FCC PART 15 SUBPART C

EMI MEASUREMENT AND TEST REPORT

For

Escort Memory Systems

170 Technology Circle
Scotts Valley, California 95066

FCC ID: E36M56HSAREI10100

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

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Report No.:	R0508042
Report Date:	2005-08-15
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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *Escort Memory Systems's* product, FCC ID: *E36M56HSAREI10100*, Model: *HS500E* or the "EUT" as referred to this report is a Passive RFID Reader / Writer, which measures approximately 120mmL x 100mmW x 70mmH. The EUT operates at the frequency range of 313.864– 453.333 kHz.

** The test data gathered are from typical production sample, serial number: 080405001 provided by the manufacturer.*

Objective

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

The objective is to determine compliance with FCC rules, section 15.209 rules.

Related Submittal(s)/Grant(s)

No Related Submittals.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, 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. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Test Facility

The Open Area Test site used by BACL 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 BACL 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 radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

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 can be found at http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm

SYSTEM TEST CONFIGURATION

Justification

The host system was configured for testing according to ANSI C63.4-2003.

The EUT was tested in the normal (native) operating mode to represent *worst*-case results during the final qualification test.

EUT Exercise Software

The EUT exercise program used during radiated testing was designed to exercise the system components.

Once loaded, set the Tx channel to low, mid and high for testing.

Special Accessories

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

Schematics / Block Diagram

Please refer to Appendix A.

Equipment Modifications

No modifications were made to the EUT.

Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
IBM	Laptop Computer	2628	78-GPGCZ	DOC
Escort Memory Systems	32K Byte Read/Write Tag	HS232R	05C0090	DOC
Linksys	10/100 Integrated PC Card	PCM200	A13A25503092	MQ4C2K5MX

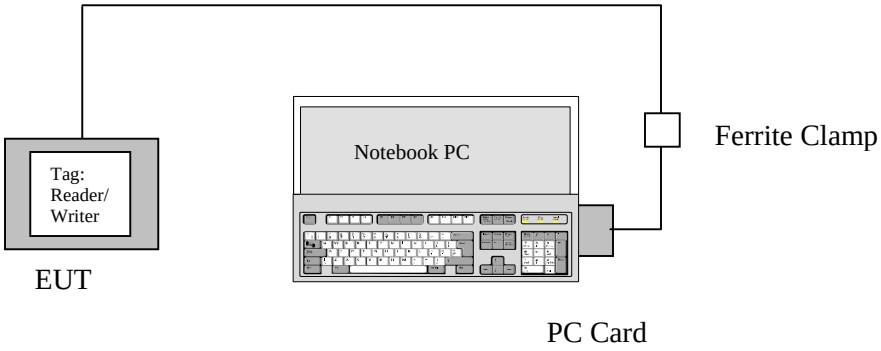
Power Supply Information

Manufacturer	Description	Model	Serial Number	FCC ID
Escort Memory Systems	24V DC Power Supply	00-1142	BETA	DOC

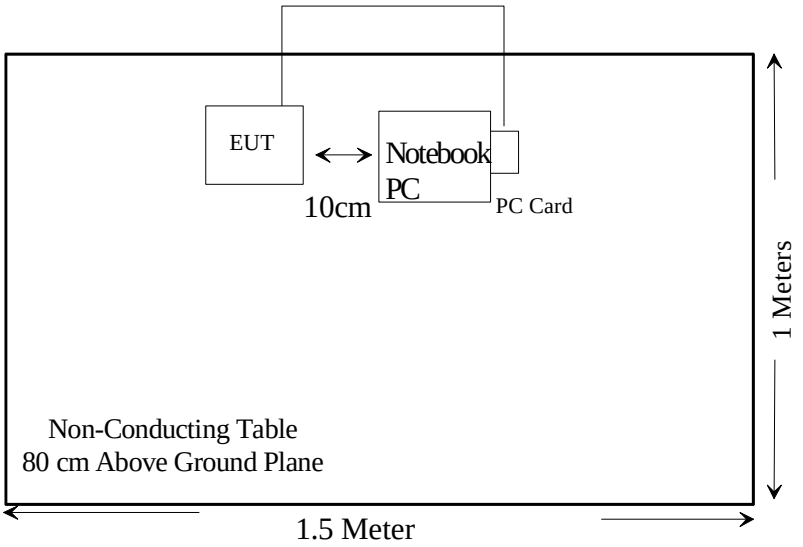
Interface Ports and Cabling

Cable Description	Length (M)	From	To
Shielded Cable	2	Serial Port / Host Laptop	10/100 Integrated PC Card
Unshielded RJ 45 Cable	1.5	RJ 45 Port/PC Card	RJ45 Port/ EUT
Shielded Power Cable	1.1	Serial Port / Host Laptop	DC power supply

Configuration of Test System



Test Setup Block Diagram



SUMMARY OF TEST RESULTS

Results reported relate only to the product tested.

