

DATE: 01 May 2008

I.T.L. (PRODUCT TESTING) LTD.
FCC EMC/Radio Test
for
AeroScout Ltd.

Equipment under test:

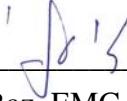
Exciter

EX-2000B*

*See customer's declaration on page 5.

Written by: 
D. Shidowsky, Documentation

Approved by: 
A. Sharabi, 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-2000B

FCC ID:Q3H BS2035-1

01 May 2008

This report concerns: Original Grant Class II Change

Class B verification Class A verification Class I Change

Equipment type: Radio Telemetry Transmitter

Limits used:

CISPR 22 Part 15

Measurement procedure used is ANSI C63.4-2003.

Application for Certification
prepared by:

Ishaishou Raz
ITL (Product Testing) Ltd.
Kfar Bin Nun
D.N. Shimshon 99780
Israel
e-mail: Sraz@itl.co.il

Applicant for this device:
(different from "prepared by")

Reuven Amsalem
AeroScout Ltd.
10 Oppenheimer St. Park Tamar
Rechovot 76701
Israel
Tel: +972-8-9363136
Fax: +972-8-9365977
e-mail:
reuven.amsalem@aeroscout.com

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1. General Information

1.1 ***Administrative Information***

Manufacturer: AeroScout Ltd.

Manufacturer's Address: 3 Pekeris St.
Einstein Entrance
4th Floor
Rechovot 76702
Israel
Tel: +972-8-9369393
Fax: +972-8-9365977

Manufacturer's Representative: Leonid Gonusin

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

Equipment Model No.: EX-2000B (See customer's declaration on following page)

Equipment Serial No.: 310-1000-5862

Date of Receipt of E.U.T: 05.03.08

Start of Test: 05.03.08

End of Test: 05.03.08

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

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

Sunday, March 23, 2008

DECLARATION

I HEREBY DECLARE THAT THE FOLLOWING PRODUCT:

EX-2000B

IS IDENTICAL ELECTRONICALLY, PHYSICALLY, AND
MECHANICALLY TO:

EX-2100

Please relate to them all (from an EMC point of view) as the same
product.

Thank you,



Signature:

Printed Name:

Yuval Uziel Hardware Manager

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

The Exciter serves as a Beacon which transmits the same message continually. The Exciter transmits the message in ASK modulation with a carrier of 125 kHz.

The Exciter triggers AeroScout's tags as they pass through a choke point to transmit a message that will be received by an AeroScout Location Receiver or 802.11 Access Point. This provides instant knowledge that a tagged asset or person passed through a gate, doorway or some other tightly defined area. The detection capabilities of the Exciter, combined with the location features of the AeroScout Location Receiver, make the AeroScout suite the most sophisticated enterprise visibility solution for a wide variety of industries.

Key features include:

- Long range LF triggering of AeroScout tags, triggering them to transmit as they pass through a defined area.
- Rugged IP65 rated enclosure for use in any hostile indoor or outdoor environment and in a wide temperature range.
- Ethernet connectivity for centralized programming, monitoring and software updates by the AeroScout system manager.

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. System Test Configuration

2.1 ***Justification***

Radiated emission tests were performed due to the following changes in the E.U.T.

1. The PCB was changed and uses a different micro-controller and DC-DC converter.
2. The DC jack was changed and a 24VAC input operation voltage option was removed.

2.2 ***EUT Exercise Software***

The Exciter SW supports two modes of operation:

1. Continuous 125 kHz carrier (use only in test mode).
2. ASK modulated 125 kHz signal.

The Exciter was configured to send an “Exciter ID” message with 10ms Tx interval in maximum transmission power.

2.3 ***Special Accessories***

No special accessories were needed to achieve compliance.

2.4 ***Equipment Modifications***

No equipment modifications are required and none have been made.

