FCC requirements § 2.1033 (b)(6)

TEST MEASUREMENT REPORT

Contains 24 pages and follows this page.

ELECTROMAGNETIC EMISSIONS TEST REPORT

ACCORDING TO FCC PART 15, SUBPART C, §15.209

FOR

Hi-G-Tek Ltd.

EQUIPMENT UNDER TEST

Electronic Seal (Active HI-G-SEAL)
model IG-SA-21
FCC ID:OB6-IGSA21-01

Prepared by: _____
Mrs. M. Cherniavsky, certif. engineer
Hermon Labs

Approved by: _____
Mr. A. Usoskin, QA manager
Hermon Labs

Approved by: Haimovich
Mr. Y. Haimovich, Vice President R&D
Hi-G-Tek Ltd.

Hermon Laboratories Ltd.
P.O.Box 23
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Email:hermon@Netvision.net.il

ACCREDITED
839.01

Description of equipment under test

Test items	Electronic seal, FCC ID:OB6-IGSA21-01
Manufacturer	Hi-G-Tek Ltd. Microelectronics & Asset Tracking Technology
Brand Mark	Hi-G-Tek
Type (Model)	IG-SA-21, P/N TA3157
Trade Mark	Hi-G-Seal

Applicant information

Applicant's representative	Mr. Rony Cohen, chief engineer
Applicant's responsible person	Mr. Yossi Haimovich, VP R&D
Company	Hi-G-Tek Ltd. Microelectronics & Asset Tracking Technology
Address	16 Hacharoshet St.
P.O. Box	NA
Postal code	60375
City	Or-Yehuda
Country	Israel
Telephone number	011-972-3533 9359
Telefax number	011-972-3533 9225

Test performance

Project Number	13066
Location of the test	Hermon Laboratories, Binyamina, Israel
Test started	December 3, 1998
Test completed	December 6, 1998
Purpose of test	The EUT certification in accordance with CFR 47, part 2, §2.1033
Test specification(s)	FCC part 15, subpart C, §15.209

Through this report a point is used as the decimal separator and the thousands are counted with a comma.
This report is in conformity with EN 45001 and ISO GUIDE 25.
The test results relate only to the items tested.

Table of Contents

1 General Information

1.1 Abbreviations and Acronyms

The following abbreviations and acronyms are applicable to this test report:

AC	alternating current
BW	bandwidth
dB	decibel
dBm	decibel referred to one milliwatt
dB(μV)	decibel referred to one microvolt
dB(μV/m)	decibel referred to one microvolt per meter
DC	direct current
EUT	Equipment Under Test
GHz	gigahertz
H	height
HL	Hermon Laboratories
HP	Hewlett Packard
Hz	hertz
IF	intermediate frequency
kHz	kilohertz
L	length
m	meter
mm	millimeter
MHz	megahertz
msec	millisecond
mW	milliwatt
NA	Not Applicable
NARTE	National Association of Radio and Telecommunications Engineers, Inc.
QP	quasi-peak (detector)
RBW	resolution bandwidth
RF	Radio Frequency
RE	radiated emission
RMS	root-mean-square
sec	second
V	volt

1.2 Specification References

CFR 47 part 15: October 1997	Radio Frequency Devices.
ANSI C63.2:06/1987	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.
ANSI C63.4:1992	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.

1.3 EUT Description

The EUT, electronic active seal Hi-G-Seal, model IG-SA-21, is a part of Hi-G-Seal system, that enables sealing of containers and verifying of assets that need to be sealed against and monitored for any trail to tamper with them. The seal enables remote reading of recorded data. The seal is monitored by radio terminal that is a part of the Hi-G-Seal system. Every opening or closing of the seal is logged and can be remotely read. The data is read by using an RF communication link at a distance of up to 1 meter. Once the Hi-G-Seal is activated the seal generates a unique sealing stamp with date and time details. The sealing stamp with all details is saved in the seal memory, logged in the seal reader and stored in the database.
The seal contains a transceiver with a permanently attached antenna. Transmitted frequency is 250 ± 1.5% kHz, maximum transmitted power is 40 mW. The EUT is powered by 3.6 V battery.