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.203	Antenna Requirement	Pass
§15.205	Restricted Bands of Operation	Pass
§15.207	AC Line Conduction	N/A*
§15.209 (a)	Radiated Emission	Pass**

*: Due to the fact that the EUT does not include an AC adapter, AC Line conducted emission test is not applicable.

**: Within measurement uncertainty

§15.203 - ANTENNA REQUIREMENT

Standard Applicable

For intentional device, 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.

The antenna used with the EUT is an integral antenna.

§15.205 & §15.209 - SPURIOUS RADIATED EMISSION

Measurement Uncertainty

All measurements involve certain levels of uncertainties. 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.

According to §15.205, except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	399.9 – 410	4.5 – 5.15
[1]0.495 – 0.505	16.69475 – 16.69525	608 – 614	5.35 – 5.46
2.1735 – 2.1905	16.80425 – 16.80475	960 – 1240	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1300 – 1427	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1435 – 1626.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1645.5 – 1646.5	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1660 – 1710	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	1718.8 – 1722.2	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2200 – 2300	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2310 – 2390	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2483.5 – 2500	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	2655 – 2900	22.01 – 23.12
8.41425 – 8.41475	162.0125 – 167.17	3260 – 3267	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3332 – 3339	31.2 – 31.8
12.51975 – 12.57725	240 – 285	3345.8 – 3358	36.43 – 36.5
13.36 – 13.41	322 – 335.4	3600 – 4400	([2])

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510MHz
[2] Above 38.6

Except as provided in paragraph (d) and (e), the filed strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

According to §15.209, the device shall meet radiated emission general requirements.

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency of Emission (MHz)	Field Strength (Microvolts/meter)	Measurement Distance (Meters)
0.009-0.490	2400/F (kHz)	300
0.490-1.705	24000/F (kHz)	30
1.705-30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

EUT Setup

The radiated emission tests were performed in the open area 3-meter test site, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC 15.209 limits.

The spacing between the peripherals was 10 centimeters.

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

The EUT was connected to the power adapter which is connected with 120Vac/60Hz power source.

Spectrum Analyzer Setup

According to FCC Rules, 47 CFR, Section 15.33, the frequency was investigated from 300KHz to 1000 MHz.

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

For Average measurement: RBW = 1MHz, VBW = 10Hz (above 1000MHz)

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Amplifier, Pre (.1 ~1300MHz)	8447D	2944A10198	8/25/2004
Sunol Science	30MHz – 2 GHz Antenna	JB1	A03105-3	02/11/2005
Sunol Science	System Controller	SC99V	122303-1	N/R
Rohde & Schwarz	Receiver, EMI Test	ESCI1166.5950K03	100044	09/29/2004
ETS	Antenna, Loop, H-Field, Passive	6512	34167	5/9/2005

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

Test Procedure

For the radiated emissions test, the EUT, and all support equipment power cords was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

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

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. - FCC 15.209 Limit

Environmental Conditions

Temperature:	28°C
Relative Humidity:	53%
ATM Pressure:	1021mbr

**Testing was performed by Jerry Wang on 2005-08-04*

Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.207 and 15.209, and had the worst margin of:

-5.5 dB at **627.72 KHz**, 0.3 – 30MHz

-1.7 dB at **141.20 MHz** in the **Vertical** polarization, 30 – 1000MHz

(The test data is within the measurement uncertainty ±4.0 dB)

Radiated Emission Test Result, 0.3 – 30MHz

Frequency KHz	Reading dBuV	Direction Degree	Height Meter	Loop Antenna Factor dB	Cable loss dB	Dist Factor dB	Amplifer dB	Field Strength dBuV/m	15.209 Limit dBuV/m	15.209 Margin dB
627.72	38.6	200	1.2	50.5	5.5	-40.0	28.4	26.2	31.7	-5.5
906.66	35.1	200	1.2	47.1	6.7	-40.0	27.4	21.5	28.4	-6.9
941.59	32.1	200	1.2	47.1	7.1	-40.0	27.2	19.1	28.1	-9.0
1569.32	29.9	200	1.2	46.3	1.9	-40.0	27.1	11.0	23.7	-12.7
1359.99	30.3	200	1.2	46.3	1.3	-40.0	27.3	10.6	24.9	-14.3
1255.46	30.7	180	1.2	46.3	1.3	-40.0	27.3	11.0	25.6	-14.6
1813.32	32.1	180	1.2	46.3	1.9	-40.0	27.3	13.0	29.5	-16.5
1883.18	31.2	180	1.2	46.3	1.9	-40.0	27.6	11.8	29.5	-17.7
2719.98	32.8	180	1.2	41.0	2.4	-40.0	27.6	8.6	29.5	-20.9
2266.65	31.8	200	1.2	41.0	2.0	-40.0	27.1	7.7	29.5	-21.8
2197.05	30.6	240	1.2	41.0	2.0	-40.0	27.9	5.7	29.5	-23.8
2510.91	29.6	200	1.2	41.0	2.4	-40.0	28.0	5.0	29.5	-24.5
313.86	39.8	300	1.2	56.5	3.8	-80.0	27.5	-7.4	17.6	-25.0
2824.78	28.9	120	1.2	41.0	2.4	-40.0	28.1	4.2	29.5	-25.3
3173.31	30.6	240	1.2	38.0	2.5	-40.0	27.9	3.2	29.5	-26.3
3138.64	30.3	100	1.2	38.0	2.5	-40.0	28.3	2.5	29.5	-27.0
4533.30	31.4	100	1.2	36.3	3.1	-40.0	28.3	2.5	29.5	-27.0
3626.64	29.6	200	1.2	38.0	2.7	-40.0	28.0	2.3	29.5	-27.2
4079.97	30.5	120	1.2	36.3	2.9	-40.0	28.1	1.6	29.5	-27.9
453.33	36.2	300	1.2	54.0	4.6	-80.0	28.4	-13.6	14.5	-28.1

