# FCC PART 15.225
# EMI MEASUREMENT AND TEST REPORT

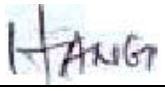
For

## Escort Memory Systems

170 Technology Circle, Scotts Valley
California, 95066

**FCC ID: E36HF-0405-XXX-01**

| **This Report Concerns:** | **Equipment Type:** |
|---|---|
| ☒ Original Report | Passive RFID Reader / Writer |

| | |
|---|---|
| **Test Engineer:** | Hang Tan  |
| **Report No.:** | R0501121 |
| **Report Date:** | 2005-02-04 |
| **Reviewed By:** | Daniel Deng  |
| **Prepared By:** | Bay Area Compliance Laboratory Corporation (BACL)<br>230 Commercial Street<br>Sunnyvale, CA 94085<br>Tel: (408) 732-9162<br>Fax: (408) 732 9164 |

## TABLE OF CONTENTS

# GENERAL INFORMATION

## Product Description for Equipment Under Test (EUT)

The *Escort Memory System*'s product, FCC ID: E36HF-0405-XXX-01 or the "EUT" as referred to in this report is a Passive RFID Reader / Writer. The EUT measures approximately 6.7cm (L) x 4.0cm (W) x 2.4cm (H).

** The test data gathered is from production samples, serial number: 99H9999, provided by the manufacturer.*

## Objective

This Type approval report is prepared on behalf of *Escort Memory Systems* in accordance with Part 2, Subpart J, and Part 15 Subpart C of the Federal Communication Commissions rules.

The objective of the manufacturer is to demonstrate compliance with FCC rules, Part 15, sec 15.35, sec 15.203, sec 15.205, sec 15.207, sec 15.209 and sec 15.225.

## Related Submittal(s)/Grant(s)

No Related Submittals.

## Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2001, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp.

## Test Facility

The Open Area Test site used by Bay Area Compliance Laboratory Corporation to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA.

Test site at Bay Area Compliance Laboratory Corporation has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the test methods and procedures set forth in ANSI C63.4-2001.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations is attached hereinafter and can also be found at
http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm

# SYSTEM TEST CONFIGURATION

## Justification

The EUT was configured for testing according to ANSI C63.4-2001.

## EUT Exercise Software

The EUT exercising program used during radiated and conducted testing was designed to exercise the various system components.

## Special Accessories

As shown in the following test setup block diagram, all interface cables used for compliance testing are shielded.

## Schematics and Block Diagram

Please refer to Appendix D.

## Equipment Modifications

No modifications were made to the EUT

## Local Support Equipment

| Manufacturer | Description | Model | Serial Number | FCC ID |
|---|---|---|---|---|
| Dell | Laptop Computer | Latitude Cpi R-series | 0002257D-38380-9AR-P0ZA | DOC |

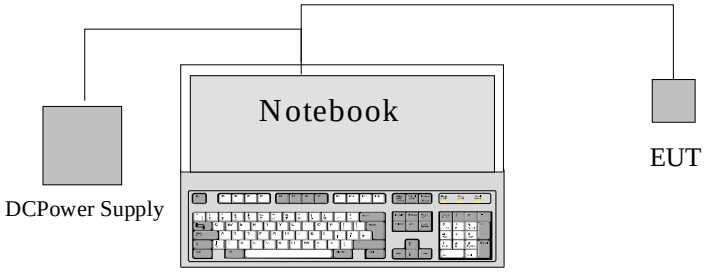
## Power Supply and Line Filters

| Manufacturer | Description | Model | Serial Number | FCC ID |
|---|---|---|---|---|
| Escort Memory Systems | 28V DC Power Supply | 00-1142 | 03G0905 | DOC |

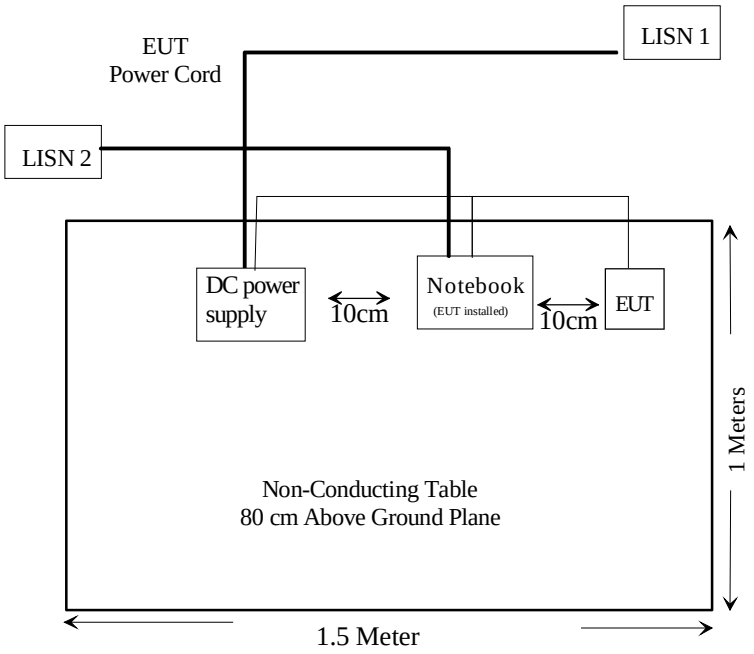
## Interface Ports and Cabling

| Manufacturer/Description | Length (M) | From | To |
|---|---|---|---|
| Shielded Cable | 2 | Serial Port / Host Laptop | EUT |
| Shielded Power Cable | 1.1 | Serial Port / Host Laptop | DC power supply |