1.4 Statement of Manufacturer

I, Yossi Haimovich, Vice President R&D of Hi-G-Tek Ltd. Microelectronics & Asset Tracking Technology, declare that active electronic Hi-G-Seal, model IG-SA-21, was tested on December 3, 6, 1998 by Hermon Laboratories and which this test report applies to, is identical of the equipment that will be marketed.

The term identical means identical within the variations that can be expected to arise as a result of quantity production technique.

Yossi Haimovich, Vice President R&D
Hi-G-Tek Ltd. Microelectronics & Asset Tracking Technology

Signature: Haimovich

Date: Jan. 5, 1999

2 Test Facility Description

2.1 General

Tests were performed at Hermon Laboratories, which is a fully independent, private EMC, Safety and Telecommunication testing facility. Hermon Laboratories is listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47), listed by Industry Canada for radiated measurements (file numbers IC 2186-1 for OATS and IC 2186-2 for anechoic chamber), recognized by VDE (Germany) for witness test, certified by VCCI (Japan), assessed by NMi Certin B.V. (Netherlands) for a number of EMC, Telecommunications and Safety standards, recognized by TUV Sudwest (Germany) for Safety testing, and Accredited by AMTAC (UK) for safety of Medical Devices. The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO GUIDE 25/EN 45001 for EMC, Telecommunications and Product Safety Information Technology Equipment (Certificate No. 839.01).

Address: PO Box 23, Binyamina 30550, Israel.
Telephone: +972-6-628-8001
Fax: +972-6-628-8277

Person for contact: Mr. Alex Usoskin, testing and QA manager.

2.2 Equipment Calibration

The test equipment has been calibrated according to its recommended procedures and is within the manufacturer's published limit of error. The standards and instruments used in the calibration system conform to the present requirements of MIL-STD-45662A.
The laboratory standards are calibrated by the third party (traceable to NIST, USA) on a regular basis according to equipment manufacturer requirements.

2.2.1 Uncertainty in Hermon Labs Measurements.

Radiated Emissions (95% Confidence)	Biconical Antenna: 3m measuring distance : + 4.06 dB Expanded uncertainty : - 3.98 dB Expanded uncertainty : + 2.032 dB Combined standard uncertainty : - 1.99 dB Combined standard uncertainty 10m measuring distance : + 3.98 dB Expanded uncertainty : - 4.08 dB Expanded uncertainty : + 1.99 dB Combined standard uncertainty : - 2.04 dB Combined standard uncertainty Log periodic Antenna: 3m measuring distance : + 4.74 dB Expanded uncertainty : - 3.26 dB Expanded uncertainty : + 2.37 dB Combined standard uncertainty : - 1.63 dB Combined standard uncertainty 10m measuring distance : + 3.06 dB Expanded uncertainty : - 3.00 dB Expanded uncertainty

2.3 Laboratory Personnel

The two people of Hermon Laboratories that have participated in measurements and documentation preparation are: Mr. Michael Feldman, test technician and Mrs. Marina Cherniavsky - certification engineer.
M. Cherniavsky is a telecommunication engineer certified by the National Association of Radio and Telecommunications Engineers (NARTE, USA).
The Hermon Laboratories' personnel that participated in this project have more than 50 years combined experience time in EMC measurements and electronic products design.

2.4 Statement of Qualification

The test measurement data supplied in this test measurement report having been received by me, is hereby duly certified. The following is a statement of my qualifications:
I am a technician, have obtained 29 years experience in electronics and measurements.
I have been with Hermon Laboratories since 1995.

Name: Mr. Michael Feldman Signature:
Position: test technician Date: December 29, 1998

I hereby certify that this test measurement report was prepared by me and is hereby duly certified. The following is a statement of my qualifications.
I am an engineer, graduated from University in 1971, with an MScEE degree, have obtained 25 years experience in electronic products design and development and have been with Hermon Laboratories since 1991. Also, I am a Telecommunication Class II engineer certified by the National Association of Radio and Telecommunications Engineers, Inc. (USA.), the certificate no. is E2-03410.

