FCC requirements § 2.1033 (b)(6)

TEST MEASUREMENT REPORT

Contains 33 pages and follows this page.

ELECTROMAGNETIC EMISSIONS TEST REPORT

ACCORDING TO FCC PART 15, SUBPART C, §15.239

FOR

O.N. Wirefree Products (Israel) Ltd.

EQUIPMENT UNDER TEST

FM Frequency Hands Free Device (Transmitter) for Cellular Phone

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

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

Approved by: _____ 5 December 1998
Dr. E. Usoskin, C.E.O.
Hermon Labs

Approved by: _____
Mr. Ziv Or, sales manager
O.N. Wirefree Products (Israel) Ltd.

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30550, Israel
Tel.+972-6628-8001
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Email:hermon@Netvision.net.il

ACCREDITED
839.01

Description of equipment under test

Test items	Low power transmitter for a cellular phone FCC ID:NZNZO1
Manufacturer	O.N. Wirefree Products (Israel) Ltd.
Brand Mark	WireFree
Type (Model)	Cell-man

Applicant information

Applicant's representative & responsible person	Mr. Ziv Or, sales manager
Company	O.N. Wirefree Products (Israel) Ltd.
Address	18/F., Textile Center, 2 Kaufman Street
P.O. Box	NA
Postal code	68012
City	Tel Aviv
Country	Israel
Telephone number	011 972 3517 3701
Telefax number	011 972 3517 3699

Test performance

Project Number	13113
Location	Hermon Laboratories, Binyamina, Israel
Test started	October 13, 1998
Test completed	October 13, 1998
Purpose of test	The EUT certification in accordance with CFR 47, part 2, §2.1033
Test specification(s)	FCC part 15, subpart C, §15.239

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 45001and 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:

Amp	amplitude
AVR	average
BW	bandwidth
dB	decibel
dB(μV)	decibel referred to one microvolt
dB(μV/m)	decibel referred to one microvolt per meter
DC	direct current
EUT	Equipment Under Test
FM	frequency modulation
GHz	gigahertz
H	height
HL	Hermon Laboratories
HP	Hewlett Packard
Hz	hertz
IF	intermediate frequency
kHz	kilohertz
kV	kilovolt
L	length
m	meter
mm	millimeter
MHz	megahertz
msec	millisecond
mW	milliwatt
μW	microwatt
NA	Not Applicable
NARTE	National Association of Radio and Telecommunications Engineers, Inc.
Ohm	ohms
QP	quasi-peak
RBW	resolution bandwidth
RF	radio frequency
RE	radiated emission
V	volt
V/m	volt per meter

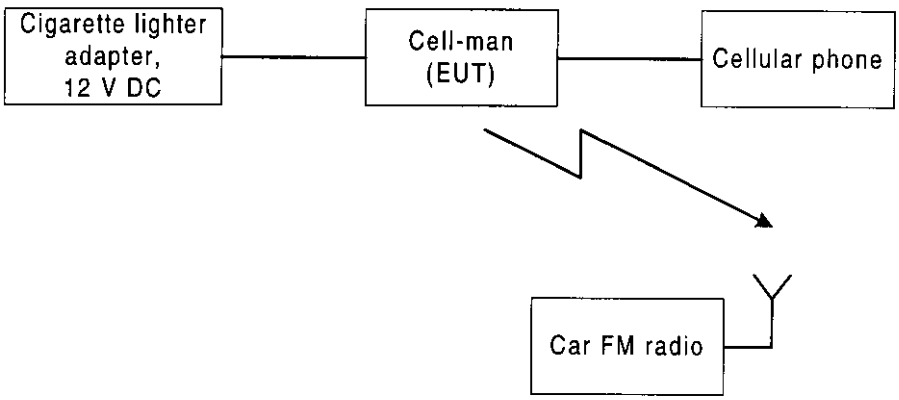
1.2 Specification References

CFR 47 part 15:1997	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, Cell-man, enables a "hands free" operation of a cellular phone in the car. The device consists of the microcontroller that handles the phone interface, the microphone and the FM transmitter that transmits the incoming audio from the cellular phone to the car radio. The transmitter operates in 88.1 – 107.9 MHz frequency range. The RF output power is 20 μW.
The Cell-man is connected to a cellular phone and is powered by 12 V DC power source (cigarette lighter charger in a car).
The EUT test configuration is given in Figure 1.1.

Figure 1.1
EUT test configuration



1.4 Statement of Manufacturer

I, Ziv Or, sales manager of O.N. Wirefree Products (Israel) Ltd., declare that the FM frequency hands free device, FCC ID:NZNZO1, was tested on October 13, 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.

Ziv Or, sales manager
O.N. Wirefree Products (Israel) Ltd.