2.5 Configuration of Tested System

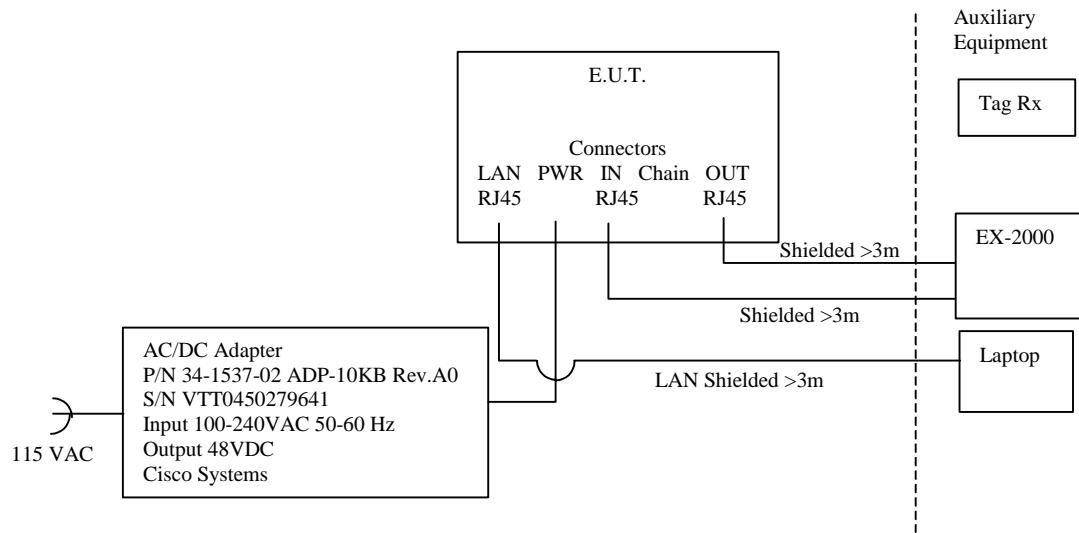


Figure 1. Configuration of Tested System

3. Theory of Operation

3.1 *Theory of Operation*

The Exciter is a 125 kHz transmitter which is powered from, either 220 VAC/50Hz - 24VDC adapter, 48VDC or PoE source. The Exciter can be connected to the AeroScout server for dynamic configuration and monitoring 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 that the Exciter transmits cause the AeroScout tag to wakeup and transmit a reply message to the AeroScout location Receivers. The Exciter includes an LF detection circuit which monitors the Exciter operation and report the status to the AeroScout server.

In order to cover large gates or chokepoints several Exciters may be chained one to the other.

4. Radiated Measurement Photos



Figure 2. Radiated Emission Test

5. Radiated Emission, 9 kHz – 30 MHz

5.1 ***Test Specification***

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

5.2 ***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 10 meters.

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

5.3 ***Measured Data***

The only signal in the band 9 kHz – 30 MHz was the carrier frequency.

The margin between the emission levels and the specification limit is 5.31 dB.

See details in Figure 3.

TEST PERSONNEL:

Tester Signature: 

Date: 25.05.08

Typed/Printed Name: A. Sharabi

Radiated Emission, 9 kHz – 30 MHz

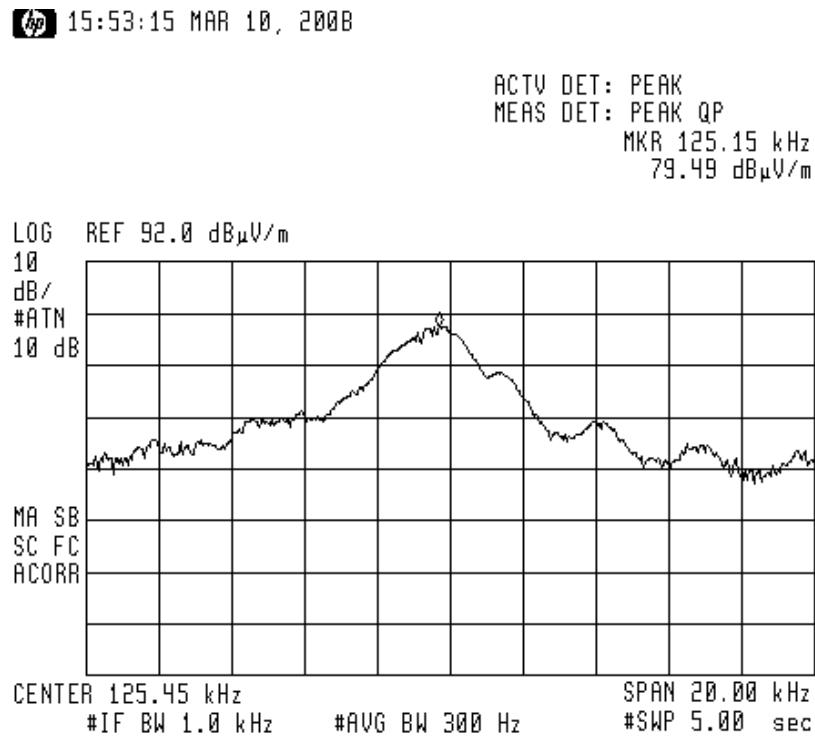


Figure 3 Spurious Radiated Emissions 9 kHz – 30 MHz

$$\text{Limit}_{300m} = 20 \log \frac{2400}{125} = 25.7 \text{ dB}\mu\text{V/m}$$

$$\text{Limit}_{10m} = 25.7 + 40 \log \frac{300}{10} = 84.8 \text{ dB}\mu\text{V/m}$$

5.4 **Test Instrumentation Used, Radiated Measurements**

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3411A00102	November 12, 2007	1 year
RF Section	HP	85420E	3427A00103	November 12, 2007	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	March 22, 2007	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 22, 2007	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 15, 2007	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	LaserJet 2200	JPKGC19982	N/A	N/A

5.5 **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.