## Test Setup Configuration




## Test Setup Block Diagram



# SUMMARY OF TEST RESULTS

| FCC RULES | DESCRIPTION OF TEST | RESULT |
|---|---|---|
| §15.203 | Antenna Requirement | Compliant |
| § 15.35<br>§ 15.205<br>§ 15.209<br>§ 15.225 | Radiated Emission | Compliant |
| § 15.207 | Conducted Emission | Compliant |
| §15.225(e) | Frequency Stability | Compliant |

# § 15.35, § 15.205, § 15.209, § 15.225 - RADIATED EMISSION TEST

## Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is ±4.0 dB.

## EUT Setup

The radiated emission tests were performed in the open area 3-meter test site, using the setup accordance with the ANSI C63.4-2001. The specification used was the FCC 15 Subpart C limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of test table and bundle when necessary.

The EUT was placed on the center of the back edge on the test table, connected to DC power supply which connected to 120Vac/60Hz power source.

## Spectrum Analyzer Setup

According to FCC Rules, 47 CFR 15.33, the EUT was tested to 1 GHz.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

| ***Frequency Range*** | ***RBW*** | ***Video B/W*** |
|---|---|---|
| Below 30MHz | 10kHz | 10kHz |
| 30 – 1000MHz | 100kHz | 100kHz |
| Above 1000MHz | 1MHz | 1MHz |

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Cal. Date |
|---|---|---|---|---|
| Agilent | Amplifier, Pre | 8447D | 2944A10187 | 2004-10-24 |
| EMCO | Antenna, Log-Periodic | 3146 | 2101 | 2004-11-08 |
| HP | Analyzer, Spectrum, RF | 8566B | 2332A02816 | 2004-08-13 |
| HP | Analyzer, Spectrum, Display | 85662A | 2318A05603 | 2004-08-13 |
| ETS | Antenna, Loop, H-Field, Passive | 6512 | 34167 | 2004-03-26 |
| HP | Adapter, Quasi-Peak | 85650A | 3107A01505 | 2004-09-30 |
| EMCO | Antenna, Biconical | 3110B | 9309-1165 | 2004-10-01 |
| HP | Plotter | 7475A | 2517A05739 | N/R |
| Sunol Sciences | System Controller | SC99V | 122303-1 | N/R |
| Rohde & Schwarz | EMI Test Receiver | ESCI | 100044 | 2004-09-29 |

* **Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

## Test Procedure

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant with all installation combination.

All data was recorded in the peak detection mode. Quasi-peak readings performed only when an emission was found to be marginal (within -4 dB of specification limitation), and are distinguished with a "**QP**" in the data table.

The EUT was operating at normal to represent worst case during final qualification test. Therefore, this configuration was used for final test data recorded in the following table of this report.

## Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. - Limit

## Summary of Test Results

According to the final data in the following table, the EUT measures within the measurement uncertainty ±4.0 dB, and had the worst margin of:

**-1.6 dB** at **352.61MHz** in the **Horizontal** polarization

**Environmental Conditions**

| | |
|---|---|
| Temperature: | 8° C |
| Relative Humidity: | 93% |
| ATM Pressure: | 1026 mbar |