Signature: Ziv Or

Date: 11/28/98

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 three people of Hermon Laboratories that have participated in measurements and documentation preparation are: Dr. Edward Usoskin - C.E.O., Mr. Alex Usoskin, testing manager, and Mrs. Marina Cherniavsky - certification engineer.
Dr. E. Usoskin is an EMC specialist and 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 70 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 an engineer, graduated from university in 1987 with an BScEE degree, have obtained 11 years experience in EMC measurements and product development and have been with Hermon Laboratories since 1987.

Name: Mr. Alex Usoskin
Position: test manager

Signature:
Date: November 24, 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
Position: certif. engineer

Signature:
Date: November 24, 1998

I hereby certify that this test measurement report was prepared under my direction and that to the best of my knowledge and belief, the facts set in the report and accompanying technical data are true and correct.
The following is a statement of my qualifications.
I have a Ph.D. degree in electronics, have obtained more than 41 years of experience in EMC measurements and electronic product design and have been with Hermon Laboratories since 1986.
Also, I am an EMC engineer certified by the National Association of Radio and Telecommunications Engineers, Inc. (USA). The certificate no. is EMC-000623-NE, Senior Member.

Name: Dr. Edward Usoskin
Position: C.E.O.

Signature:
Date: November 24, 1998

3 Radiated Emission Measurements

3.1 Occupied bandwidth according to § 15.239 (a)

3.1.1 Definition of the test

This test was performed to demonstrate that the emissions from the EUT are confined within the band of 200 kHz width centered on the operating frequency. The 200 kHz band should be wholly within the frequency range of 88 - 108 MHz.

3.1.2 Test procedure and results

The measurements were performed at three channels: low (88.1 MHz), middle (98 MHz) and high (107.9 MHz). The spectrum trace data around transmitter fundamental frequency was obtained with the spectrum analyzer in "Max Hold" mode. The bandwidth value was determined between two points 26 dB down from the center frequency. The measured results are less than 200 kHz.
The test results are shown in Table 3.1.1 and Plots 3.1.1 to 3.1.3.

Table 3.1.1
Occupied bandwidth measurement results

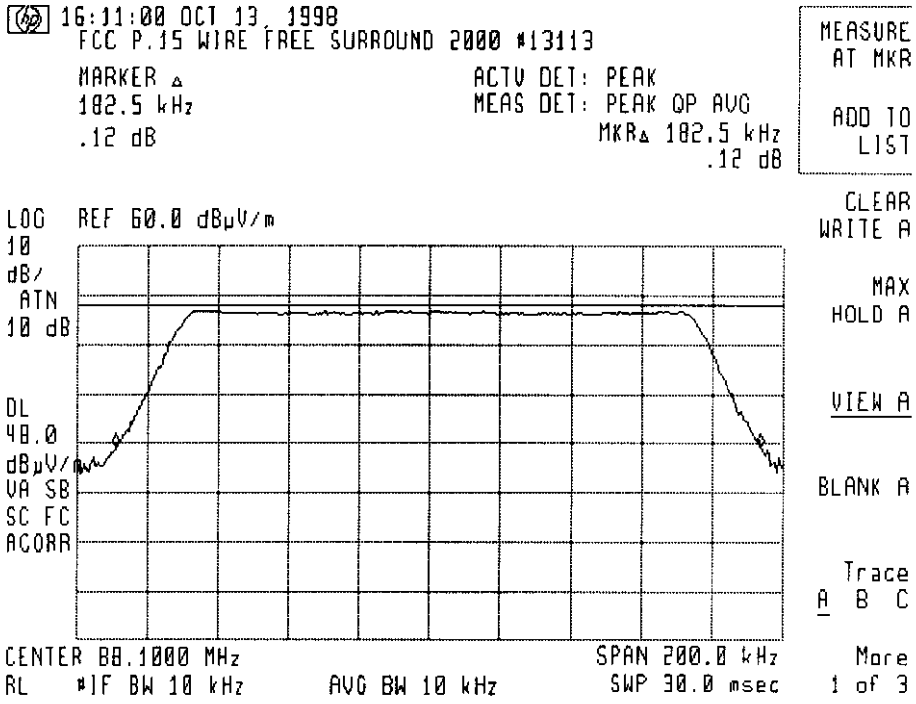
Center frequency, MHz	Measured occupied bandwidth, kHz	Pass/Fail
88.1	182.5	Pass
98	146.5	Pass
107.9	137	Pass

