

DATE: 26 December 2006

I.T.L. (PRODUCT TESTING) LTD.

FCC EMC/Radio Test

for

AeroScout Ltd.

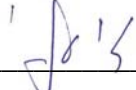
Equipment under test:

Exciter

EX-3200

Written by: 
D. Shidlow, Documentation

Approved by: 
Y. Mordukhovitch, Test Engineer

Approved by: 
I. Raz, EMC Laboratory Manager

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This report relates only to items tested.



Measurement/Technical Report for AeroScout Ltd.

Exciter

EX-3200

FCC ID:Q3H EX3200

26 December 2006

This report concerns: Original Grant Class II change

Class B verification Class A verification Class I change

Equipment type: Low Power Transmitter Below 1705kHz

Request Issue of Grant:

Immediately upon completion of review

Limits used:

CISPR 22 Part 15

Measurement procedure used is ANSI C63.4-2003.

Application for Certification

prepared by:

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Applicant for this device:

(different from "prepared by")

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1. General Information

1.1 Administrative Information

Manufacturer: AeroScout Ltd.

Manufacturer's Address: 10 Oppenheimer St. Park Tamar
Rehovot 76701
Israel
Tel: +972-8-9363136
Fax: +972-8-9365977

Manufacturer's Representative: Reuven Amsalem
Leonid Gnusin

Equipment Under Test (E.U.T): Exciter

Equipment Model No.: EX-3200

Equipment Serial No.: Not Designated

Date of Receipt of E.U.T: 23.10.06

Start of Test: 23.10.06

End of Test: 13.11.06

Test Laboratory Location: I.T.L (Product Testing) Ltd.
Kfar Bin Nun,
ISRAEL 99780

Test Specifications: FCC Part 15, Sub-part B,
Sub-part C
Sections: 15.207, 15.209



1.2 List of Accreditations

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), Registration No. 90715.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-1350, R-1285.
5. Industry Canada (Canada), File No. IC 4025.
6. TUV Product Services, England, ASLLAS No. 97201.
7. Nemko (Norway), Authorization No. ELA 207.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

1.3 Product Description

The AeroScout EX3200 Exciter is a component of the AeroScout suite of enterprise visibility solutions that enables location-based applications.

The EX3200 Exciter extends the AeroScout suite to provide robust and sophisticated RFID detection capabilities, using the same AeroScout tags that can also be accurately located in real time by the AeroScout system.

The EX3200 Exciter triggers AeroScout's tags in range, and those transmit a message to AeroScout Location Receivers or compatible Access Points.

This provides instant acknowledgment that a tagged asset was present in a well defined area. The detection and programming capabilities of the Exciter, combined with the location features of the AeroScout Visibility System, make the AeroScout suite the most sophisticated enterprise visibility solution for a wide variety of industries. The EX3200 Exciter can be utilized in one of the following ways:

1. Standalone: The EX3200 Exciter can trigger Tags located within a spherical area around it.
2. Chained: Several EX3200 Exciters can be used to cover a larger area and to operate as a single entity. Such a chain has a Controller Unit as its "master" and several EX3200 Exciters as "slaves", chained to one another.

1.4 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4: 2003. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 Test Facility

The radiated emissions tests were performed at I.T.L.'s testing facility at Kfar Bin-Nun, Israel. This site is a FCC listed test laboratory (FCC Registration No. 90715, date of listing August 22, 2006).

I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

1.6 Measurement Uncertainty

Radiated Emission

The Open Site complies with the ± 4 dB Normalized Site Attenuation requirements of ANSI C63.4-2003. In accordance with Paragraph 5.4.6.1 of this standard, this tolerance includes instrumentation calibration errors, measurement technique errors, and errors due to site anomalies.

2. Product Labeling



Label Dimension: 50x60 mm

Figure 1. FCC Label

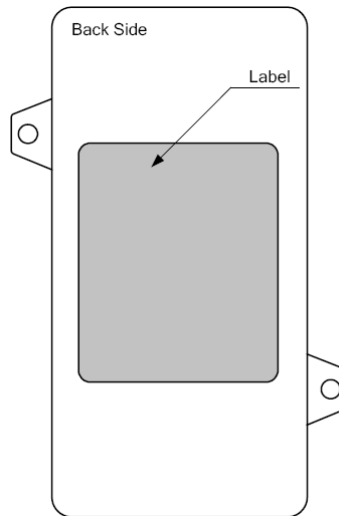


Figure 2. Location of Label on EUT

3. System Test Configuration

3.1 *Justification*

The E.U.T. is a fixed wall or ceiling mounted unit.