*Testing was performed by Hang Tan on 2005-01-19.*

## Radiated Emissions Test Result Data @ 3M

| INDICATED | | TABLE | ANTENNA | | CORRECTION FACTOR | | | | FCC 15 SUBPART C | |
|---|---|---|---|---|---|---|---|---|---|---|
| Freq | Reading | Angle | Height | Polar | Antenna | Cable | Amp. | Correction Factor | Limit | Margin |
| MHz | dBμV | Degree | Meter | H/ V | dB | dB | dB | dBμV/m | dBμV/m | dB |
| 352.61 | 52.8 | 30 | 1.0 | h | 15.1 | 4.2 | 27.7 | 44.4 | 46.0 | -1.6 |
| 40.69 | 53.3 | 0 | 1.0 | v | 12.1 | 1.4 | 28.7 | 38.1 | 40.0 | -1.9 |
| 325.48 | 53.6 | 15 | 1.0 | h | 13.7 | 3.8 | 27.6 | 43.5 | 46.0 | -2.5 |
| 48.01 | 52.8 | 330 | 1.0 | v | 11.3 | 1.5 | 28.7 | 36.9 | 40.0 | -3.1 |
| 54.24 | 53.3 | 270 | 1.0 | v | 10.5 | 1.6 | 28.6 | 36.8 | 40.0 | -3.2 |
| 230.56 | 55.2 | 240 | 1.2 | h | 11.8 | 3.3 | 27.5 | 42.8 | 46.0 | -3.2 |
| 284.81 | 54.1 | 300 | 1.0 | h | 12.7 | 3.5 | 27.5 | 42.8 | 46.0 | -3.3 |
| 244.12 | 55.0 | 0 | 1.0 | v | 11.8 | 3.3 | 27.6 | 42.5 | 46.0 | -3.5 |
| 54.24 | 52.9 | 0 | 2.2 | h | 10.5 | 1.6 | 28.6 | 36.4 | 40.0 | -3.6 |
| 244.12 | 54.7 | 270 | 1.2 | h | 11.8 | 3.3 | 27.6 | 42.2 | 46.0 | -3.8 |
| 271.24 | 54.3 | 290 | 1.0 | h | 12.0 | 3.4 | 27.5 | 42.2 | 46.0 | -3.8 |
| 230.56 | 54.2 | 0 | 1.0 | v | 11.8 | 3.3 | 27.5 | 41.8 | 46.0 | -4.2 |
| 189.87 | 50.5 | 0 | 1.0 | v | 13.8 | 2.8 | 27.9 | 39.2 | 43.5 | -4.3 |
| 379.74 | 50.4 | 30 | 1.0 | h | 15.1 | 4.1 | 27.9 | 41.7 | 46.0 | -4.4 |
| 366.18 | 49.9 | 45 | 1.0 | h | 15.1 | 4.1 | 27.8 | 41.3 | 46.0 | -4.7 |
| 203.43 | 52.8 | 300 | 1.2 | h | 10.5 | 3.0 | 27.9 | 38.4 | 43.5 | -5.1 |
| 393.30 | 49.1 | 30 | 1.0 | h | 15.6 | 4.3 | 28.4 | 40.6 | 46.0 | -5.4 |
| 189.87 | 49.3 | 300 | 1.3 | h | 13.8 | 2.8 | 27.9 | 38.0 | 43.5 | -5.5 |
| 339.05 | 48.9 | 30 | 1.0 | h | 15.0 | 3.9 | 27.8 | 40.0 | 46.0 | -6.0 |
| 162.75 | 49.7 | 270 | 1.7 | h | 13.2 | 2.5 | 28.1 | 37.3 | 43.5 | -6.3 |
| 501.79 | 44.6 | 30 | 1.6 | v | 18.5 | 4.9 | 28.4 | 39.6 | 46.0 | -6.4 |
| 135.62 | 50.0 | 210 | 2.2 | h | 12.9 | 2.4 | 28.3 | 37.0 | 43.5 | -6.5 |
| 528.92 | 44.9 | 15 | 1.3 | v | 18.5 | 5.0 | 29.0 | 39.4 | 46.0 | -6.6 |
| 257.68 | 51.5 | 270 | 1.1 | h | 12.0 | 3.4 | 27.6 | 39.3 | 46.0 | -6.7 |
| 216.99 | 53.0 | 240 | 1.0 | h | 10.5 | 3.1 | 27.7 | 38.9 | 46.0 | -7.1 |
| 108.48 | 51.0 | 60 | 1.9 | h | 11.4 | 2.1 | 28.3 | 36.2 | 43.5 | -7.3 |
| 420.43 | 45.9 | 30 | 1.0 | h | 16.2 | 4.7 | 28.1 | 38.7 | 46.0 | -7.3 |
| 135.62 | 49.0 | 330 | 1.0 | v | 12.9 | 2.4 | 28.3 | 36.0 | 43.5 | -7.5 |
| 257.68 | 50.7 | 15 | 1.0 | v | 12.0 | 3.4 | 27.6 | 38.5 | 46.0 | -7.5 |