Radiated Emission Test Result, 30 – 1000MHz

Frequency MHz	Reading dBuV	Direction Degree	Height Meter	Polar H / V	Antenna Loss dB	Cable loss dB	Amplifer dB	Correction Factor dBuV/m	FCC 15 B Limit dBuV/m	FCC 15 B Margin dB
141.20	53.6	180	1.3	V	13.9	2.4	28.1	41.8	43.5	-1.7
498.00	48.8	200	1.2	V	18.6	4.9	28.6	43.7	46.0	-2.3
498.00	48.6	180	1.5	H	18.6	4.9	28.6	43.5	46.0	-2.5
146.65	53.2	180	1.5	H	13.1	2.5	28.0	40.8	43.5	-2.7
432.00	49.6	200	1.5	H	17.0	4.4	28.2	42.8	46.0	-3.2
141.20	52.1	200	1.5	H	13.9	2.4	28.1	40.3	43.5	-3.2
162.50	53.1	180	1.5	H	12.7	2.5	28.0	40.3	43.5	-3.2
194.00	53.6	180	1.5	H	11.5	2.9	27.7	40.3	43.5	-3.2
297.80	52.3	170	1.2	V	14.1	3.7	27.4	42.7	46.0	-3.3
172.60	52.6	180	1.5	H	12.1	2.8	27.8	39.7	43.5	-3.8
74.70	54.2	200	1.5	H	8.5	1.8	28.4	36.1	40.0	-3.9
194.00	52.8	200	1.2	V	11.5	2.9	27.7	39.5	43.5	-4.0
432.00	48.7	220	1.2	V	17.0	4.4	28.2	41.9	46.0	-4.1
210.00	52.6	200	1.5	H	11.4	3.0	27.7	39.3	43.5	-4.2
232.70	52.9	200	1.5	H	11.9	3.3	27.6	40.5	46.0	-5.5
64.80	53.4	180	1.5	H	7.9	1.7	28.5	34.5	40.0	-5.5
128.00	48.7	200	1.5	H	14.5	2.3	28.2	37.3	43.5	-6.2
192.00	49.4	200	1.2	V	11.5	2.9	27.7	36.1	43.5	-7.4
248.83	49.8	200	1.2	V	12.5	3.4	27.5	38.2	46.0	-7.8
86.30	49.9	200	1.5	H	8.4	2.0	28.5	31.8	40.0	-8.2
192.00	48.3	180	1.5	H	11.5	2.9	27.7	35.0	43.5	-8.5
384.00	45.2	180	1.2	V	16.0	4.3	28.0	37.5	46.0	-8.5
248.83	48.6	200	1.5	H	12.5	3.4	27.5	37.0	46.0	-9.0
576.00	39.7	180	1.2	H	19.2	5.2	28.7	35.4	46.0	-10.6
416.00	42.3	180	1.2	V	16.8	4.4	28.1	35.4	46.0	-10.6
576.00	39.5	200	1.2	V	19.2	5.2	28.7	35.2	46.0	-10.8
480.00	40.7	200	1.5	H	18.0	4.8	28.6	34.9	46.0	-11.1
172.60	45.3	300	1.2	V	12.1	2.8	27.8	32.4	43.5	-11.1
288.00	43.7	200	1.2	V	13.9	3.6	27.4	33.8	46.0	-12.2
256.00	44.7	200	1.5	H	12.4	3.4	27.4	33.1	46.0	-12.9
256.00	44.2	180	1.2	V	12.4	3.4	27.4	32.6	46.0	-13.4
288.00	42.1	180	1.5	H	13.9	3.6	27.4	32.2	46.0	-13.8

No detectable emission above 1000MHz Test at 3 M