To determine the E.U.T. orientation for the spurious radiated emissions test, the product carrier field level was measured in three orthogonal directions of the E.U.T. The vertical position was selected as the worst case final orientation position.

The typical operation of the Exciter (as a customer would normally use) is that the Exciter is used as a beacon, which is programmed to transmit a specific message in a preprogrammed interval (10 msec – 2 sec).

In the test configuration the Exciter was programmed to the lowest transmission interval of 10 msec and maximum transmission power, which is the worst case operating mode of the Exciter.

3.2 *EUT Exercise Software*

The Exciter SW supports two modes of operation:

- 1) Continues 125 KHz carrier transmitting (used only in test mode).
- 2) Transmitting of 125 kHz ASK modulated signal.

The Exciter was configured to send an “Exciter ID” messages with a 10ms TX interval for maximum transmission power.

3.3 *Special Accessories*

No special accessories were needed to achieve compliance.

3.4 *Equipment Modifications*

No equipment modifications are required and none have been made.

3.5 Configuration of Tested System

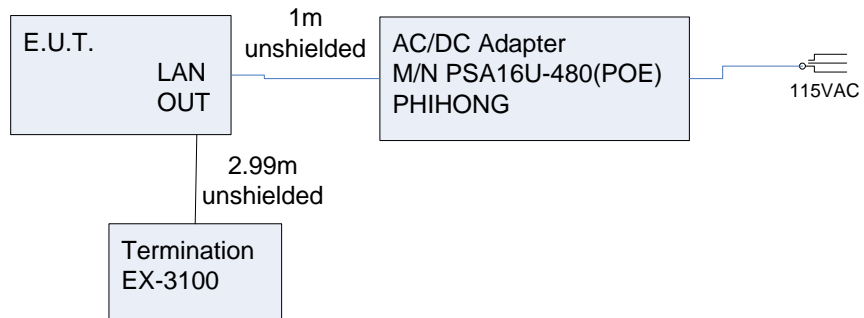


Figure 3. Configuration of Tested System

4. Block Diagram

4.1 *Schematic Block/Connection Diagram*

Withheld for reasons of confidentiality

4.2 *Theory of Operation*

The Exciter is a 125 kHz transmitter, powered from 230VAC. The Exciter can be connected to another Exciter for chaining or programming or can act as standalone Exciter with no connection to the server.

The Exciter is a 125 kHz ASK modulated beacon, which transmits the same message in a preprogrammed transmission interval. The messages transmitted by Exciter cause the AeroScout Tag to wakeup and transmit a reply message to the AeroScout location receivers.