Reference numbers of test equipment used

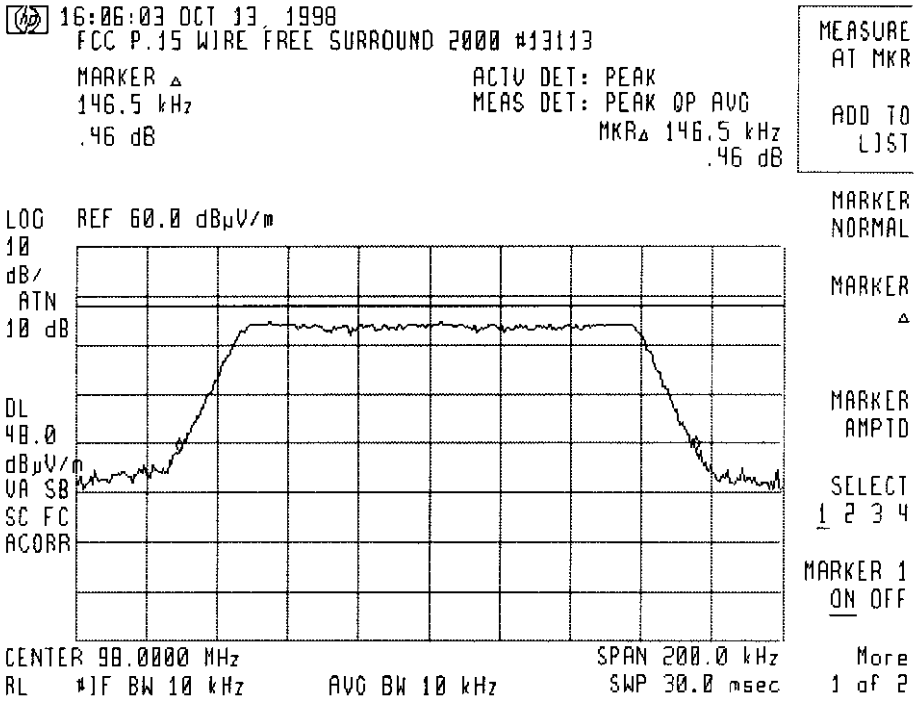
HL 0521	HL 0593	HL 0594	HL 0604	HL 0815	HL 0816	

Full description is given in Appendix A.

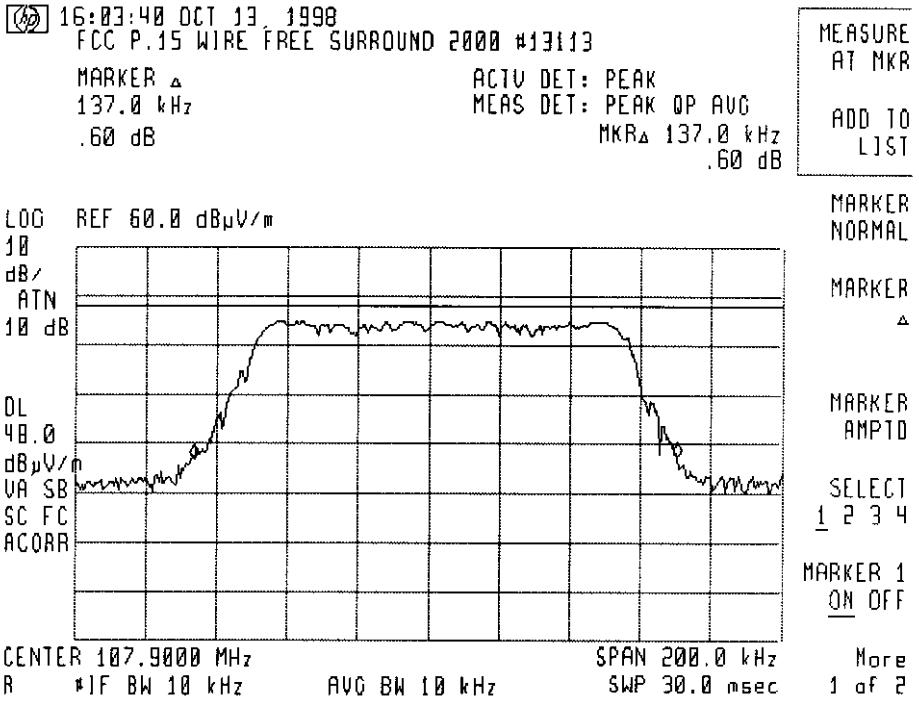
Plot 3.1.1
Occupied bandwidth measurement results



Plot 3.1.2
Occupied bandwidth measurement results



Plot 3.1.3
Occupied bandwidth measurement results



3.2 Field strength of emissions according to § 15.239 (b)

3.2.1 Specified limits

Fundamental frequency MHz	Field strength of fundamental @3 m distance	
	µV/m	dB (µV/m)
88 - 108	250	48

3.2.2 Test procedure and results

The test was performed in the anechoic chamber at 3 meter test distances, i.e. the distance between measuring antenna and EUT boundary.
The EUT was installed on the 0.8 m high wooden table which was on the top of the metal turntable flush mounted with the ground plane as shown in Figure 3.2.1 and Photographs 3.2.1 to 3.2.3. The biconilog antenna was used. To find the maximum radiation measuring antenna height was changed from 0.8 to 4 m, the turntable was rotated 360° and the antenna polarization was changed from vertical to horizontal.
The EUT was operated in transmitting mode. The measurements were performed at three modulated carrier frequencies: 88.1 MHz, 98 MHz and 107.9 MHz.
The average detector was used. The EUT has successfully met the average emission requirements. The peak emission limitation (measured with peak detector) of §15.35 were also met - the maximum difference between peak and average emissions was 6 dB.
The spectrum analyzer settings are shown in plots.
The test results were recorded into Table 3.2 and shown in Plots 3.2.1 to 3.2.3.

