ELECTROMAGNETIC EMISSIONS TEST REPORT

according to FCC Part 15 subpart C, §15.247 and subpart B

for

BREEZECOM LTD.

EQUIPMENT UNDER TEST:

DS11M system

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Electrical

ACCREDITED
839.01

Description of equipment under test

Test items	DS11M family
Manufacturer	BreezeCom Ltd.
Types (Models)	**DS11M**
Receipt date	April 2, 2000

Applicant information

Applicant's representative	Mr. David Shechter
Applicant's responsible person	Mr. Tsach Shwarts, engineering manager
Company	BreezeCom Ltd.
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Postal code	
City	Tel Aviv
Country	Israel
Telephone number	+972 3 6456262
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Test performance

Project Number:	14002
Location	Hermon Laboratories
Test performed	April 12, 16, June 13, 2000
Purpose of test	The EUT certification in accordance with CFR 47, part 2, §2.1033
Test specification(s)	FCC Part 15, Subpart C, §15.247, §§15.205, 15.207, 15.209, 15.107, 15.109

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1 Summary and signatures

The EUT, DSM11 system, was tested according to FCC part 15 subpart C, §.15.247 and part 15 subpart B §.15.109 and found to comply with the standard requirements.

Test performed by:

Mr. M. Feldman, test technician

Test report prepared by:

Mrs. V. Mednikov, certification engineer

Test report approved by:

Mr. M. Nikishin, EMC group leader

Mr. A. Usoskin, QA manager

The A2LA logo endorsement applies only to the test methods and the standards that are listed in the scope of Hermon Laboratories accreditation by A2LA.
Through this report period is used as decimal separator while thousands are separated by comma.
This report is in conformity with EN 45001 and ISO GUIDE 25.
The test results relate only to the items tested.

2 General information

2.1 Abbreviations and acronyms

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

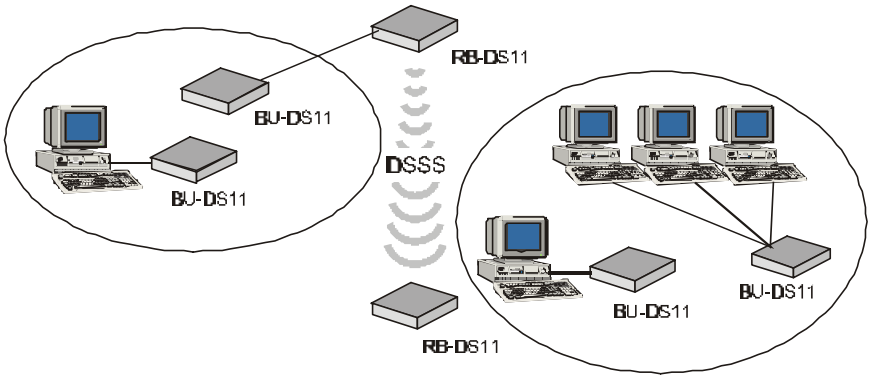
AC	alternating current
AVRG	average (detector)
BER	bit error rate
BW	bandwidth
CE	conducted emissions
cm	centimeter
CW	sine wave
dB	decibel
dBm	decibel referred to one milliwatt
dB(μA)	decibel referred to one microampere
dB(μV)	decibel referred to one microvolt
dB(μV/m)	decibel referred to one microvolt per meter
DC	direct current
EMC	electromagnetic compatibility
EUT	equipment under test
FSK	frequency shift keying
GHz	gigahertz
H	height
HL	Hermon Laboratories
Hz	hertz
IF	Intermediate frequency
kHz	kilohertz
L	length
LISN	line impedance stabilization network
m	meter
mm	millimeter
MHz	megahertz
msec	millisecond
NA	not applicable
NARTE	National Association of Radio and Telecommunications Engineers, Inc.
nF	nanofarad
Ω	ohm
QP	quasi-peak (detector)
PC	personal computer
RBW	resolution bandwidth
RF	radio frequency
RE	radiated emission
sec	second
UTP	unshielded twisted pair
V	volt
V/m	volt per meter
W	watt

2.2 Specification references

CFR 47 part 15:1998	Radio Frequency Devices.
ANSI C63.2:1996	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.

2.3 EUT description

The BreezeNET BU-DS.11 and RB-DS.11 can be used as a high speed connection between two remote networks.



DS.11 Outdoor Application

BU-DS.11 Wireless Base Station

The BU-DS.11 is an IEEE 802.11 TGb-compliant base station bridge that is used to connect either a single remote site or multiple remote sites to a central server or Internet connection. It is the central unit for a point to multipoint configuration. It may be also used as one side of point-to-point configuration.

The BU-DS.11 comes in two options: the basic unit comes with an antenna integrated on the front cover of the Outdoor unit. In this model, the front cover also functions as a protective sun cover.