5. Conducted and Radiated Measurement Photos



Figure 4. Conducted Emission Test Front



Figure 5. Conducted Emission Test Side



Figure 6. Radiated Emission Test Front

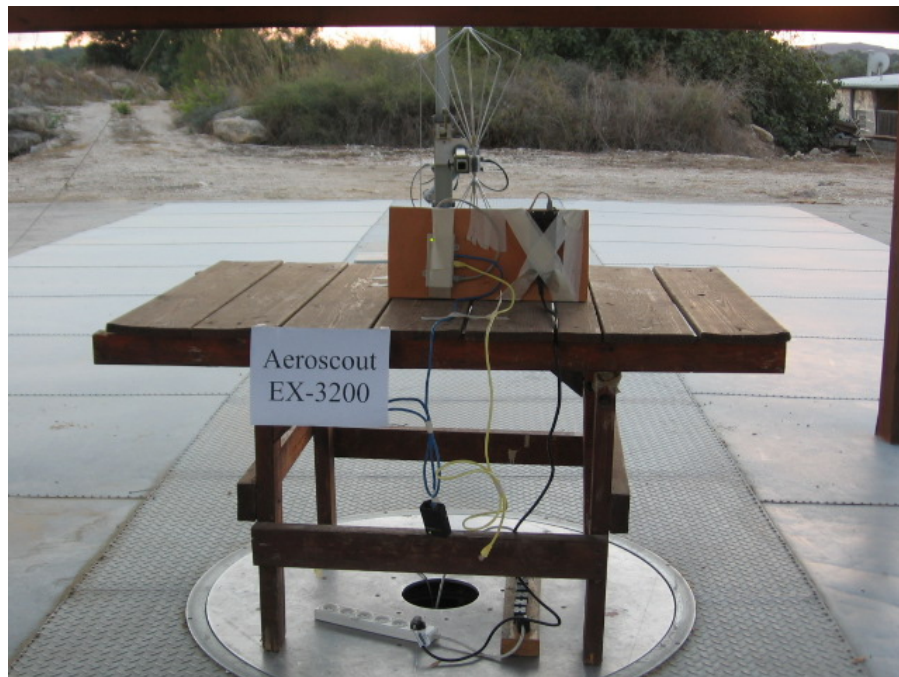


Figure 7. Radiated Emission Front



Figure 8. Radiated Emission Test Side

6. Conducted Emission Data

6.1 Test Specification

F.C.C., Part 15, Subpart B, Class B

6.2 Test Procedure

The E.U.T operation mode and test set-up are as described in Section 3.1. In order to minimize background noise interference, the conducted emission testing was performed inside a shielded room (see section 3), with the E.U.T placed on an 0.8 meter high wooden table, 0.4 meter from the room's vertical wall.

The E.U.T was powered from 115 V AC / 60 Hz – 5 VDC adapter via 50 Ohm / 50 μ Hn Line Impedance Stabilization Network (LISN) on the phase and neutral lines. The LISN's were grounded to the shielded room ground plane (floor), and were kept at least 0.8 meters from the nearest boundary of the E.U.T

The center of the E.U.T AC cable was folded back and forth, in order to form a bundle less than 0.40 meters and a total cable length of 1 meter.

The emission voltages at the LISN's outputs were measured using a computerized receiver, complying with CISPR 16 requirements. The specification limits are loaded to the receiver via a 3.5" floppy disk and are displayed on the receiver's spectrum display.

A frequency scan between 0.15 and 30 MHz was performed at 9 kHz I.F. band width, and using peak detection.

The spectral components having the highest level on each line were measured using a quasi-peak and average detector.

6.3 Measured Data

JUDGEMENT: Passed by 13.4 dB

The margin between the emission levels and the specification limit is, in the worst case, 13.4 dB for the phase line at 0.15 MHz and 13.9 dB at 0.15 MHz for the neutral line.

The EUT met the F.C.C. Part 15, Subpart B, Sub-part B specification requirements.

The details of the highest emissions are given in *Figure 9* to *Figure 14*.

TEST PERSONNEL:

Tester Signature: 

Date: 26.12.06

Typed/Printed Name: Y. Mordukhovitch


Conducted Emission

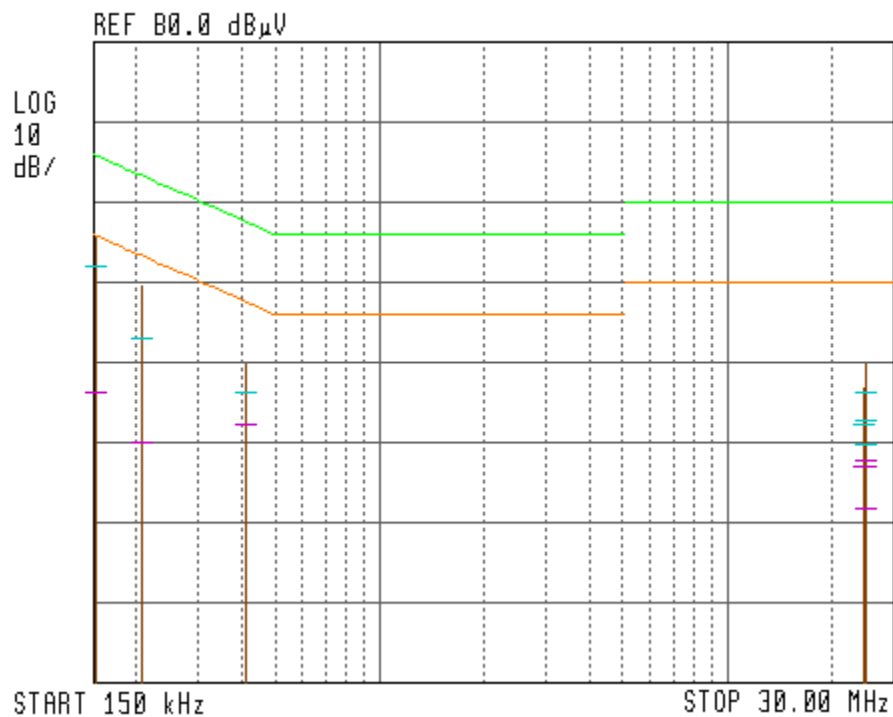
E.U.T Description Exciter
 Type EX-3200
 Serial Number: Not Designated