Table continued

| INDICATED | | TABLE | ANTENNA | | CORRECTION FACTOR | | | | FCC 15 SUBPART C | |
|---|---|---|---|---|---|---|---|---|---|---|
| Freq | Reading | Angle | Height | Polar | Antenna | Cable | Amp. | Correction Factor | Limit | Margin |
| MHz | dBμV | Degree | Meter | H/ V | dB | dB | dB | dBμV/m | dBμV/m | dB |
| 40.69 | 47.5 | 330 | 1.7 | h | 12.1 | 1.4 | 28.7 | 32.3 | 40.0 | -7.7 |
| 325.48 | 48.2 | 30 | 1.0 | v | 13.7 | 3.8 | 27.6 | 38.1 | 46.0 | -7.9 |
| 271.24 | 49.9 | 120 | 1.0 | v | 12.0 | 3.4 | 27.5 | 37.8 | 46.0 | -8.2 |
| 32.00 | 43.5 | 270 | 1.4 | v | 15.3 | 1.3 | 28.7 | 31.4 | 40.0 | -8.6 |
| 80.00 | 48.4 | 60 | 2.5 | h | 9.6 | 1.9 | 28.6 | 31.3 | 40.0 | -8.7 |
| 203.43 | 49.2 | 0 | 1.0 | v | 10.5 | 3.0 | 27.9 | 34.8 | 43.5 | -8.7 |
| 528.92 | 42.6 | 0 | 1.2 | h | 18.5 | 5.0 | 29.0 | 37.1 | 46.0 | -8.9 |
| 160.00 | 46.9 | 270 | 2.0 | h | 13.2 | 2.5 | 28.1 | 34.5 | 43.5 | -9.0 |
| 80.00 | 47.9 | 0 | 1.0 | v | 9.6 | 1.9 | 28.6 | 30.8 | 40.0 | -9.2 |
| 501.79 | 41.7 | 0 | 1.0 | h | 18.5 | 4.9 | 28.4 | 36.7 | 46.0 | -9.3 |
| 352.61 | 44.9 | 60 | 1.0 | v | 15.1 | 4.2 | 27.7 | 36.5 | 46.0 | -9.5 |
| 81.36 | 47.4 | 0 | 1.0 | v | 9.6 | 1.9 | 28.6 | 30.3 | 40.0 | -9.7 |
| 406.87 | 43.7 | 30 | 1.0 | h | 16.2 | 4.6 | 28.2 | 36.3 | 46.0 | -9.7 |
| 81.36 | 47.2 | 60 | 2.4 | h | 9.6 | 1.9 | 28.6 | 30.1 | 40.0 | -9.9 |
| 556.04 | 40.9 | 0 | 1.3 | h | 18.9 | 5.1 | 29.0 | 35.9 | 46.0 | -10.1 |
| 67.81 | 47.1 | 60 | 1.8 | h | 9.6 | 1.7 | 28.6 | 29.8 | 40.0 | -10.2 |
| 379.74 | 44.5 | 120 | 1.2 | v | 15.1 | 4.1 | 27.9 | 35.8 | 46.0 | -10.2 |
| 393.30 | 44.3 | 110 | 1.1 | v | 15.6 | 4.3 | 28.4 | 35.8 | 46.0 | -10.2 |
| 216.99 | 49.8 | 180 | 1.0 | v | 10.5 | 3.1 | 27.7 | 35.7 | 46.0 | -10.3 |
| 108.48 | 47.9 | 180 | 1.0 | v | 11.4 | 2.1 | 28.3 | 33.1 | 43.5 | -10.4 |
| 117.36 | 47.3 | 45 | 2.0 | h | 11.9 | 2.2 | 28.3 | 33.1 | 43.5 | -10.4 |
| 447.14 | 42.9 | 30 | 1.0 | h | 16.5 | 4.6 | 28.7 | 35.3 | 46.0 | -10.7 |
| 284.81 | 46.2 | 140 | 1.0 | v | 12.7 | 3.5 | 27.5 | 34.9 | 46.0 | -11.1 |
| 67.81 | 46.0 | 0 | 1.0 | v | 9.7 | 1.7 | 28.6 | 28.8 | 40.0 | -11.2 |
| 366.18 | 43.3 | 120 | 1.0 | v | 15.1 | 4.1 | 27.8 | 34.7 | 46.0 | -11.3 |
| 461.10 | 41.5 | 30 | 1.0 | h | 17.2 | 4.7 | 28.9 | 34.5 | 46.0 | -11.5 |
| 48.01 | 44.3 | 330 | 2.2 | h | 11.3 | 1.5 | 28.7 | 28.4 | 40.0 | -11.6 |
| 420.43 | 41.5 | 110 | 1.1 | v | 16.2 | 4.7 | 28.1 | 34.3 | 46.0 | -11.7 |
| 117.36 | 45.8 | 210 | 1.1 | v | 11.9 | 2.2 | 28.3 | 31.6 | 43.5 | -11.9 |
| 149.19 | 43.9 | 270 | 1.3 | h | 13.4 | 2.5 | 28.3 | 31.5 | 43.5 | -12.0 |
| 176.31 | 43.2 | 0 | 1.2 | v | 13.4 | 2.7 | 27.9 | 31.4 | 43.5 | -12.1 |
| 122.05 | 44.9 | 240 | 2.0 | h | 12.1 | 2.4 | 28.3 | 31.1 | 43.5 | -12.4 |
| 339.05 | 42.2 | 45 | 1.0 | v | 15.0 | 3.9 | 27.8 | 33.3 | 46.0 | -12.7 |
| 461.10 | 40.0 | 290 | 1.3 | v | 17.2 | 4.7 | 28.9 | 33.0 | 46.0 | -13.0 |
| 122.05 | 44.0 | 0 | 1.0 | v | 12.1 | 2.4 | 28.3 | 30.2 | 43.5 | -13.3 |
| 556.04 | 37.7 | 340 | 1.2 | v | 18.9 | 5.1 | 29.0 | 32.7 | 46.0 | -13.3 |