Name: Mrs. Marina Cherniavsky Signature:
Position: certification engineer Date: December 29, 1998

3 Radiated Emission Measurements

3.1 Field Strength of Emissions according to § 15.209 (a)

3.1.1 Specified limit

Frequency, MHz	Field strength, microvolts/meter	Measurement distance, meters
0.009 – 0.490	2400/F(kHz)	300

3.1.2 Extrapolation (distance correction) factor

The test was performed in the anechoic chamber at 3 meter test distance, i.e. the distance between measuring antenna and EUT boundary. The results were extrapolated by using the square of an inverse linear distance factor DF:

$$DF = 40 \log (D_1/D_2) = 80 \text{ dB, where}$$

D_1 is the 300 meters specified measurement distance
D_2 is the 3 meters test measurement distance.
The DF=80 dB was applied for limit calculation at 3 m test distance measurements.

For 248 kHz frequency the calculated limit is:
$\text{Limit}_{3m} = \text{Limit}_{300\ m} + DF = 19.6\ dB(\mu V/m) + 80\ dB = 99.6\ dB(\mu V/m)$.

3.1.3 Test Procedure and Results

The EUT was placed on the wooden turntable, as shown in Figure 3.1.1, Photographs 3.1.1, 3.1.2 and was operated in continuous modulated transmitting mode. During testing the EUT was positioned in three orthogonal axes and the measurements were performed with loop antenna. The center of the loop was 1 m above the ground. The frequency range from the lowest generated signal frequency up to 10th harmonic was investigated.
To find maximum radiation the turntable was rotated 360°, the antenna was rotated about its vertical axis and the antenna polarization was changed from vertical to horizontal.
The average detector was used. The test measurement results were recorded into Table 3.1.1 and are shown in Plot 3.1.1.

Reference numbers of test equipment used

HL 0275	HL 0446	HL 0465	HL 0521	HL 0593	HL 0594	HL 0815
HL 0816						

Full description is given in Appendix A.

Table 3.1.1

Radiated Emission Measurements – Test Results

TEST SPECIFICATION: FCC part 15 subpart C § 15.209
COMPANY: Hi-G-Tek Ltd.
EUT: Hi-G-Seal, IG-SA-21
DATE: December 3, 1998
RELATIVE HUMIDITY: 67%
AMBIENT TEMPERATURE: 21°C

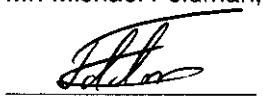
MEASUREMENTS PERFORMED AT 3 METRES DISTANCE

Frequency	Resolution Bandwidth	Measured Result	Correction Factor	Calculated Limit	Specified Margin	Pass/ Fail
kHz	kHz	dB (μV)	dB	dB (μV/m)	dB	
248.25	9	69.1	80	99.6	30.5	Pass

Notes to Table:

Average detector and Loop antenna were used.
Calculated Limit is in accordance with section 3.1.2 of this test report.