Specification: F.C.C., Part 15, Subpart B,
 Class B

Lead: Neutral

Detectors: Peak, Quasi-peak, Average

 14:53:36 OCT 25, 2006



**Figure 14 Conducted Emission: NEUTRAL
 Detectors: Peak, Quasi-peak, Average**

Notes:

1. Horizontal axis shows logarithmic frequency scale.
2. The vertical axis shows amplitude (in dB μV).
3. Peak detection is designated by the top of each vertical line.
4. Quasi-peak detection is designated by the first dash mark (from the top) of each vertical line.
5. Average detection is designated by the second dash mark (from the top) of each vertical line.

6.4 Test Instrumentation Used, Conducted Measurement

Instrument	Manufacturer	Model	Serial No.	Calibration	Period
LISN	Fischer	FCC-LISN-2A	127	March 20, 2006	1 year
LISN	Fischer	FCC-LISN-2A	128	March 20, 2006	1 year
Receiver	HP	85420E/85422E	3427A00103/34	March 22, 2006	1 year
Printer	HP	ThinkJet2225	2738508357	N/A	N/A

7. Radiated Emission, 9 kHz – 30 MHz

7.1 Test Specification

9 kHz-30 MHz, FCC, Part 15, Subpart C, Section 209

7.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 3.1.

The frequency range 9 kHz-30 MHz was scanned.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 9 kHz-30MHz, the loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter at a distance of 3 meters.

The E.U.T. was operated at the frequency of 125 kHz. This frequency was measured using a peak detector.

7.3 Measured Data

JUDGEMENT: Passed by 18.2 dB

The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 209 specification.

The margin between the emission level and the specification limit is 18.2 dB in the worst case at the frequency of 0.125 MHz.

See details in *Figure 15* to *Figure 16*.

TEST PERSONNEL:

Tester Signature:  Date: 26.12.06

Typed/Printed Name: Y. Mordukhovitch

Radiated Emission, 9 kHz-30 MHz

E.U.T Description Exciter
 Type EX-3200
 Serial Number: Not Designated

Specification: FCC Part 15, Subpart C, Section 209

Frequency range: 9 kHz to 30 MHz

Antenna: 3 meters distance

Detectors: Peak, Average

Frequency (MHz)	Peak Amp (dBμV/m)	Average Amp (dBμV/m)	Correction (dB)	Average Specification (dBμV/m)	Margin (dB)
0.125	96.5	87.0	11.5	105.2	-18.2
0.250	64.0	52.8	11.6	99.6	-46.8
0.375	66.0	51.7	11.6	96.1	-44.4

Figure 15. Radiated Emission. Detectors: Peak, Quasi-peak

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Radiated Emission, 9 kHz-30 MHz

15:11:46 OCT 24, 2006

ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR 124.92 kHz
 96.50 dB μ V/m

