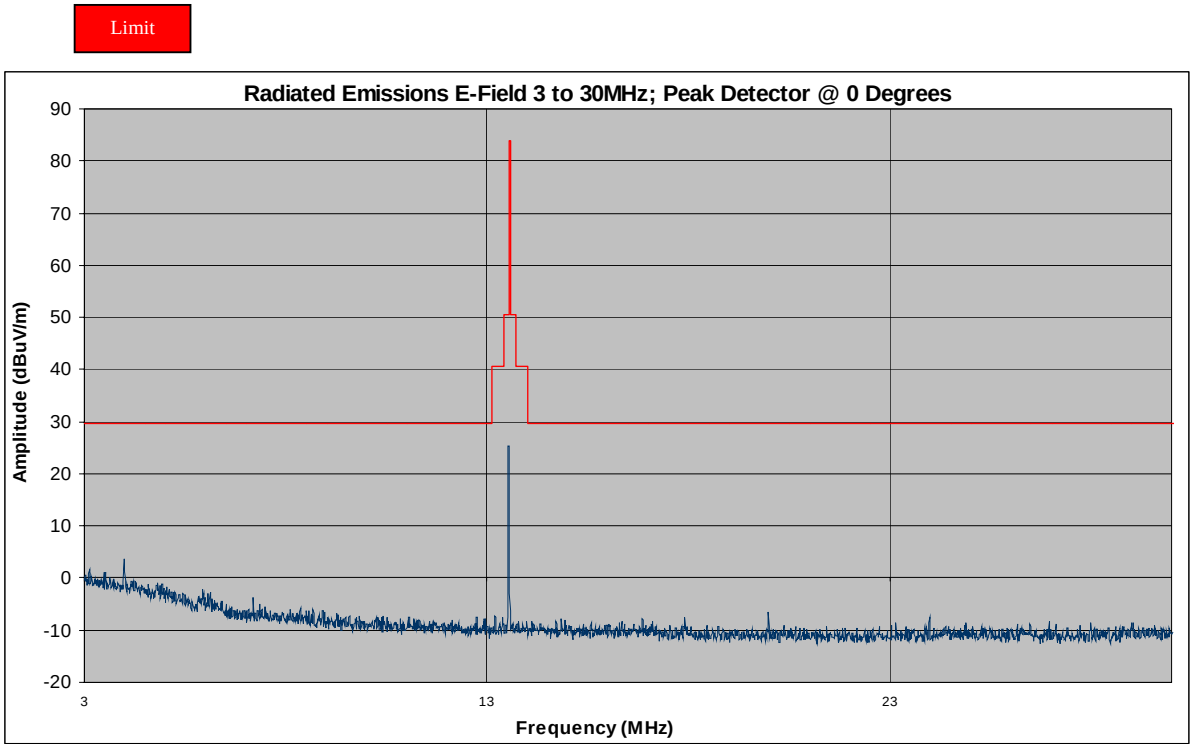
**Requirement(s):** 47 CFR §15.209; 47 CFR §15.225(d) & RSS-210 (A2.6)

**Procedures:** Radiated emissions were measured according to ANSI C63.4. The EUT was set to transmit at the highest output power. The EUT was set 3 meter away from the measuring antenna. The loop antenna was positioned 1 meter above the ground from the center of the loop. The measuring bandwidth was set to 10 kHz.

The limit is converted from microvolts/meter to decibel microvolts/meter.

Sample Calculation: Corrected Amplitude = Raw Amplitude(dBµV/m) + ACF(dB) + Cable Loss(dB) – Distance Correction Factor