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.

Table 3.2

Radiated emission measurements - test results
(Field strength of fundamental frequency)

TEST SPECIFICATION: FCC part 15 subpart C § 15.239(b)
COMPANY: O.N. Wirefree Products (Israel) Ltd.
EUT: Cell-man
DATE: October 13, 1998
RELATIVE HUMIDITY: 41%
AMBIENT TEMPERATURE: 23°C

MEASUREMENTS PERFORMED AT 3 METER DISTANCE

Frequency MHz	Detector type	Measured result dB (µV)	Specified limit dB (µV/m)	Specified margin dB	Pass/ Fail
88.1032	Average	37.19	48	10.81	Pass
88.1032	Peak	41.30	68	26.70	Pass
97.9575	Average	36.77	48	11.23	Pass
97.9575	Peak	42.53	68	25.47	Pass
107.9414	Average	37.85	48	10.15	Pass
107.9414	Peak	42.08	68	25.92	Pass

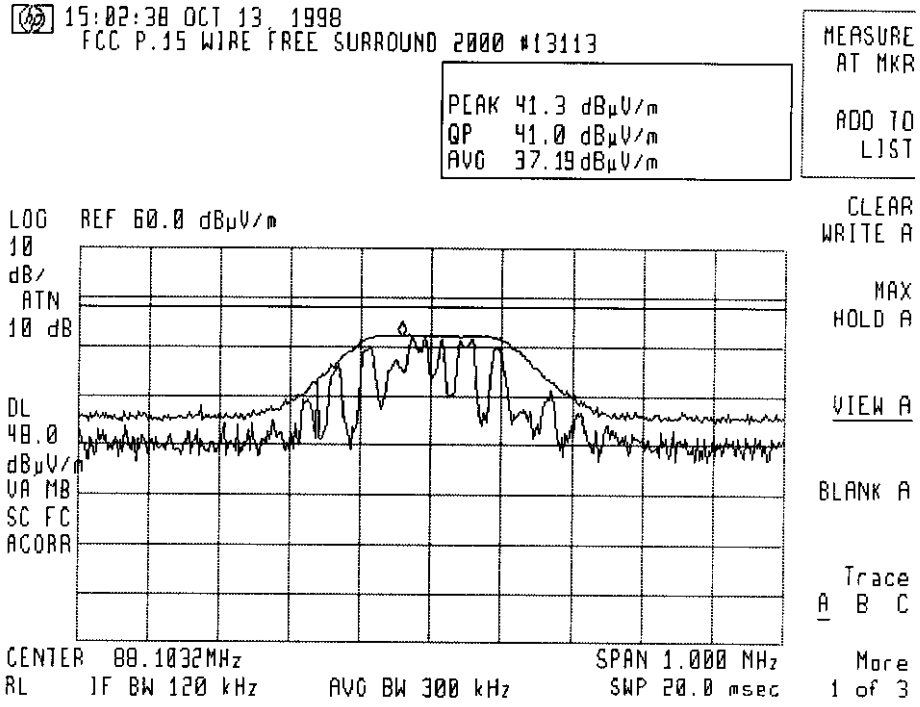
Notes to Table:
The maximum results listed in Table 3.2 were obtained with the biconilog antenna in vertical polarization at 1.1 m height. The turntable position was 26 degrees (EUT front panel position is 0 degrees).

Table Abbreviations:
Spec. margin = Specification margins = dB below (negative if above) specification limit.