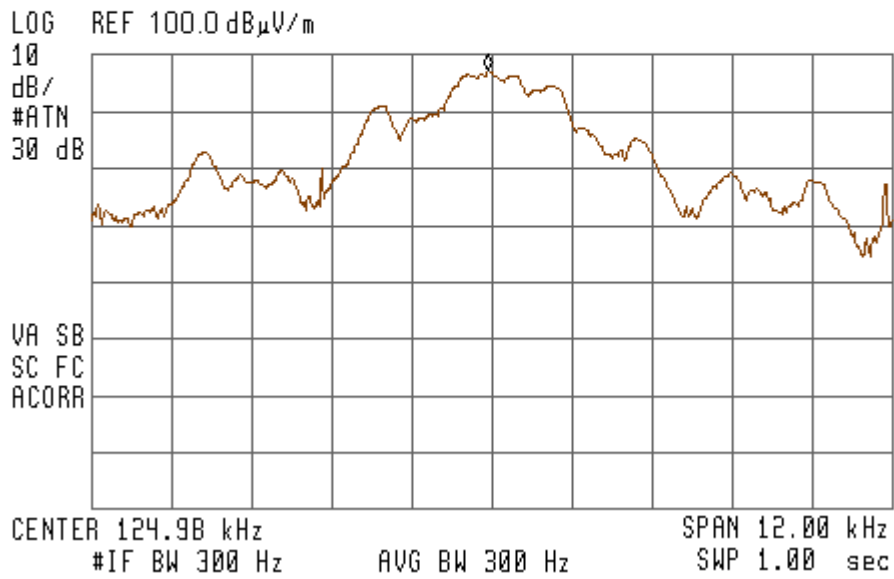


Figure 16 Spurious Radiated Emissions 9 kHz – 30 MHz

7.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3411A00102	March 22, 2006	1 year
RF Section	HP	85420E	3427A00103	March 22, 2006	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	March 19, 2006	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 17, 2005	1 year
Active Loop Antenna	EMCO	6502	9506-2950	November 17, 2005	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	ThinkJet 2225	2738508357.0	N/A	N/A

7.5 *Field Strength Calculation*

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$FS = RA + AF + CF$$

FS:	Field Strength [dB μ v/m]
RA:	Receiver Amplitude [dB μ v]
AF:	Receiving Antenna Correction Factor [dB/m]
CF:	Cable Attenuation Factor [dB]

No external pre-amplifiers are used.

8. Radiated Emission, 30 MHz –1 GHz

8.1 Test Specification

30 MHz-1000 MHz, FCC, Part 15, Subpart B, Class B

8.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 3.1.

The frequency range 30 MHz-1000 MHz was scanned, and the list of the highest emissions was verified and updated accordingly.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 30-1000MHz, the readings were maximized by adjusting the antenna height between 1-4 meters. The turntable azimuth between 0-360°, and the antenna polarization.

Verification of the E.U.T emissions was based on the following methods:

- Turning the E.U.T on and off.

- Using a frequency span less than 10 MHz.

- Observation of the signal level during turntable rotation. Background noise is not affected by the rotation of the E.U.T.

8.3 **Measured Data**

The results for both operating and standby modes were the same.

JUDGEMENT: Passed by 7.5 dB

The EUT met the requirements of the F.C.C. Part 15, Subpart B, Class B specification.

The margin between the emission level and the specification limit is 7.5 dB in the worst case at the frequency of 51.29 MHz, vertical polarization.

The details of the highest emissions are given in *Figure 17* to *Figure 20*.

TEST PERSONNEL:

Tester Signature:  Date: 26.12.06

Typed/Printed Name: Y. Mordukhovitch

Radiated Emission 30 MHz– 1 GHz

E.U.T Description Exciter
 Type EX-3200
 Serial Number: Not Designated

Specification: FCC Part 15, Subpart B, Class B

Antenna Polarization: Horizontal
 Antenna: 3 meters distance

Frequency range: 30 MHz to 1000 MHz
 Detectors: Peak, Quasi-peak

Frequency	Peak Amp	QP Amp	Correction	Specification	Margin
(MHz)	(dB μ V/m)	(dB μ V/m)	(dB)	(dB μ V/m)	(dB)
84.29	31.8	27.6	10.7	40.0	-12.4
84.73	32.3	26.7	10.7	40.0	-13.3
134.03	33.7	29.0	13.8	43.5	-14.5
240.03	35.3	32.6	19.2	46.0	-13.4
250.04	34.8	31.9	20.3	46.0	-14.1
300.03	37.6	36.3	15.6	46.0	-9.7
625.07	35.1	31.8	24.1	46.0	-14.2

**Figure 17. Radiated Emission. Antenna Polarization: HORIZONTAL.
 Detectors: Peak, Quasi-peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Radiated Emission 30 MHz– 1 GHz

E.U.T Description Exciter
 Type EX-3200
 Serial Number: Not Designated

Specification: FCC Part 15, Subpart B, Class B

Antenna Polarization: Vertical
 Antenna: 3 meters distance

Frequency range: 30 MHz to 1000 MHz
 Detectors: Peak, Quasi-peak

Frequency	Peak Amp	QP Amp	Correction	Specification	Margin
(MHz)	(dB μ V/m)	(dB μ V/m)	(dB)	(dB μ V/m)	(dB)
51.29	38.4	32.5	11.2	40.0	-7.5
76.27	32.2	27.1	10.1	40.0	-12.9
84.68	34.0	28.9	10.7	40.0	-11.1
180.03	32.8	31.0	15.7	43.5	-12.5
250.04	35.5	33.0	20.3	46.0	-13.0
300.03	35.5	33.9	15.6	46.0	-12.1
500.05	35.6	33.4	20.4	46.0	-12.6