Table continued

| INDICATED | | TABLE | ANTENNA | | CORRECTION FACTOR | | | | FCC 15 SUBPART C | |
|---|---|---|---|---|---|---|---|---|---|---|
| Freq | Reading | Angle | Height | Polar | Antenna | Cable | Amp. | Correction Factor | Limit | Margin |
| MHz | dBμV | Degree | Meter | H/ V | dB | dB | dB | dBμV/m | dBμV/m | dB |
| 433.99 | 39.8 | 30 | 1.0 | h | 16.5 | 4.4 | 28.3 | 32.4 | 46.0 | -13.6 |
| 128.00 | 43.4 | 30 | 2.4 | h | 12.3 | 2.3 | 28.3 | 29.7 | 43.5 | -13.8 |
| 569.59 | 36.8 | 15 | 1.3 | h | 18.9 | 5.1 | 28.7 | 32.1 | 46.0 | -13.9 |
| 447.14 | 39.4 | 180 | 1.0 | v | 16.5 | 4.6 | 28.7 | 31.8 | 46.0 | -14.2 |
| 162.75 | 41.2 | 210 | 1.2 | v | 13.2 | 2.5 | 28.1 | 28.8 | 43.5 | -14.7 |
| 406.87 | 38.6 | 0 | 1.0 | v | 16.2 | 4.6 | 28.2 | 31.2 | 46.0 | -14.8 |
| 64.00 | 42.3 | 90 | 1.0 | v | 9.7 | 1.7 | 28.6 | 25.1 | 40.0 | -14.9 |
| 64.00 | 41.9 | 240 | 2.2 | h | 9.6 | 1.7 | 28.6 | 24.6 | 40.0 | -15.4 |
| 128.00 | 41.3 | 330 | 1.1 | v | 12.3 | 2.3 | 28.3 | 27.6 | 43.5 | -15.9 |
| 569.59 | 34.4 | 0 | 1.3 | v | 18.9 | 5.1 | 28.7 | 29.7 | 46.0 | -16.3 |
| 311.93 | 39.2 | 300 | 1.0 | h | 13.7 | 3.8 | 27.6 | 29.1 | 46.0 | -17.0 |
| 160.00 | 38.4 | 270 | 1.1 | v | 13.2 | 2.5 | 28.1 | 26.0 | 43.5 | -17.5 |
| 384.00 | 36.8 | 30 | 1.0 | h | 15.6 | 4.3 | 28.2 | 28.5 | 46.0 | -17.5 |
| 304.00 | 38.1 | 300 | 1.0 | h | 13.7 | 3.6 | 27.3 | 28.1 | 46.0 | -17.9 |
| 433.99 | 34.9 | 240 | 1.5 | v | 16.5 | 4.4 | 28.3 | 27.5 | 46.0 | -18.5 |
| 149.19 | 36.3 | 270 | 1.0 | v | 13.4 | 2.5 | 28.3 | 23.9 | 43.5 | -19.6 |
| 32.00 | 32.0 | 0 | 2.5 | h | 15.3 | 1.3 | 28.7 | 19.9 | 40.0 | -20.1 |
| 311.93 | 34.8 | 15 | 1.0 | v | 13.7 | 3.8 | 27.6 | 24.7 | 46.0 | -21.3 |
| 272.00 | 35.2 | 30 | 1.0 | h | 12.0 | 3.4 | 27.5 | 23.1 | 46.0 | -22.9 |
| 384.00 | 30.8 | 0 | 1.0 | v | 15.6 | 4.3 | 28.2 | 22.5 | 46.0 | -23.5 |
| 304.00 | 31.3 | 30 | 1.0 | v | 13.7 | 3.6 | 27.3 | 21.3 | 46.0 | -24.7 |
| 272.00 | 31.8 | 130 | 1.1 | v | 12.0 | 3.4 | 27.5 | 19.7 | 46.0 | -26.3 |
| 13.56 | 42.8 | 180 | 1.0 | / | 15.3 | 0.4 | 28.6 | 29.9 | 104.0 | -74.1 |

# § 15.203 – ANTENNA REQUIEMENT

## Standard Applicable

According to § 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.

Refer to statement below for compliance.

“The antenna for this device is an integral antenna that the end user cannot access. Furthermore the device is for indoor/outdoor use as detailed in the Users Manual and Operational Description”.

## Antenna Connected Construction

This device has an integral antenna; it is a permanently attached antenna.

# § 15.207 – CONDUCTED EMISSIONS TEST

## Measurement Uncertainty

All measurements involve certain levels of uncertainties. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at BACL is ±2.4 dB.

## EUT Setup

The measurement was performed in the shielded room, using the same setup per ANSI C63.4-2001 measurement procedure. The specification used was FCC 15 Class B limits.