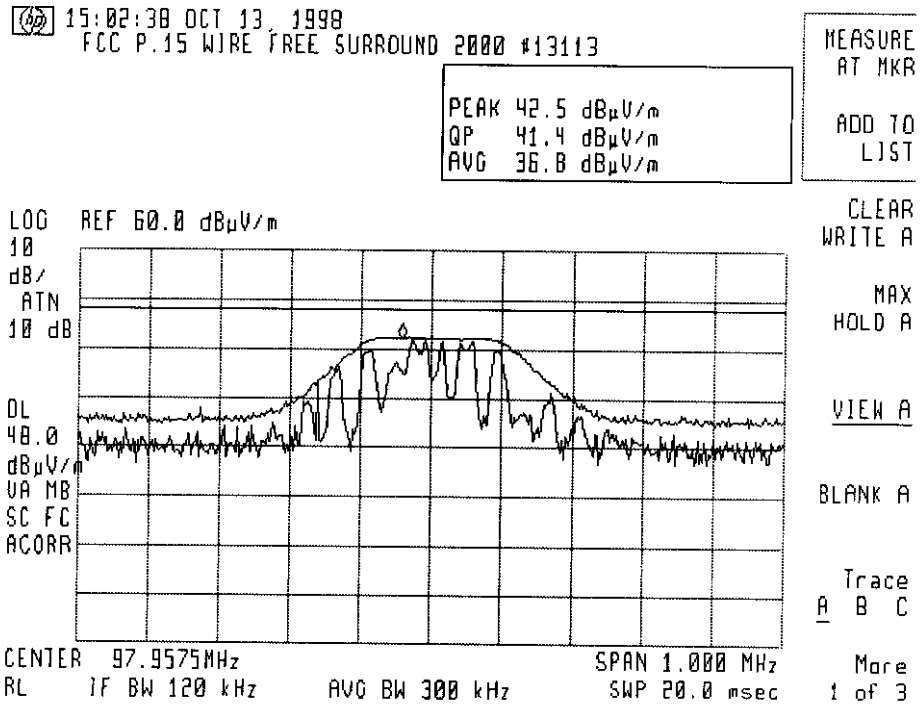
Test performed by:
Mr. Alex Usoskin, test manager

Hermon Labs

Plot 3.2.1
Radiated emission measurement results



Plot 3.2.2
Radiated emission measurement results



Plot 3.2.3
Radiated emission measurement results

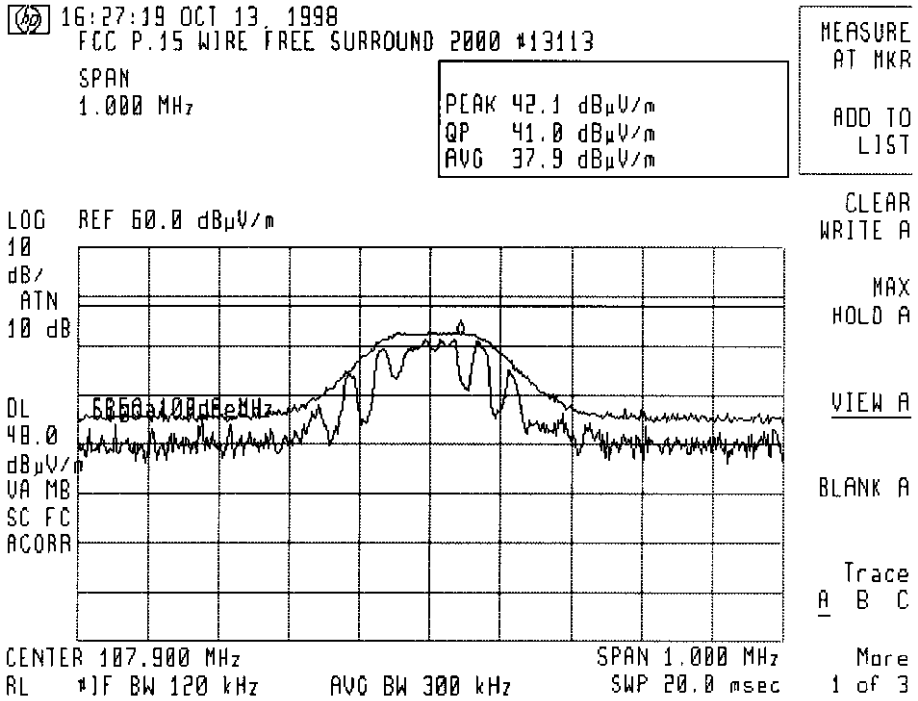
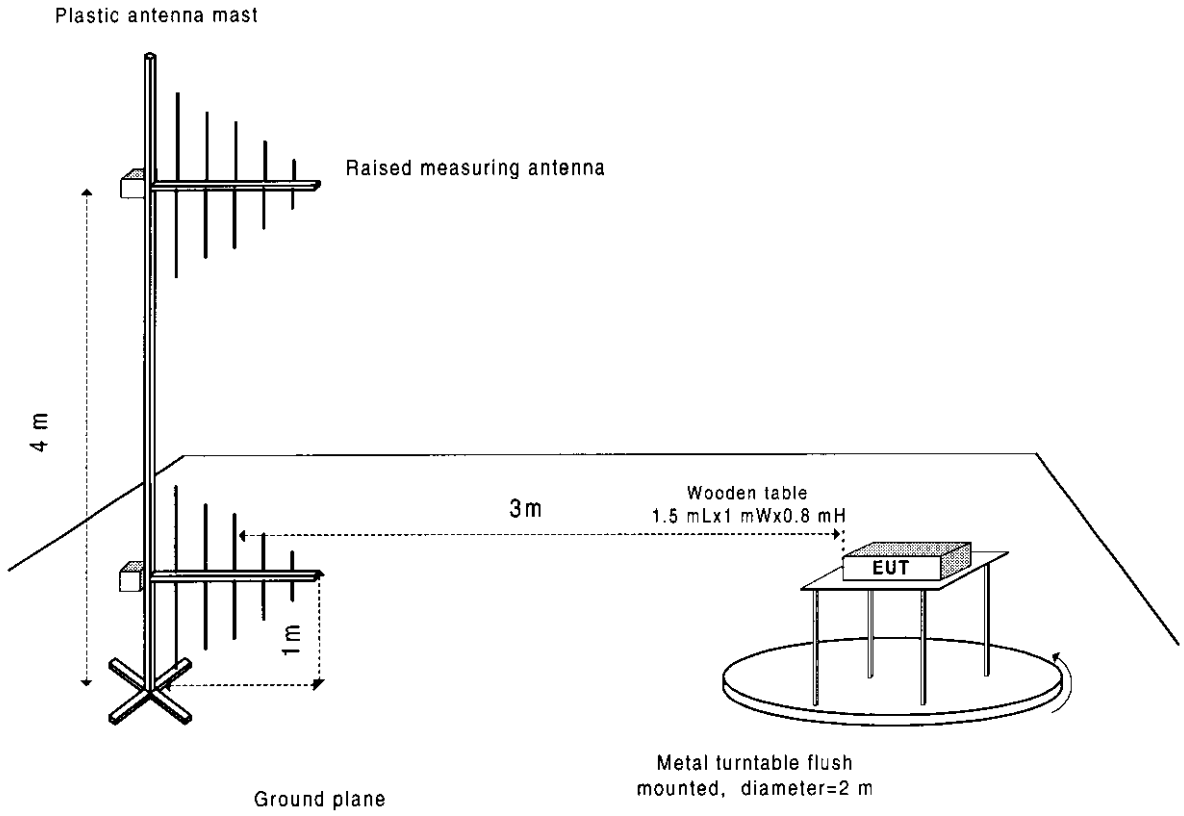