Test Performed by:
Mr. Michael Feldman, test technician



Hermon Labs

Plot 3.1.1
Radiated Emission Test Results

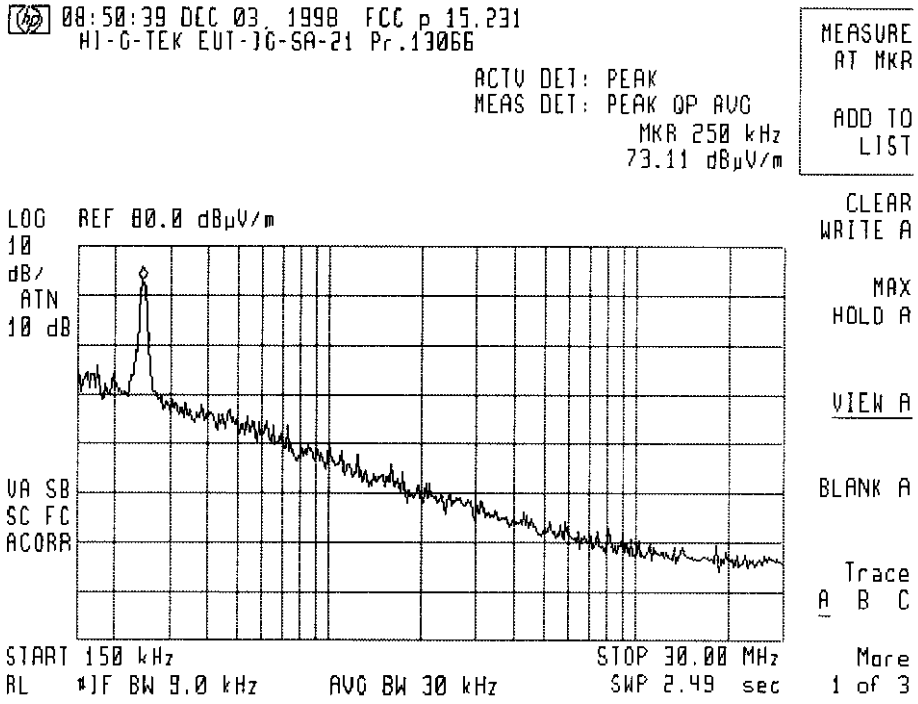
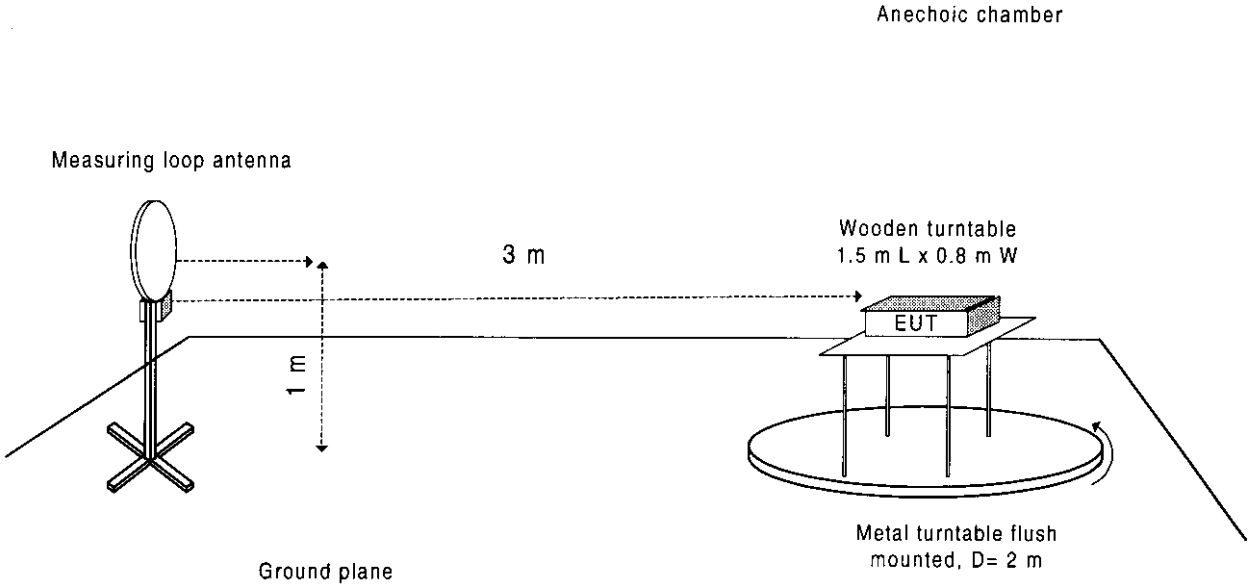


Figure 3.1.1
Radiated Emission Test Setup



3.2 Unintentional Radiated emissions test

3.2.1 Definition of the test

This test was performed to measure radiated emissions from the receiver and incorporated digital device of the EUT and also to verify the EUT full compliance with §15.109, §15.209.

3.2.2 The test set-up configuration, Test Procedure and Results

The radiated emissions measurements of the EUT in receive mode and incorporated digital device were performed in the anechoic chamber at 3 meter measuring distance in the frequency range from 30 MHz to 1 GHz. The EUT was placed on the wooden table as shown in Figure 3.2.1. The biconilog antenna was used. To find maximum radiation the turntable was rotated 360°, the measuring antenna height changed from 1 to 4 m, and the antenna polarization was changed from vertical to horizontal.
The measurements were performed with the EMI receiver settings: RBW=120 kHz, peak and quasi peak detectors.
All the measured emissions were found at least 20 dB below Class A specified limit. The test measurement results are shown in Plot 3.2.1.

Reference numbers of test equipment used

HL 0275	HL 0465	HL 0521	HL 0593	HL 0594	HL 0604	HL 0815
HL 0816						

Full description is given in Appendix A.