The EUT was placed on the test table and connected to the DC power supply, which connected to 120Vac/60Hz power source.

External I/O cables were draped along the edge of the test table and bundle when necessary.

## Spectrum Analyzer Setup

The EMI test receiver was set to investigate the spectrum from 150 KHz to 30 MHz.

## Test Equipment

| Manufacturer | Description | Model | Serial Number | Cal. Date |
|---|---|---|---|---|
| Rohde & Schwarz | LISN | ESH2-Z5 | 871884/039 | 2004-08-16 |
| Rohde & Schwarz | EMI Test Receiver | ESCS30 | 100176 | 2004-09-15 |
| Fluke | Calibrated Voltmeter | 189 | 18485-38 | 2004-07-18 |

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

## Test Procedure

During the conducted emission test, the power cord of the host system was connected to the mains outlet of the LISN-1.

Maximizing procedure was performed on the six (6) highest emissions of each modes tested to ensure EUT is compliant with all installation combination.

All data was recorded in the peak detection mode. Quasi-peak readings were only performed when an emission was found to be marginal (within -4 dB of specification limits). Quasi-peak readings are distinguished with a "**Qp**".

## Summary of Test Results

According to the data in the following table, the EUT complies with the FCC 15 Class B Conducted margin for a Class B device, and these test results is deemed as satisfactory evidence of compliance with ICES-003 of the Canadian Interference-Causing Equipment Regulations, with the worst margin reading of:

**-36.0 dB** at **0.810 MHz** in the **Line** conductor

### Environmental Conditions

| | |
|---|---|
| Temperature: | 6° C |
| Relative Humidity: | 87% |
| ATM Pressure: | 1025 mbar |

*Testing was performed by Hang Tan on 2005-01-12.*

## Conducted Emissions Test Data

| LINE CONDUCTED EMISSIONS | | | | FCC 15 CLASS B | |
|---|---|---|---|---|---|
| Frequency MHz | Amplitude dBμV | Detector Qp/Ave/Peak | Phase Line/Neutral | Limit dBμV | Margin dB |
| 0.810 | 10.0 | Ave | Line | 46.0 | -36.0 |
| 0.810 | 9.1 | Ave | Neutral | 46.0 | -36.9 |
| 0.150 | 26.1 | QP | Line | 66.0 | -39.9 |
| 0.150 | 25.8 | QP | Neutral | 66.0 | -40.2 |
| 0.810 | 12.4 | QP | Line | 56.0 | -43.6 |
| 21.500 | 6.3 | Ave | Line | 50.0 | -43.7 |
| 16.000 | 6.0 | Ave | Neutral | 50.0 | -44.0 |
| 0.810 | 10.9 | QP | Neutral | 56.0 | -45.1 |
| 0.150 | 4.9 | Ave | Neutral | 56.0 | -51.1 |
| 16.000 | 7.8 | QP | Neutral | 60.0 | -52.2 |
| 21.500 | 7.7 | QP | Line | 60.0 | -52.3 |

## Plot of Conducted Emissions Test Data

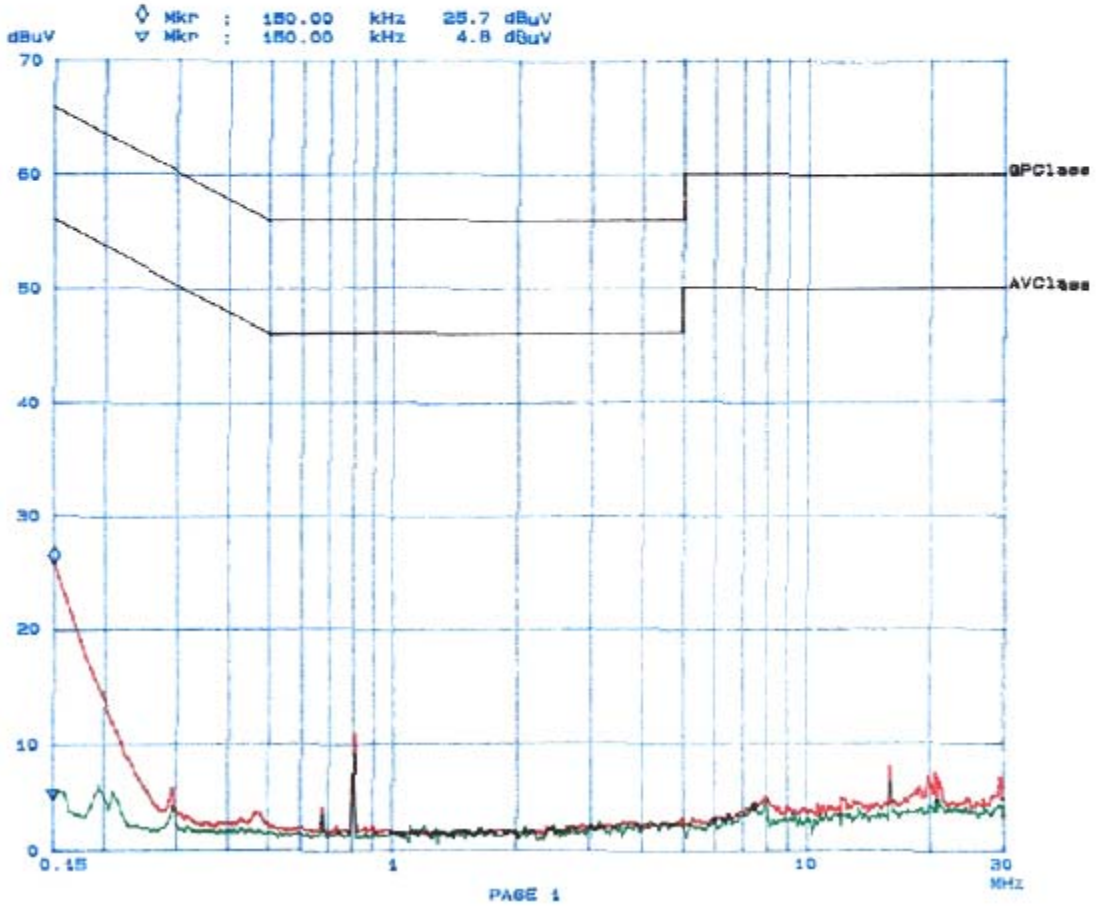
Plot(s) of Conducted Emissions Test Data is presented hereinafter as reference.