In BU-DS.11D models with no integral antenna, the unit is provided with one or two antenna connectors (on the Outdoor unit) for connection of one or two external antennas. When this unit is ordered, no antenna is supplied by BreezeCOM and a protective sun cover is mounted on the front of the Outdoor unit. When two antennas are connected to the Outdoor unit, the unit supports the antenna diversity feature described below.

RB-DS.11 Wireless Bridge Client

The RB-DS.11 connects a remote Ethernet network to a BU-DS.11 Multipoint Base Station bridge located at a central server or Internet site. It can be programmed to handle up to 1024 MAC addresses.

When a station on the Ethernet LAN sends a message that is not destined for a local station, the RB-DS.11 wirelessly forwards the message to the BU-DS.11. When the BU-DS.11 receives a message destined for a station on the RB-DS.11's LAN, the BU-DS.11 wirelessly forwards it to the RB-DS.11. In this manner, the RB-DS.11 and the BU-DS.11 work together like a standard network bridge.

The first time each station on the RB-DS.11's LAN sends a message, the station's address is registered in the RB-DS.11 and the BU-DS.11. The RB-DS.11 and BU-DS.11 can hold all the addresses necessary to support an entire LAN connected to a RB-DS.11.

The RB-DS.11 comes in two options: the basic unit comes with an antenna integrated on the front cover of the Outdoor unit.

The RB-DS.11D has no integral antenna, and provides one or two antenna connectors (on the Outdoor unit) for connection of one or two external antennas. When this unit is ordered, no antenna is supplied by BreezeCOM. When two antennas are connected to the Outdoor unit, the unit supports the antenna diversity feature described below.

Antenna diversity

In applications where no multipath propagation is expected, a single antenna is sufficient for good performance levels. However, in cases where multipath propagation exists BreezeCOM recommends using two antennas in order to utilize the space diversity feature. By using two antennas per unit, the system can select the best antenna on a per-packet basis (every several milliseconds).

Multipath propagation is to be expected when there are potential reflectors between the main and remote sites. These reflectors may be buildings or moving objects such as airplanes and motor vehicles. If this is the case, the radio signal does not travel in a straight line, but is reflected or deflected off of the object, creating multiple propagation paths.

The IEEE802.11 specification calls out 11 selectable channels (USA) between 2412 MHz and 2462 MHz. Because of the transmission bandwidth of the DS modulation, only 3 channels are non-overlapping. Those are channels 1, 6, and 11, therefore, only 3 systems may be co-located. The other channels may be used, however, if used with another DS system co-located on another nearby channel, the overlap will cause them to share the bandwidth yielding no increase in aggregate data bandwidth. When operating in a single channel network, the other channels may be used to move away from any in band interference that may exist.

2.4 EUT test configuration

The EUT test configuration is given in Figures 2.4.1, 2.4.2, ports and lines description in Tables 2.4.1, 2.4.2, EUT support/test description in Table 2.4.3, operating frequencies in Table 2.4.4.

Table 2.4.1
EUT (with two external antennas) ports and lines

Unit	Port type	Port Description	Indoor/ outdoor	Connector type	Quantity	Cable type description	Cable length, m	Connected to
IDU	Power	Power	Indoor	Standard main	1	unshielded	1.5	AC mains
IDU	Signal	10BaseT	Indoor	RJ45	1	UTP	3	laptop
IDU	Data& power	Ethernet+ power + control	Outdoor	RJ45	1	8 wire shielded	up to 100 3 during the test	ODU
ODU	Data& power	Ethernet + power	Outdoor	RJ45	1	8 wire shielded	up to 100 3 during the test	IDU
ODU	Signal	Antenna	Outdoor	N type f	2	w/o cable	antenna	
							open circuit	

Table 2.4.2
EUT (with integral antenna) p orts and lines

Unit	Port type	Port Description	Indoor/ outdoor	Connector type	Quantity	Cable type description	Cable length, m	Connected to
IDU	Power	Power	Indoor	Standard main	1	unshielded	1.5	AC mains
IDU	Signal	10BaseT	Indoor	RJ45	1	UTP	3	laptop
IDU	Data& power	Ethernet+ power + control	Outdoor	RJ45	1	8 wire shielded	up to 100 3 during the test	ODU
ODU	Data& power	Ethernet + power	Outdoor	RJ45	1	8 wire shielded	up to 100 3 during the test	IDU

Table 2.4.3
EUT (with two external antennas or with integral antenna) support/test equipment

Description	Manufacturer	Model number	Serial number
IDU	Breezcom	DS11M	NA
Laptop	IBM	Think pad 380Z	78-CVXW6

Table 2.4.4
EUT (with two external antennas or with an integral antenna) operating frequencies

Frequency	UNIT		Description
	IDU	ODU	
22MHz		*	Clock Osc.
44MHz		*	Master Clock Osc.
748MHz		*	IF Local Osc.
374MHz		*	IF FREQ.
2038 – 2088MHz		*	RF Local Osc.
2412 – 2462MHz		*	RF Carrier Freq.