**Figure 19. Radiated Emission. Antenna Polarization: VERTICAL.
 Detectors: Peak, Quasi-peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

8.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3411A00102	March 22, 2006	1 year
RF Section	HP	85420E	3427A00103	March 22, 2006	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	March 19, 2006	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 17, 2005	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	ThinkJet 2225	2738508357.0	N/A	N/A

8.5 *Field Strength Calculation*

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$FS = RA + AF + CF$$

FS:	Field Strength [dB μ v/m]
RA:	Receiver Amplitude [dB μ v]
AF:	Receiving Antenna Correction Factor [dB/m]
CF:	Cable Attenuation Factor [dB]

No external pre-amplifiers are used.

9. Photographs of Tested E.U.T.



Figure 21 Front View



Figure 22 Rear View



Figure 23 Side View



Figure 24 PCB in Cover

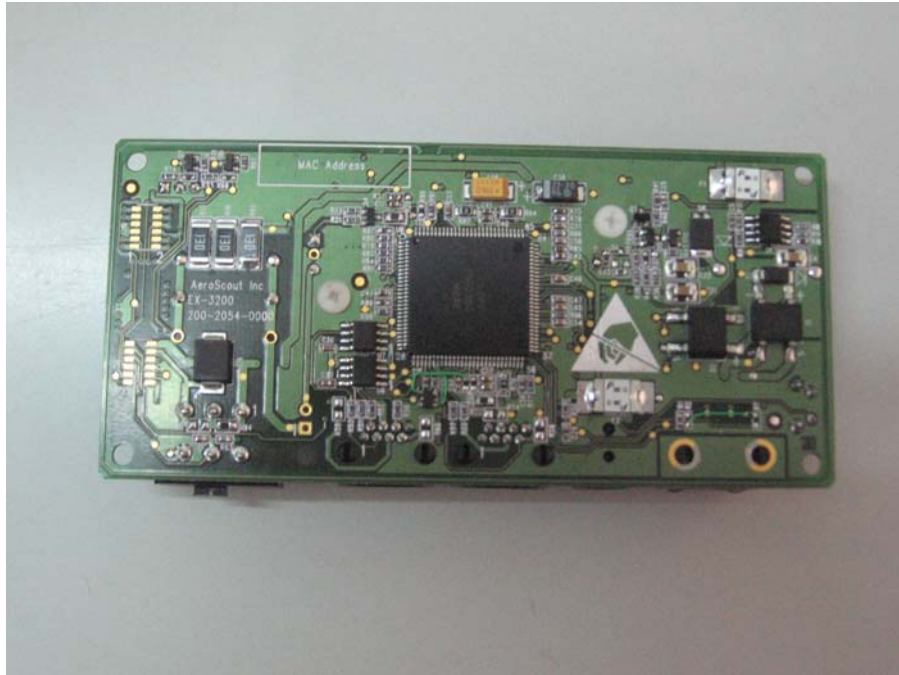


Figure 25 PCB Print Side

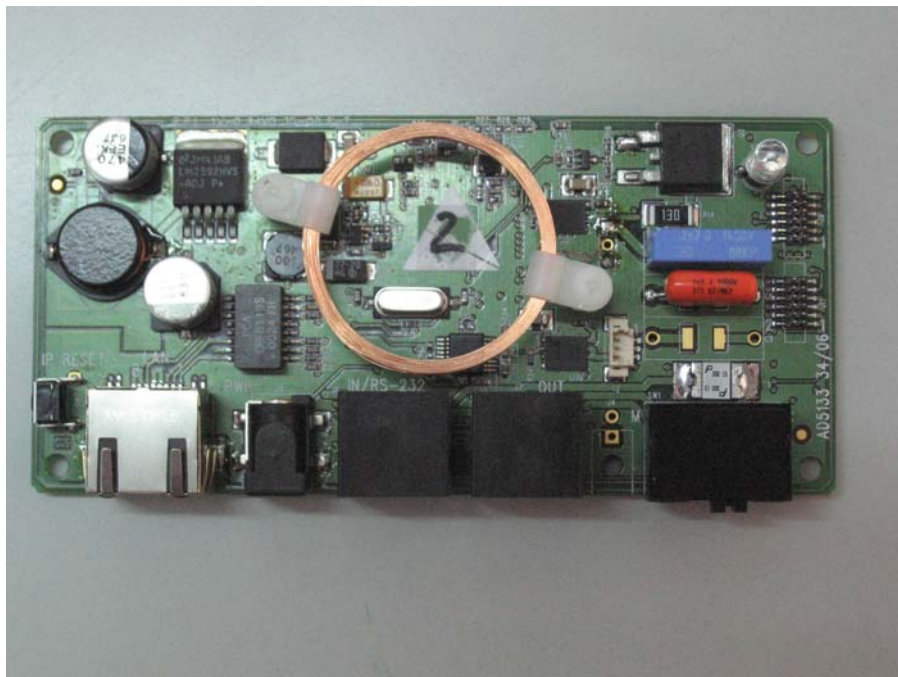


Figure 26 PCB Component Side



Figure 27 PCB Side Connectors

10. APPENDIX A - CORRECTION FACTORS

10.1 Correction factors for CABLE
from EMI receiver
to test antenna
at 3 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)	FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3	1200.0	7.3
20.0	0.6	1400.0	7.8
30.0	0.8	1600.0	8.4
40.0	0.9	1800.0	9.1
50.0	1.1	2000.0	9.9
60.0	1.2	2300.0	11.2
70.0	1.3	2600.0	12.2
80.0	1.4	2900.0	13.0
90.0	1.6		
100.0	1.7		
150.0	2.0		
200.0	2.3		
250.0	2.7		
300.0	3.1		
350.0	3.4		
400.0	3.7		
450.0	4.0		
500.0	4.3		
600.0	4.7		
700.0	5.3		
800.0	5.9		
900.0	6.3		
1000.0	6.7		

NOTES:

1. The cable type is RG-214.
2. The overall length of the cable is 27 meters.
3. The above data is located in file 27MO3MO.CBL on the disk marked "Radiated Emission Tests EMI Receiver".