Plot 3.2.1
Radiated Emission Test Results

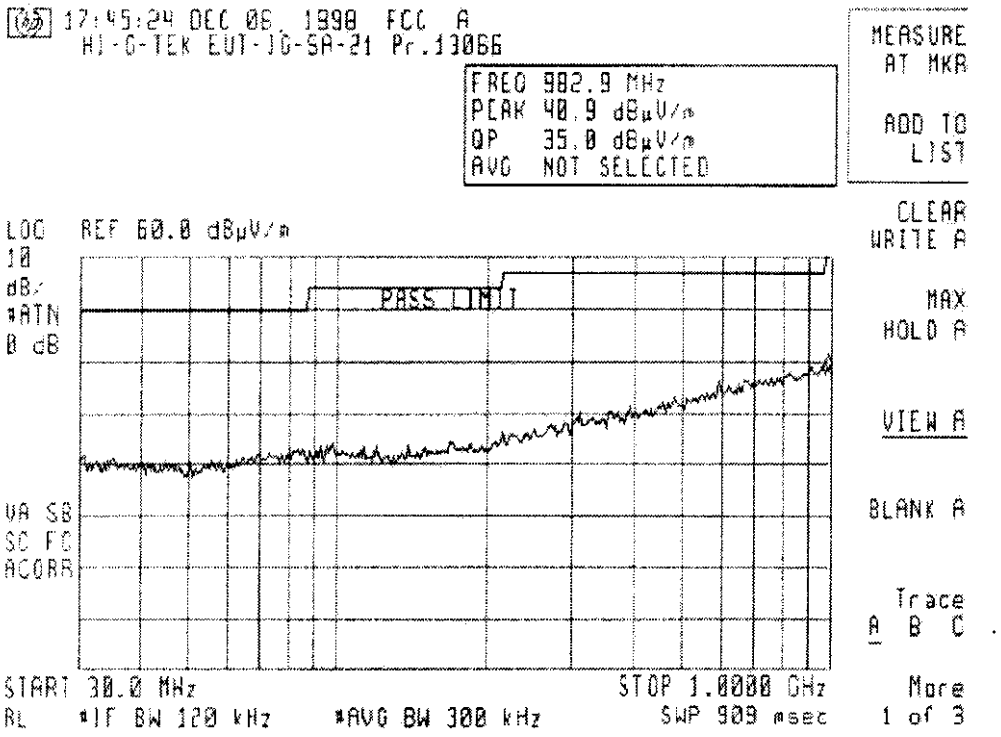
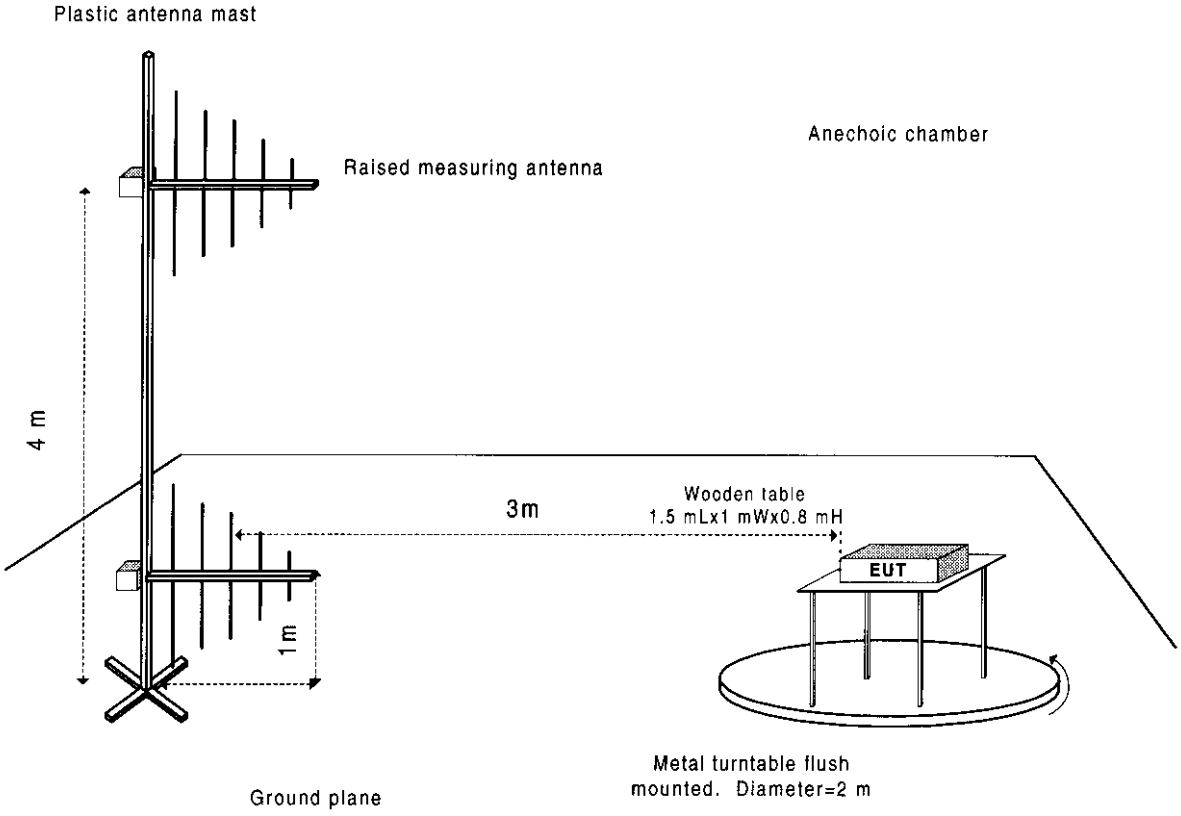