Figure 2.4.1
EUT (with external antennas) conducted emission test configuration

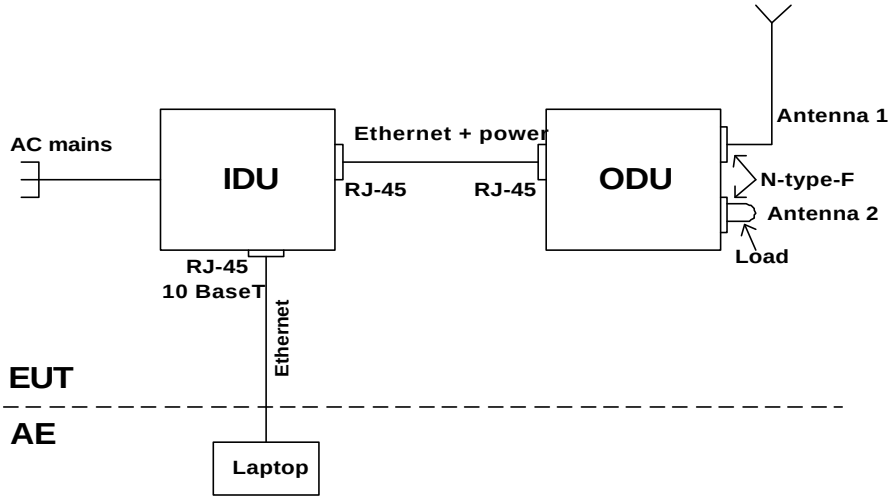
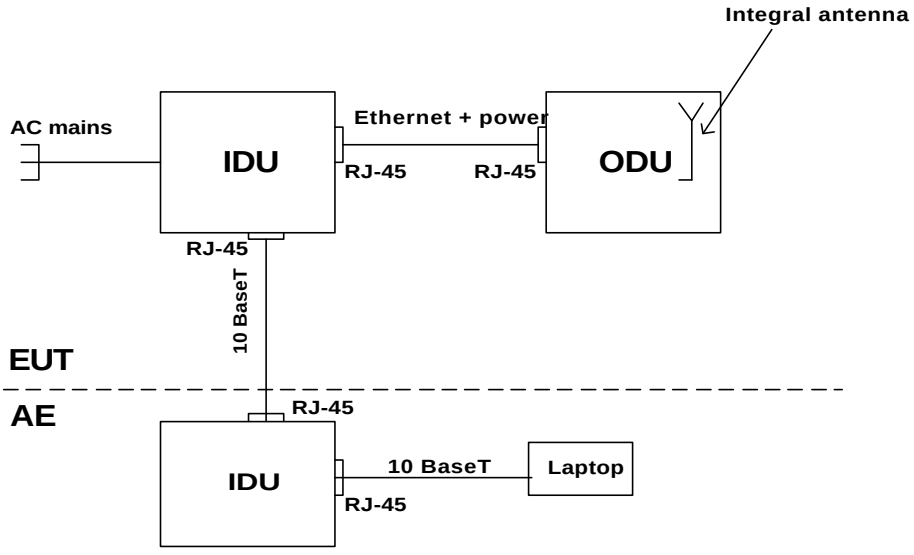


Figure 2.4.2
EUT (with integral antenna) conducted emission test configuration



3 Test Facility Description

3.1 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 (the registration numbers are R-808 for OATS, R-809 for anechoic chamber, C-845 for conducted emissions site), 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). At the end of 1999, Hermon Laboratories signed an agreement with Intertek Testing Services NA. INC. concerning mutual recognition of the test results for EMC and Safety. According to this agreement Hermon Laboratories customers can bear ETL safety mark after successful testing in Hermon Laboratories. Also the laboratory performs various follow-up services.

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

3.2 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.

3.2.1 Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Radiated emissions in the open field test site at 10 m measuring distance	Biconilog antenna: ±3.2 dB Log periodic antenna: ±3 dB Biconical antenna: ±4 dB
Radiated emissions in the anechoic chamber at 3 m measuring distance	Biconilog antenna: ±3.2 dB

3.3 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 30 years experience in electronics and measurements.
I have been with Hermon Laboratories since 1995.

Name: Mr. Michael Feldman Signature: _____
Position: test technician Date: July 2, 2000

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 have a university degree and more than 10 years experience in document processing.
I have been with Hermon Laboratories since May 1999.