Bay Area Compliance Laboratory Corp 12. Jan 05 18:07
Class B

| | |
|---|---|
| EUT: | HF-0405-xxx-01 |
| Manuf: | Escort Memory Systems |
| Op Cond: | Normal |
| Operator: | Hang |
| Comment: | N |
| File name: | RONLE.RES |

Scan Settings (3 Ranges)

| Frequencies | | | Receiver Settings | | | | |
|---|---|---|---|---|---|---|---|
| Start | Stop | Step | IF BW | Detector | M-Time | Atten | Preamp |
| 150k | 1M | 5k | 9k | QP+AV | 20ms | 15dBLN | OFF |
| 1M | 5M | 10k | 9k | QP+AV | 1ms | 15dBLN | OFF |
| 5M | 30M | 100k | 9k | QP+AV | 1ms | 15dBLN | OFF |



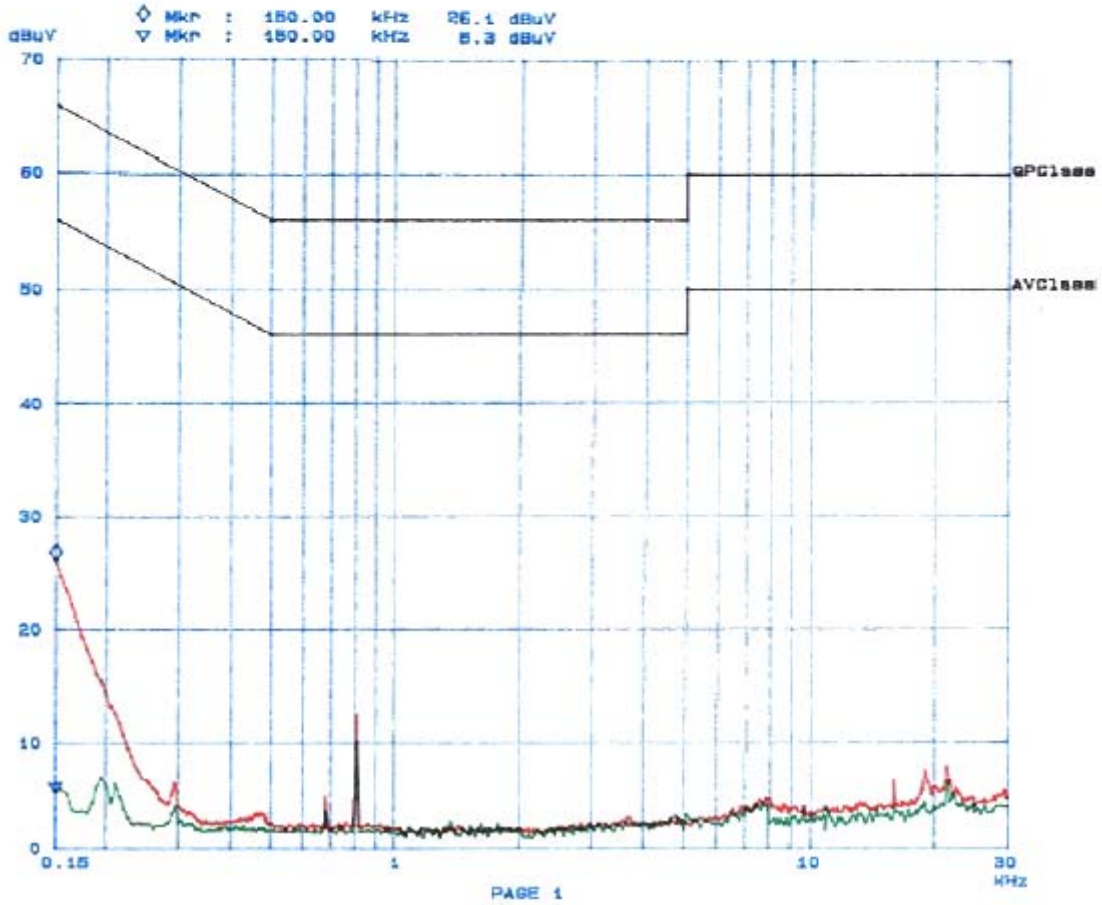
Bay Area Compliance Laboratory Corp 12. Jan 05 17:48