Figure 3.2.1
Radiated emission test setup



3.3 Out-of-band radiated emissions test according to §15.209

3.3.1 Definition of the test

This test was performed to measure radiated emissions on frequencies outside of the specified 200 kHz band and also to verify the EUT full compliance with §15.209.

Radiated emission measurements specification limits are given in Table 3.3.1 below:

Table 3.3.1 Limits for electric field strength at 3 meters distance, general requirements, quasi-peak detector, §15.209

Frequency, MHz	Field strength, dB (μV/m)
30 - 88	40
88 - 216	43.5
216 - 960	46
Above 960	54

3.3.2 Test procedure and results

The radiated emissions measurements were performed in the anechoic chamber at 3 meters 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 and Photographs 3.2.1, 3.2.2, 3.2.3. The biconilog antenna was used. To find maximum radiation the turntable was rotated 360°, the cables position was varied, the measuring antenna height changed from 1 to 4 m, and the antennas polarization was changed from vertical to horizontal.
The quasi-peak detector with resolution bandwidth of 120 kHz was used. The measurements were performed in two modes of the EUT operation: transmitter 'on' and transmitter 'off'.
The results of measurements with transmitter 'on' are shown in Plot 3.3.1. The maximum peak emission result was 34.93 dB(μV/m) @ 46.0487 MHz.
The results of measurements with transmitter 'off' are shown in Plot 3.3.2. All the found emissions were at least 10 dB below specified limit.