6. Radiated Emission, 30 MHz –1 GHz

6.1 ***Test Specification***

30 MHz-1000 MHz, FCC, 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.

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 30-1000 MHz, 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.

6.3 **Measured Data**

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

JUDGEMENT: Passed by 7.4 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 7.4 dB in the worst case at the frequency of 125.00 MHz, vertical polarization.

The details of the highest emissions are given in Figure 4 to Figure 7.

TEST PERSONNEL:

Tester Signature:  Date: 25.05.08

Typed/Printed Name: A. Sharabi

Radiated Emission 30 MHz– 1 GHz

E.U.T Description Exciter
 Type EX-2000B
 Serial Number: 310-1000-5862

Specification: FCC Part 15, Subpart B, Class B

Antenna Polarization: Horizontal Frequency range: 30 MHz to 1000 MHz
 Antenna: 3 meters distance Detectors: Peak, Quasi-peak

Signal Number	Frequency (MHz)	Peak dBuV/m	QP dBuV/m	QP Delta L 1 (dB)	Avg dBuV/m	Av Delta L 2 (dB)	Corr (dB)
1	80.000000	35.4	30.1	-9.9			10.5
2	248.932550	36.6	30.8	-15.2			20.8
3	397.466589	35.2	29.5	-16.5			19.5
4	458.295657	36.1	30.0	-16.0			20.5
5	495.244332	39.8	35.5	-10.5			20.9
6	567.387205	39.6	32.8	-13.2			23.4

Figure 4. Radiated Emission. Antenna Polarization: HORIZONTAL.
Detectors: Peak, Quasi-peak

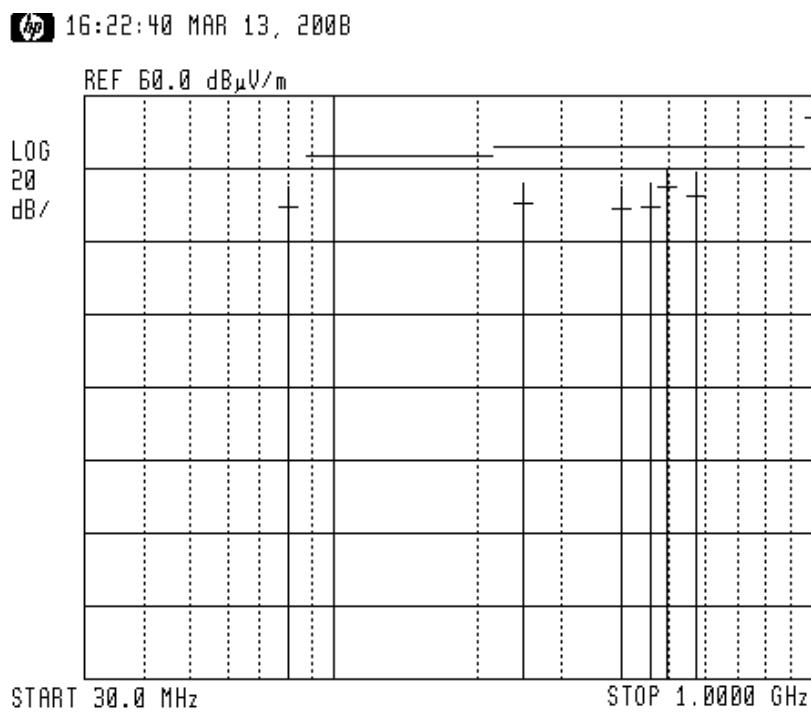
Note: QP Delta refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Radiated Emission 30 MHz– 1 GHz

E.U.T Description Exciter
 Type EX-2000B
 Serial Number: 310-1000-5862

Specification: FCC Part 15, Subpart B, Class B

Antenna Polarization: Horizontal Frequency range: 30 MHz to 1000 MHz
 Antenna: 3 meters distance Detectors: Peak, Quasi-peak



**Figure 5. Radiated Emission. Antenna Polarization: HORIZONTAL
 Detectors: Peak, Quasi-peak**

Note:

1. Horizontal axis shows logarithmic frequency scale.
2. The vertical axis shows amplitude (in dB μ V/m).
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.