**Results:** **Loop Antenna Positioned at 0 degrees with Mifare activated.**

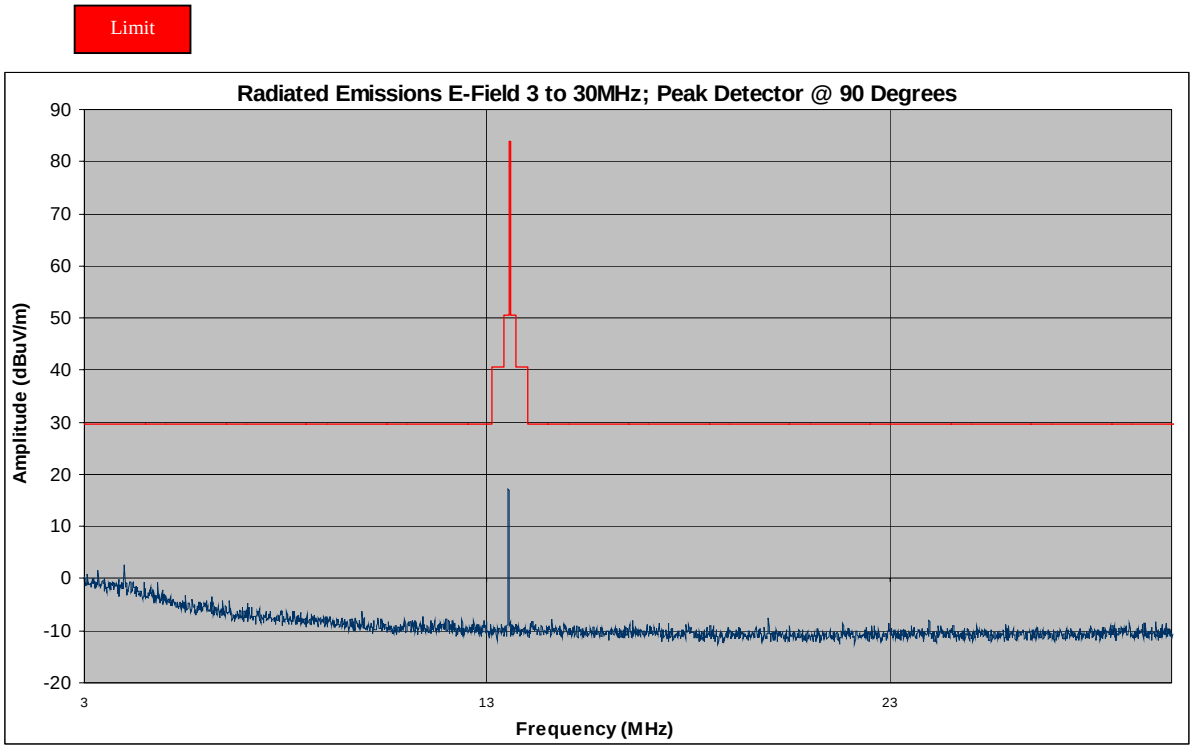



**Radiated Emissions Plot**

| Frequency | Raw Amplitude @ 3m | Antenna Factor | Cable Loss | Distance Correction Factor | Corrected Amplitude @ 3m | Limit @ 30m | Margin |
|---|---|---|---|---|---|---|---|
| (MHz) | (dBµV/m) | (dB) | (dB) | (dB) | (dBµV/m) | (dBµV/m) | (dBµV/m) |
| 3.97 | 3.72 | 44.33 | 0.24 | 40 | 8.29 | 29.54 | -21.25 |