Reference numbers of test equipment used

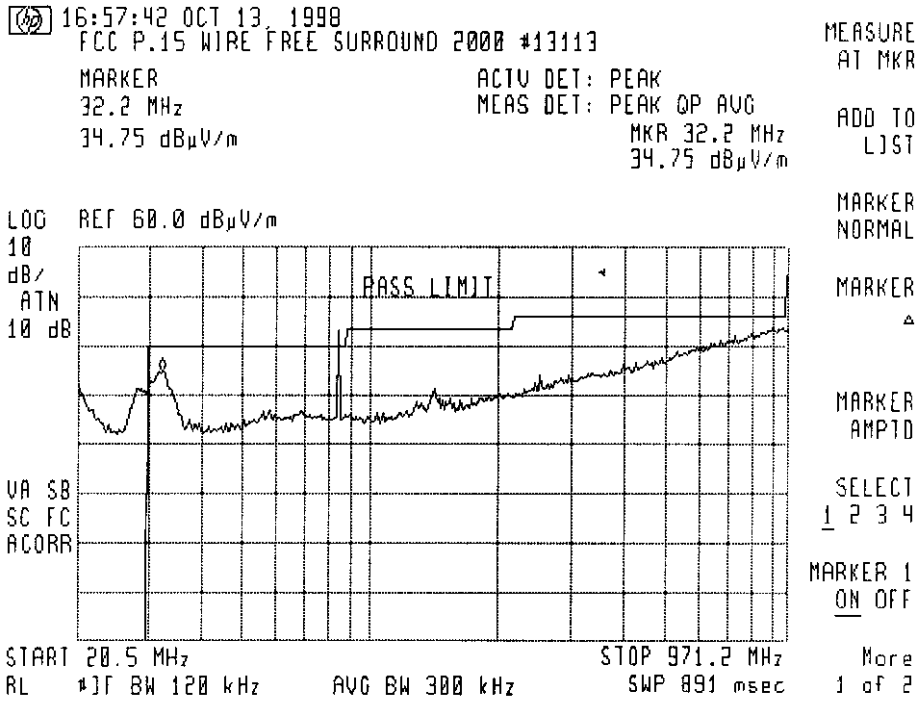
HL 0275	HL 0465	HL 0521	HL 0593	HL 0594	HL 0604	HL 0815
HL 0816						

Full description is given in Appendix A.

Plot 3.3.1
Radiated emission measurement results

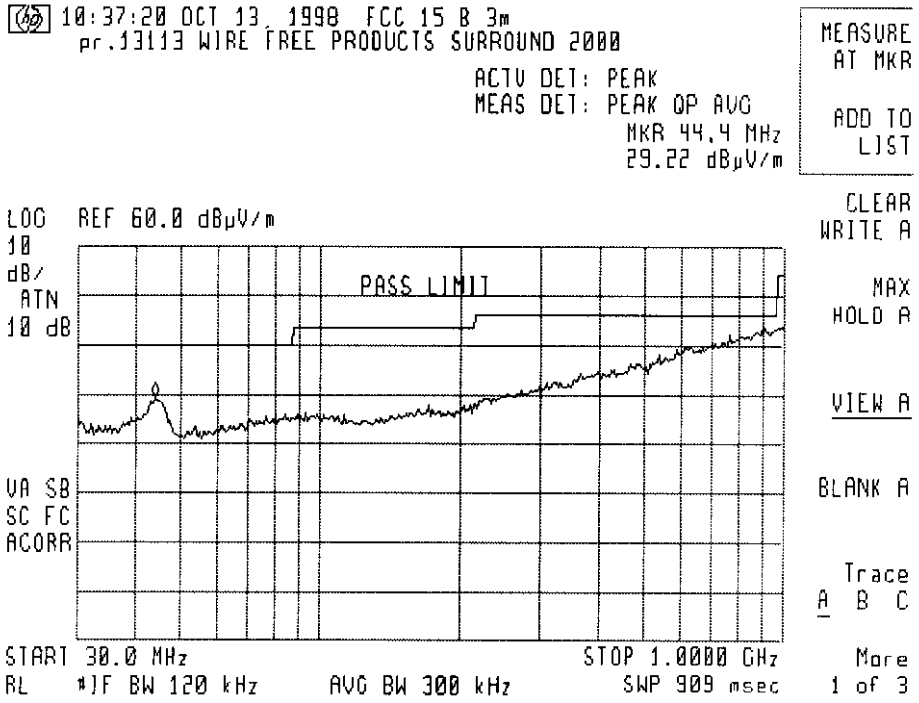
Spurious Emissions, Transmitter on

Signal	Freq (MHz)	Peak Amp (dBuV/m)	Avg Amp (dBuV/m)	Comments
1	46.048727	34.93	13.78	
2	140.132063	26.13	13.62	



Plot 3.3.2
Radiated emission measurement results

Spurious Emissions, Transmitter Off



4 Summary and Signatures

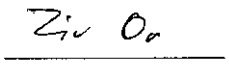
The Cell-man transmitter for cellular phone, FCC ID:NZNZO1, was found to be in compliance with the requirements of FCC part 15, subpart C, §15.239.

Test performed by:

Mr. Alex Usoskin, test manager

Responsible Person from
O.N. Wirefree Products (Israel) Ltd.