Radiated Emission 30 MHz– 1 GHz

E.U.T Description Exciter
 Type EX-2000B
 Serial Number: 310-1000-5862

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

Signal Number	Frequency (MHz)	Peak dBuV/m	QP dBuV/m	QP Delta L 1 (dB)	Avg dBuV/m	Av Delta L 2 (dB)	Corr (dB)
1	125.000000	39.0	36.1	-7.4			13.8
2	159.887350	31.8	28.2	-15.3			15.3
3	250.200000	29.1	23.9	-22.1			20.9
4	392.500000	28.9	23.4	-22.6			19.3
5	400.125000	29.2	24.5	-21.5			19.6
6	479.707800	45.7	37.1	-8.9			20.8

Figure 6. Radiated Emission. Antenna Polarization: VERTICAL.
Detectors: Peak, Quasi-peak

Note: *QP Delta 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-2000B
Serial Number: 310-1000-5862

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

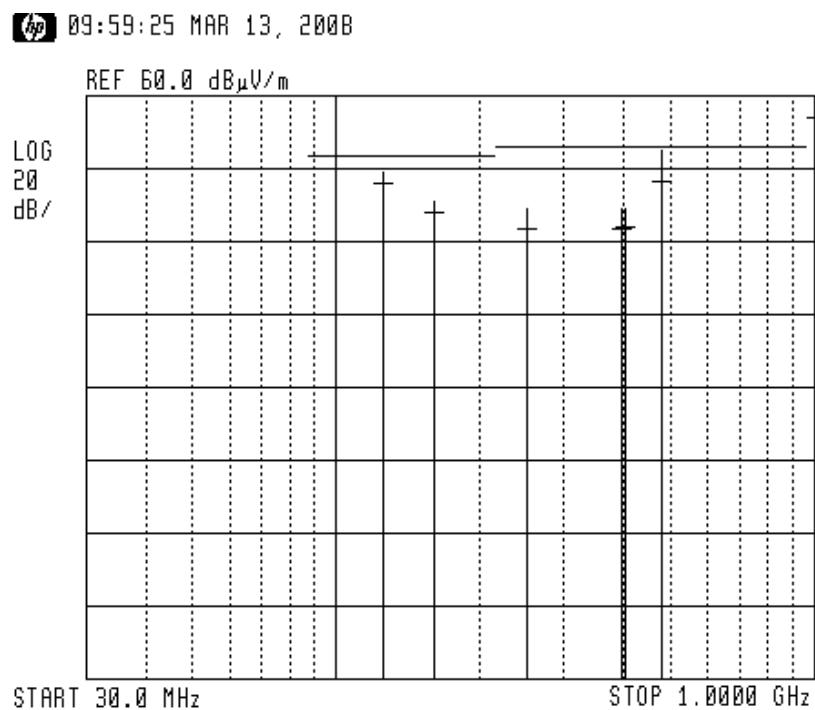


Figure 7. Radiated Emission. Antenna Polarization: VERTICAL. Detectors: Peak, Quasi-peak

Note:

1. Horizontal axis shows logarithmic frequency scale.
2. The vertical axis shows amplitude (in dB μ V/m).
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.

6.4 ***Test Instrumentation Used, Radiated Measurements***

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3411A00102	November 12, 2007	1 year
RF Section	HP	85420E	3427A00103	November 12, 2007	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	March 22, 2007	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 22, 2007	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	LaserJet 2200	JPKGC19982	N/A	N/A

6.5 **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.

7. APPENDIX A - CORRECTION FACTORS

7.1 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".

7.2 **Correction factors for CABLE**

**from EMI receiver
to test antenna**

FREQUENCY (MHz)	CORRECTION FACTOR (dB)	FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.2	1200.0	1.6
20.0	0.2	1400.0	1.8
30.0	0.2	1600.0	2.1
40.0	0.2	1800.0	2.2
50.0	0.3	2000.0	2.3
60.0	0.4	2300.0	2.8
70.0	0.4	2600.0	2.7
80.0	0.4	2900.0	3.1
90.0	0.5		
100.0	0.5		
150.0	0.6		
200.0	0.6		
250.0	0.7		
300.0	0.8		
350.0	0.9		
400.0	1.0		
450.0	1.1		
500.0	1.2		
600.0	1.3		
700.0	1.4		
800.0	1.4		
900.0	1.5		
1000.0	1.5		

NOTES:

1. The cable type is RG-214.
2. The overall length of the cable is 5.5 meters.

7.3 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".

7.4 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".

7.5 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