Figure 3.2.1
Radiated Emission Test Setup



4. Summary and Signatures

The EUT, active Hi-G-Seal, was found to be in compliance with the FCC part 15 subpart B §15.109 class A and subpart C §15.209 limits.

Test performed by:

Mr. Michael Feldman, test technician

Approved by:

Dr. Edward Usoskin, C.E.O.

Responsible person from Hi-G-Tek Ltd. Microelectronics & Asset Tracking Technology

Mr. Yossi Haimovich, Vice President R&D

APPENDIX A – Test equipment and ancillaries used for tests

HL Serial No.	Serial No.	Description	Manufacturer	Model No.	Due Calibr.
0275	0275	Wooden Table, 1.5 x 1.0 x 0.8	Hermon Labs	WT-1	NA
0446	2857	Antenna, Loop active, 10 kHz – 30 MHz	Electro-Mechanics	6502	10/99
0465	0465	Anechoic Chamber 9 mL x 6.5 mW x 5.5 mH	Hermon Labs	AC-1	10/99
0521	0319	Spectrum Analyzer with RF filter section (EMI Receiver 9 kHz - 6.5 GHz)	Hewlett Packard	8546A	7/99
0593	593	Antenna Mast, 1-4 m/ 1-6 m Pneumatic	Hermon Labs	HLAM-F1	4/99
0594	594	Turntable for anechoic chamber, flush mounted, D=1.2 m, pneumatic	Hermon Labs	HL TT-WDC1	11/99
0604	1011	Antenna Log-Periodic/T Bow-Tie, 26 - 2000 MHz	EMCO	3141 BICONILOG	12/99
0815	815	Cable, coax, RG-214, 7.3 m, N-type connectors	Hermon Labs	C56	8/99
0816	816	Cable, coax, RG-214, 8 m, N-type connectors	Hermon Labs	C7576	8/99

APPENDIX B-Test Equipment Correction Factors

Antenna Factor
Loop Antenna,Electro-Mechanics, Model 6502
Ser.No.2857

Frequency MHz	Antenna Factor dB(1/m)
0.009	18.7
0.010	17.7
0.020	13.2
0.050	10.4
0.075	10.2
0.100	9.9
0.150	9.8
0.250	9.9
0.500	9.8
0.750	9.7
1.000	10.1
2.000	10.0
3.000	10.2
4.000	10.1
5.000	10.1
10.000	9.6
15.000	9.6
20.000	9.3
25.000	8.7
30.000	7.5

Antenna factor is to be added to receiver meter reading in dB(μV) to convert to field intensity in dB(μV/meter).