Mr. Ziv Or, sales manager



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	NA	NA
0465	0465	Anechoic Chamber 9 mL x 6.5 mW x 5.5 mH	Hermon Labs	NA	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	NA
0594	594	Turntable for Anechoic Chamber, flush mounted, d=1.2 m, pneumatic	Hermon Labs	HL TT-WDC1	11/98
0604	1011	Antenna Log-Periodic/T Bow-Tie, 26 - 2000 MHz	EMCO	3141 BICONILOG	12/98
0815	815	Cable, coax, RG-214, 7.3 m, N-type connectors, inside anechoic chamber	Hermon Labs	C56	8/99
0816	816	Cable, coax, RG-214, 8 m, N-type connectors, outside anechoic chamber	Hermon Labs	C7576	8/99

APPENDIX B-Test Equipment Correction Factors

Antenna factor at 3m calibration
Biconilog antenna EMCO model 3141
Ser.No.1011

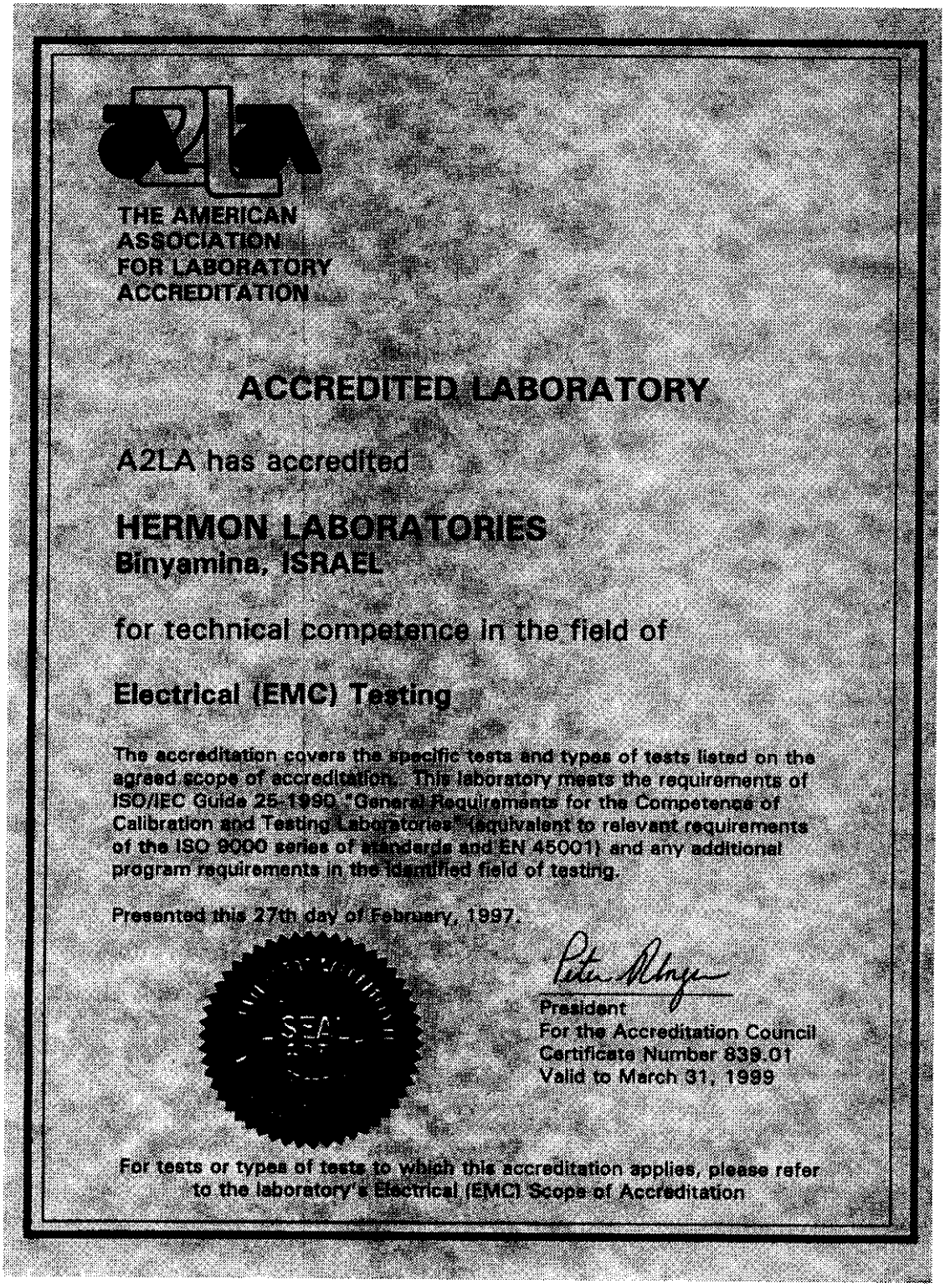
Frequency, MHz	Antenna factor, dB(1/m)
26	7.8
28	7.8
30	7.8
40	7.2
60	7.1
70	8.5
80	9.4
90	9.8
100	9.7
110	9.3
120	8.8
130	8.7
140	9.2
150	9.8
160	10.2
170	10.4
180	10.4
190	10.3
200	10.6
220	11.6
240	12.4
260	12.8
280	13.7
300	14.7
320	15.2
340	15.4
360	16.1
380	16.4
400	16.6
420	16.7
440	17.0
460	17.7
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

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
(cont'd)

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

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 Arching 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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