**Radiated Emissions Table**

**Results:** **Loop Antenna Positioned at 90 degrees with Mifare activated.**

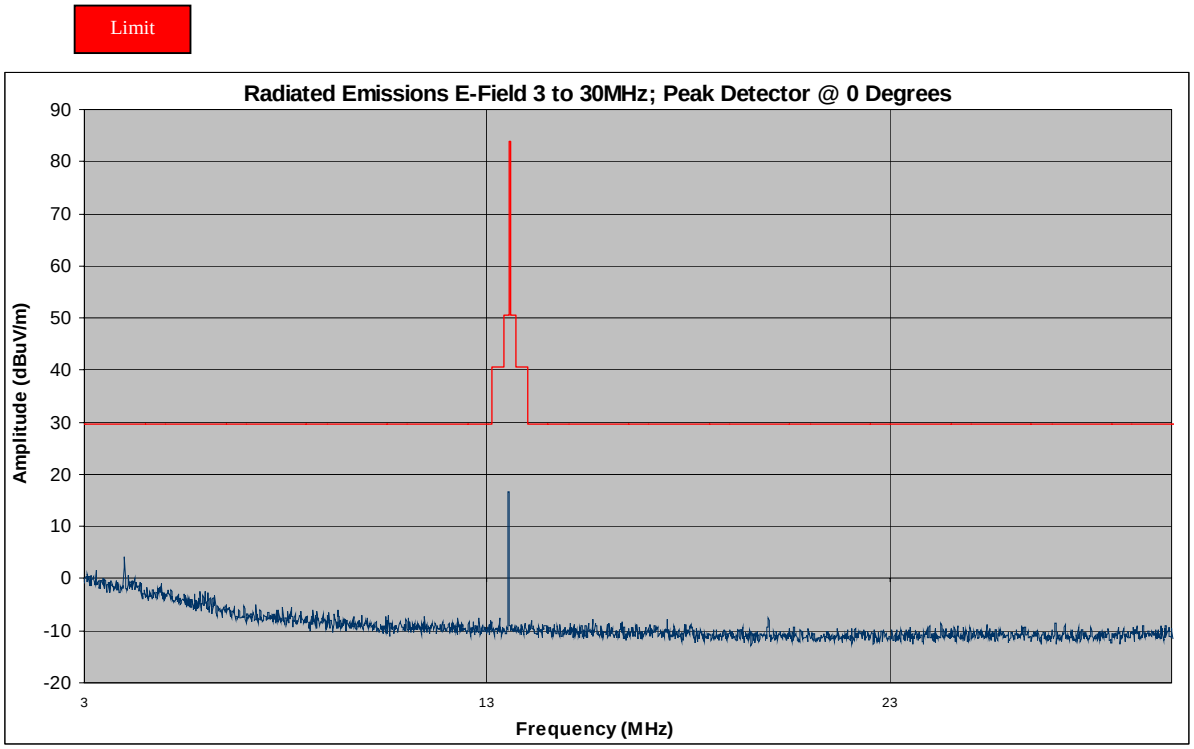



**Radiated Emissions Plot**

| Frequency | Raw Amplitude @ 3m | Antenna Factor | Cable Loss | Distance Correction Factor | Corrected Amplitude @ 3m | Limit @ 30m | Margin |
|---|---|---|---|---|---|---|---|
| (MHz) | (dBµV/m) | (dB) | (dB) | (dB) | (dBµV/m) | (dBµV/m) | (dBµV/m) |
| 3.99 | 2.5 | 44.29 | 0.24 | 40 | 7.03 | 29.54 | -22.51 |