Class B

EUT: HF-0405-xxx-01
Manuf: Escort Memory Systems
Op Cond: Normal
Operator: Hang
Comment: L
File name: RONLE.RES

Scan Settings (3 Ranges)

| Frequencies | | | Receiver Settings | | | | |
|---|---|---|---|---|---|---|---|
| Start | Stop | Step | IF BW | Detector | M-Time | Atten | Preamp |
| 150k | 1M | 5k | 9k | QP+AV | 20ms | 15dBLN | OFF |
| 1M | 5M | 10k | 9k | QP+AV | 1ms | 15dBLN | OFF |
| 5M | 30M | 100k | 9k | QP+AV | 1ms | 15dBLN | OFF |



# § 15.225(e) - FREQUENCY STABILITY MEASUREMENT

## Standard Applicable

According to FCC §15.225(e), the frequency tolerance of the carrier signal shall be maintained within ± 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.

## Test Procedure

### Frequency stability versus environmental temperature

The equipment under test was connected to an external AC power supply and the RF output was connected to a frequency counter via feed through attenuators. The EUT was placed inside the temperature chamber.

After the temperature stabilized for approximately 20 minutes, the frequency of the output signal was recorded from the counter.

### Frequency Stability versus Input Voltage

At room temperature (25±5°C), an external variable DC power supply was connected to the EUT. The frequency of the transmitter was measured for 115%, 100% and 85% of the nominal operating input voltage.

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial No. | Calibration Date |
|---|---|---|---|---|
| HP | Spectrum Analyzer | 8568B | 2408A00105 | 2004-08-19 |
| Com-Power | Active Loop Antenna | AL-130 | 17043 | 2004-04-03 |
| Tenny | Temperature Chamber | Versa Tenna | N/A | 2004-04-23 |
| HP | Quasi Peak Adapter | 85650A | 2521A00718 | 2004-08-19 |
| HP | Spectrum Analyzer Display | 85662A | 2403A06544 | 2004-08-19 |

*** Statement of Traceability: BACL Corp**. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

## Test Results

### Environmental Conditions

| | |
|---|---|
| Temperature: | 16° C |
| Relative Humidity: | 56% |
| ATM Pressure: | 1019 mbar |

*Testing was performed by Hang Tan on 2005-02-04.*

Measured Operating Frequency (MHz): 13.561830
Normal Power Supply Voltage (V): 28VDC

Limit: +0.01% (100ppm) of the operating frequency over temperature variation of –20 °C to 50 °C at normal voltage

| Temperature | Measured Frequency | Frequency Error | |
|---|---|---|---|
| C | MHz | % | PPM |
| 50 | 13.561765 | -0.0005 | -4.8 |
| 40 | 13.561784 | -0.0003 | -3.4 |
| 30 | 13.561805 | -0.0002 | -1.8 |
| 20 | 13.561828 | 0.0000 | -0.1 |
| 10 | 13.561944 | 0.0008 | 8.4 |
| 0 | 13.562012 | 0.0013 | 13.4 |
| -10 | 13.562039 | 0.0015 | 15.4 |
| -20 | 13.562080 | 0.0018 | 18.4 |

Limit: +0.01% (100ppm) of the operating frequency over voltage variation of 85% to 115% of the rated voltage at 20 °C.

| Power Supply Voltage | 2 Minutes | | | 5 Minutes | | | 10 Minutes | | |
|---|---|---|---|---|---|---|---|---|---|
| | Measured Frequency | Frequency Error | | Measured Frequency | Frequency Error | | Measured Frequency | Frequency Error | |
| VDC | MHz | % | PPM | MHz | % | PPM | MHz | % | PPM |
| 23.8 | 13.561830 | 0.0000 | 0.0 | 13.561825 | 0.0000 | -0.4 | 13.561817 | -0.0001 | -1.0 |
| 28 | 13.561830 | 0.0000 | 0.0 | 13.561828 | 0.0000 | -0.1 | 13.561825 | 0.0000 | -0.4 |
| 32.2 | 13.561828 | 0.0000 | -0.1 | 13.561820 | -0.0001 | -0.7 | 13.561825 | 0.0000 | -0.4 |