10.2 Correction factors for

LOG PERIODIC ANTENNA

Type LPD 2010/A

at 3 and 10 meter ranges.

Distance of 3 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.1
250.0	10.2
300.0	11.4
400.0	14.5
500.0	15.2
600.0	17.3
700.0	19.0
850.0	20.1
1000.0	22.2

Distance of 10 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.0
250.0	10.1
300.0	11.2
400.0	14.4
500.0	15.2
600.0	17.2
700.0	19.0
850.0	20.1
1000.0	22.1

NOTES:

1. Antenna serial number is 1038.
2. The above lists are located in file number 38M30.ANT for a 3 meter range, and file number 38M100.ANT for a 10 meter range.
3. The files mentioned above are located on the disk marked "Radiated Emission Test EMI Receiver".

**10.3 Correction factors for BICONICAL ANTENNA
Type BCD-235/B,
at 3 meter range**

FREQUENCY (MHz)	AFE (dB/m)
20.0	19.4
30.0	14.8
40.0	11.9
50.0	10.2
60.0	9.1
70.0	8.5
80.0	8.9
90.0	9.6
100.0	10.3
110.0	11.0
120.0	11.5
130.0	11.7
140.0	12.1
150.0	12.6
160.0	12.8
170.0	13.0
180.0	13.5
190.0	14.0
200.0	14.8
210.0	15.3
220.0	15.8
230.0	16.2
240.0	16.6
250.0	17.6
260.0	18.2
270.0	18.4
280.0	18.7
290.0	19.2
300.0	19.9
310	20.7
320	21.9
330	23.4
340	25.1
350	27.0

NOTES:

1. Antenna serial number is 1041.
2. The above list is located in file 19BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".

10.4 Correction factors for ACTIVE LOOP ANTENNA

Model 6502

S/N 9506-2950

FREQUENCY (MHz)	Magnetic Antenna Factor (dB)	Electric Antenna Factor (dB)
.009	-35.1	16.4
.010	-35.7	15.8
.020	-38.5	13.0
.050	-39.6	11.9
.075	-39.8	11.8
.100	-40.0	11.6
.150	-40.0	11.5
.250	-40.0	11.6
.500	-40.0	11.5
.750	-40.1	11.5
1.000	-39.9	11.7
2.000	-39.5	12.0
3.000	-39.4	12.1
4.000	-39.7	11.9
5.000	-39.7	11.8
10.000	40.2	11.3
15.000	-40.7	10.8
20.000	-40.5	11.0
25.000	-41.3	10.2
30.000	42.3	9.2