**Radiated Emissions Table**

**Results:** **Loop Antenna Positioned at 0 degrees with RFID activated.**

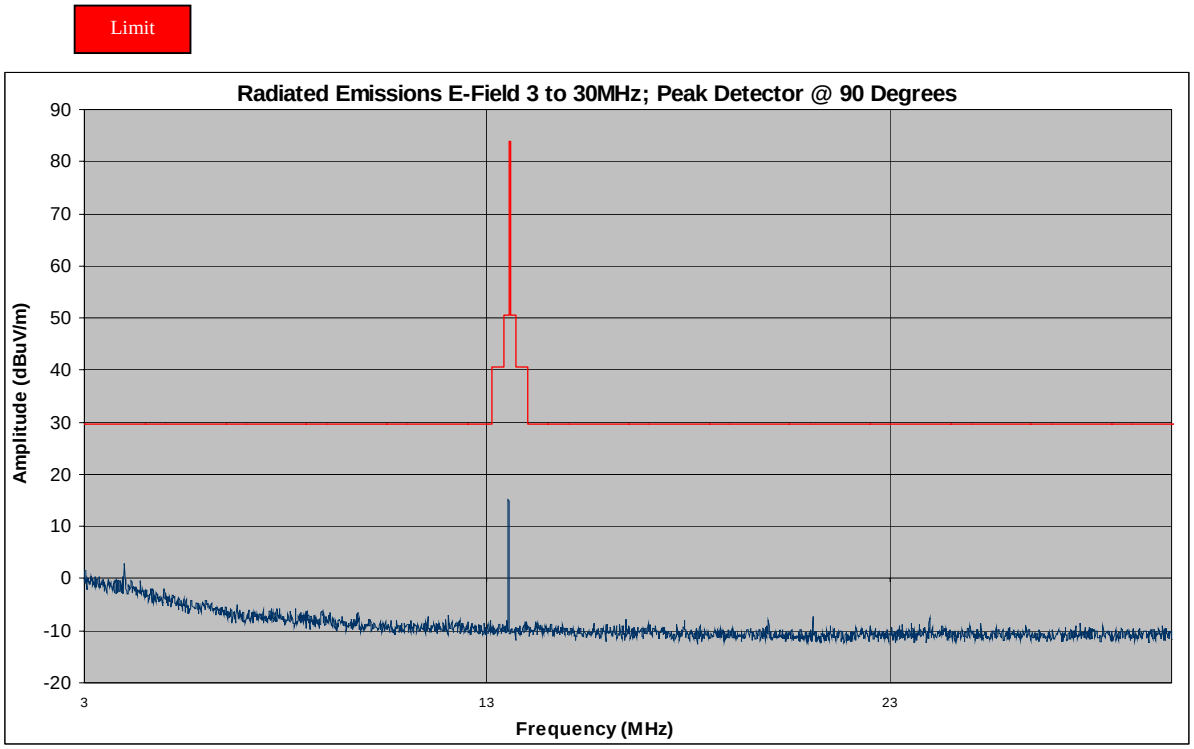



**Radiated Emissions Plot**

| Frequency | Raw Amplitude @ 3m | Antenna Factor | Cable Loss | Distance Correction Factor | Corrected Amplitude @ 3m | Limit @ 30m | Margin |
|---|---|---|---|---|---|---|---|
| (MHz) | (dBµV/m) | (dB) | (dB) | (dB) | (dBµV/m) | (dBµV/m) | (dBµV/m) |
| 3.99 | 4.1 | 44.29 | 0.24 | 40 | 8.63 | 29.54 | -20.91 |

**Radiated Emissions Table**

**Results:** **Loop Antenna Positioned at 90 degrees with RFID activated.**




**Radiated Emissions Plot**

| Frequency | Raw Amplitude @ 3m | Antenna Factor | Cable Loss | Distance Correction Factor | Corrected Amplitude @ 3m | Limit @ 30m | Margin |
|---|---|---|---|---|---|---|---|
| (MHz) | (dBµV/m) | (dB) | (dB) | (dB) | (dBµV/m) | (dBµV/m) | (dBµV/m) |
| 3.99 | 3.00 | 44.29 | 0.24 | 40 | 7.53 | 29.54 | -22.01 |

**Radiated Emissions Table**

**Tested By: Kerwinn Corpuz**

**Date Tested: 26 April 2007**

### 4.2.4 Radiated Emissions > 30 MHz

**Requirement(s):** 47 CFR §15.209; 47 CFR §15.225(d) & RSS-210 (A2.6)

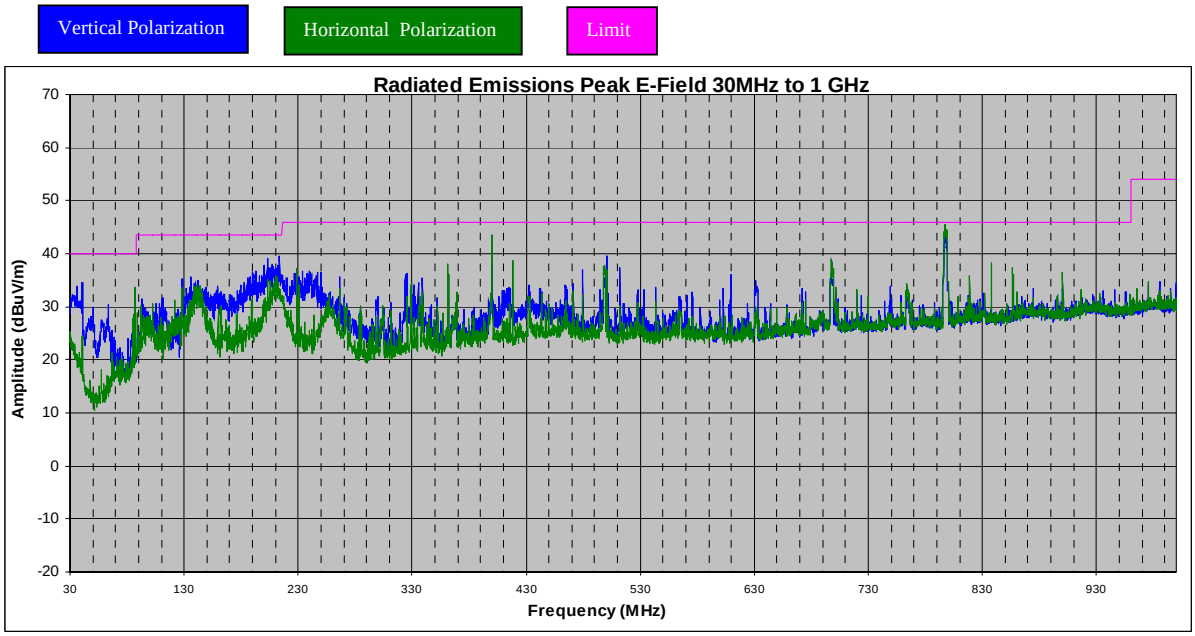
**Procedures:** Radiated emissions were measured according to ANSI C63.4. The EUT was set to transmit at the highest output power.