Antenna Factor at 3m calibration
Biconilog Antenna EMCO Model 3141
Ser.No.1011

Frequency, MHz	Antenna Factor, dB(1/m)
26	7.8
28	7.8
30	7.8
40	7.2
60	7.1
70	8.5
80	9.4
90	9.8
100	9.7
110	9.3
120	8.8
130	8.7
140	9.2
150	9.8
160	10.2
170	10.4
180	10.4
190	10.3
200	10.6
220	11.6
240	12.4
260	12.8
280	13.7
300	14.7
320	15.2
340	15.4
360	16.1
380	16.4
400	16.6
420	16.7
440	17.0
460	17.7
480	18.1
500	18.5
520	19.1
540	19.5
560	19.8
580	20.6
600	21.3
620	21.5
640	21.2
660	21.4
680	21.9
700	22.2
720	22.2
740	22.1
760	22.3
780	22.6
800	22.7
820	22.9
840	23.1
860	23.4
880	23.8
900	24.1
920	24.1

Frequency, MHz	Antenna Factor, dB(1/m)
940	24.0
960	24.1
980	24.5
1000	24.9
1020	25.0
1040	25.2
1060	25.4
1080	25.6
1100	25.7
1120	26.0
1140	26.4
1160	27.0
1180	27.0
1200	26.7
1220	26.5
1240	26.5
1260	26.5
1280	26.6
1300	27.0
1320	27.8
1340	28.3
1360	28.2
1380	27.9
1400	27.9
1420	27.9
1440	27.8
1460	27.8
1480	28.0
1500	28.5
1520	28.9
1540	29.6
1560	29.8
1580	29.6
1600	29.5
1620	29.3
1640	29.2
1660	29.4
1680	29.6
1700	29.8
1720	30.3
1740	30.8
1760	31.1
1780	31.0
1800	30.9
1820	30.7
1840	30.6
1860	30.6
1880	30.6
1900	30.6
1920	30.7
1940	30.9
1960	31.2
1980	31.6
2000	32.0

Antenna factor is to be added to receiver meter reading in dB(μV) to convert to field intensity in dB(μV/meter).

APPENDIX C- A2LA Accreditation

THE AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION

ACCREDITED LABORATORY

A2LA has accredited

HERMON LABORATORIES
Binyamina, ISRAEL

for technical competence in the field of

Electrical (EMC) Testing

The accreditation covers the specific tests and types of tests listed on the agreed scope of accreditation. This laboratory meets the requirements of ISO/IEC Guide 25:1990 "General Requirements for the Competence of Calibration and Testing Laboratories" (equivalent to relevant requirements of the ISO 9000 series of standards and EN 45001) and any additional program requirements in the identified field of testing.

Presented this 27th day of February, 1997.

President
For the Accreditation Council
Certificate Number 839.01
Valid to March 31, 1999

For tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical (EMC) Scope of Accreditation

American Association for Laboratory Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC GUIDE 25:1990 (EN 45001)

HERMON LABORATORIES
P.O. Box 23
Binyamina 30550, Israel
Edward Usoskin Phone: 972 6 6288 001

ELECTRICAL (EMC)

Valid to: March 31, 1999 Certificate Number: 0839.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following tests:

Electromagnetic Compatibility
- Radiated Emissions Tests
- Conducted Emissions Tests

Product Safety Testing
- Heat Resistance
- Impulse
- Clearance & Creepage Distance
- Temperature Rise
- High Current Arcing Ignition
- Bonding Resistance
- Flammability
- Overload
- Leakage Current
- Hot Wire Ignition
- Dielectric Withstanding

Telecommunications Testing
- Longitudinal Balance
- Environmental Stresses, Surges
- DTMF & Pulse Dialing
- On Hook, Off Hook DC/AC Impedances
- In-Band, Out of Band Signals
- Return Losses
- Hazardous Voltages
- Hearing Aids
- Billing Protection

On the following equipment:
Information Technology Equipment (ITE); Industrial, Scientific and Medical Equipment (ISM); Telecommunications Equipment, Electrical Appliances; Portable Tools; Motors, Transformers, and Similar Electrical Apparatus

Using the following test methods/specifications/standards:
FCC Part 15 using ANSI C63.4 - 1992
ANSI/UL 1950 - 1994
AS 3260
AS/NZS 1044, AS/NZS 2064, AS/NZS 3548
CISPR 11 - 1990, CISPR 14, CISPR 22 - 1993
EN 55011 - 1991, EN 55014 - 1987, EN 55022 - 1994, EN 60950 - 1993
IEC 950 - 1996
Israeli Ministry of Communications Specification No. 023/96
TS 001, TS 002, TS 004
US Code of Federal Regulation (CFR) 47 Parts 15, 18, and 68

Revised 06/25/97

Ranora J Laas

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