The limit is converted from microvolts/meter to decibel microvolts/meter.

Sample Calculation: Corrected Amplitude = Raw Amplitude(dBµV/m) + ACF(dB) + Cable Loss(dB)

**Results:**

**Note: Both RFID and Mifare are transmitting at the same time for testing purpose only.**




**Radiated Emissions Plot**

| Frequency | Azimuth | Detector | Antenna Polarization | Antenna Height | Raw Amplitude @ 3m | Antenna Factor | Cable Loss | Corrected Amplitude @ 3m | Limit @ 3m | Margin |
|---|---|---|---|---|---|---|---|---|---|---|
| (MHz) | (degrees) | (qp/pk) | (H/V) | (m) | (dBµV/m) | (dB) | (dB) | (dBµV/m) | (dBµV/m) | (dBµV/m) |
| 800.00 | 315.00 | QP | H | 2.00 | 29.55 | 8.36 | 0.80 | 38.70 | 46 | -7.30 |
| 500.00 | 135.00 | QP | H | 2.00 | 25.63 | 13.05 | 0.92 | 39.60 | 46 | -6.40 |
| 40.70 | 320.00 | QP | V | 1.50 | 19.50 | 13.20 | 1.00 | 33.70 | 40 | -6.30 |
| 145.00 | 0.00 | QP | V | 1.00 | 17.04 | 13.15 | 1.00 | 31.20 | 43.5 | -12.30 |
| 213.30 | 45.00 | QP | V | 1.00 | 28.52 | 7.59 | 0.79 | 36.90 | 43.5 | -6.60 |
| 325.6 | 46.00 | QP | V | 1.00 | 27.82 | 7.59 | 0.79 | 36.20 | 46 | -9.80 |

**Radiated Emissions Table**

**Tested By: Kerwinn Corpuz**

**Date Tested: 26 April 2007**

### 4.2.5 Frequency Stability

**Requirement(s):** 47 CFR §15.225(e) & RSS-210 (A2.6)

**Procedures:** Frequency Stability was measured according to 47 CFR §2.1055. Measurement was taken with spectrum analyzer. The spectrum analyzer bandwidth and span was set to read in hertz. A voltmeter was used to monitor when varying the voltage.

Limit: ±0.01% of 13.56 MHz = 1356 Hz

**Results: Mifare is activated**

**Frequency versus Temperature**

Reference Frequency: measured 13.559883 MHz at 20°C

| Temperature (Celsius) | Measured Freq. (MHz) | Freq. Drift (Hz) | Freq. Drift (%) |
|---|---|---|---|
| 50 | 13.559741 | -142 | -0.00105 |
| 40 | 13.559756 | -127 | -0.00094 |
| 30 | 13.559782 | -101 | -0.00074 |
| 20 | Reference | | |
| 10 | 13.559792 | -91 | -0.00067 |
| 0 | 13.559792 | -91 | -0.00067 |
| -10 | 13.559842 | -41 | -0.00030 |
| -20 | 13.559850 | -33 | -0.00024 |
| -30 | 13.559858 | -25 | -0.00018 |

**Frequency versus Voltage**

Reference Frequency: measured 13.559883 MHz at 20°C with 120 Vac / 60 Hz

| Measured Voltage ±15% of nominal (AC) | Measured Freq. (MHz) | Freq. Drift (Hz) | Freq. Drift (%) |
|---|---|---|---|
| 138 | 13.559875 | -8 | -0.00006 |
| 102 | 13.559883 | 0 | 0.00000 |

**Results: RFID is activated**

**Frequency versus Temperature**

Reference Frequency: measured 13.559083 MHz at 20°C

| Temperature (Celsius) | Measured Freq. (MHz) | Freq. Drift (Hz) | Freq. Drift (%) |
|---|---|---|---|
| 50 | 13.558975 | -108 | -0.00080 |
| 40 | 13.559008 | -75 | -0.00055 |
| 30 | 13.559025 | -58 | -0.00043 |
| 20 | Reference | | |
| 10 | 13.559025 | -58 | -0.00043 |
| 0 | 13.559017 | -66 | -0.00049 |
| -10 | 13.559217 | 134 | 0.00099 |
| -20 | 13.559325 | 242 | 0.00178 |
| -30 | 13.559217 | 134 | 0.00099 |

**Frequency versus Voltage**

Reference Frequency: measured 13.559083 MHz at 20°C with 120 Vac / 60 Hz

| Measured Voltage ±15% of nominal (AC) | Measured Freq. (MHz) | Freq. Drift (Hz) | Freq. Drift (%) |
|---|---|---|---|
| 138 | 13.559083 | 0 | 0.00000 |
| 102 | 13.559083 | 0 | 0.00000 |

**Tested By: Kerwinn Corpuz**

**Date Tested: 30 April 2007**

# 5 TEST INSTRUMENTATION

## 5.1 TEST INSTRUMENTATION

| Instrument | Manufacturer | Model | CAL Due Date |
|---|---|---|---|
| Spectrum Analyzer | HP | 8568B | 04/26/2008 |
| Quasi-Peak Adapter | HP | 85650A | 04/26/2008 |
| RF Pre-Selector | HP | 85685A | 04/26/2008 |
| Spectrum Analyzer | HP | 8564E | 05/01/2008 |
| EMI Receiver | Rohde&Schwarz | ESIB 40 | 02/07/2008 |
| Biconlog Antenna | Sunol Sciences, Inc. | JB1 | 09/11/2008 |
| Loop Antenna | ETS-Lingren | 6512 | 05/13/2008 |
| Near Field Probe | Chase | MFP9150 | See Note |
| Chamber | Lingren | 3m | 08/21/2008 |
| DMM | Fluke | 73III | 07/04/2008 |
| Variac | KRM | AEEC-2090 | See Note |
| Environment Chamber | TestEquity | 1007H | 01/24/2009 |
| DMM | Fluke | 73III | 05/01/2008 |

Note: Functional Verification

# APPENDIX A: EUT TEST CONDITIONS

The following is the description of supporting equipment and details of cables used with the EUT.

| Equipment Description (Including Brand Name) | Cable Description |
|---|---|
| Card Printer | 1. DC power |

| | | |
|---|---|---|
| EUT Description | : | Card Printer |
| Model No | : | P330i |
| Serial No | : | none |

The following is the description of how the EUT is exercised during testing.

| Test | Description Of Operation |
|---|---|
| | The EUT was set to enter test mode automatically when powered. |

# APPENDIX B: EXTERNAL PHOTOS

See Attachment

# APPENDIX C: CIRCUIT/BLOCK DIAGRAMS

See Attachment

# APPENDIX D: INTERNAL PHOTOS

See Attachment

# APPENDIX E: PRODUCT DESCRIPTION

Detail description of this product is shown in the User's Guide.

# APPENDIX F: FCC LABEL LOCATION

See Attachment

# APPENDIX G: USER MANUAL

See Attachment

# END OF REPORT