Name: Mrs. Valeria Mednikov Signature: _____
Position: certification engineer Date: July 2, 2000

4 Emission measurements

4.1 Minimum bandwidth according to §15.247(a)(2)

4.1.1 General

This test was performed to prove that the EUT minimum 6 dB bandwidth is at least 500 kHz.

4.1.2 Test setup and procedure

The EUT transmitting antenna was removed and RF output was connected to the spectrum analyzer, refer to Photograph 4.1.1.
The EUT was connected to computer and the radio transmission was activated.

All the spectrum analyzer settings are shown in the plots.

The measurements were performed in normal mode of operation. The minimum bandwidth measurements were performed for carrier (channel) frequency at low and high edges and at the middle of the frequency band. Table 4.1.1 and Plots 4.1.1 to 4.1.3 demonstrate the test results of the minimum bandwidth measurements.

Table 4.1.1 Occupied bandwidth test results

Carrier frequency, MHz	Measured 6 BW, MHz	Minimum, kHz	Result
2412	10.6	500	Pass
2437	10.1	500	Pass
2462	11.0	500	Pass

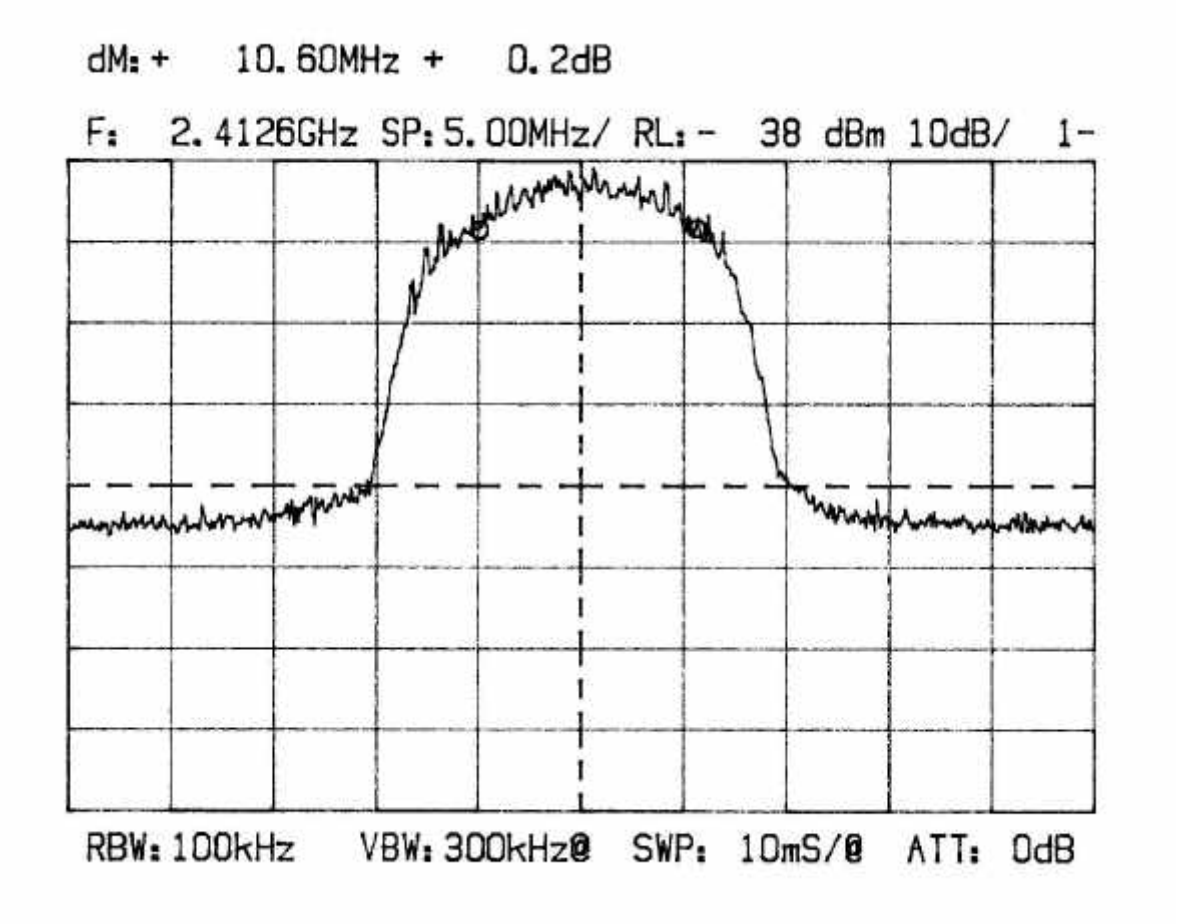
Reference numbers of test equipment used

Hl 0025	HL 0740

Full description is given in Appendix A.

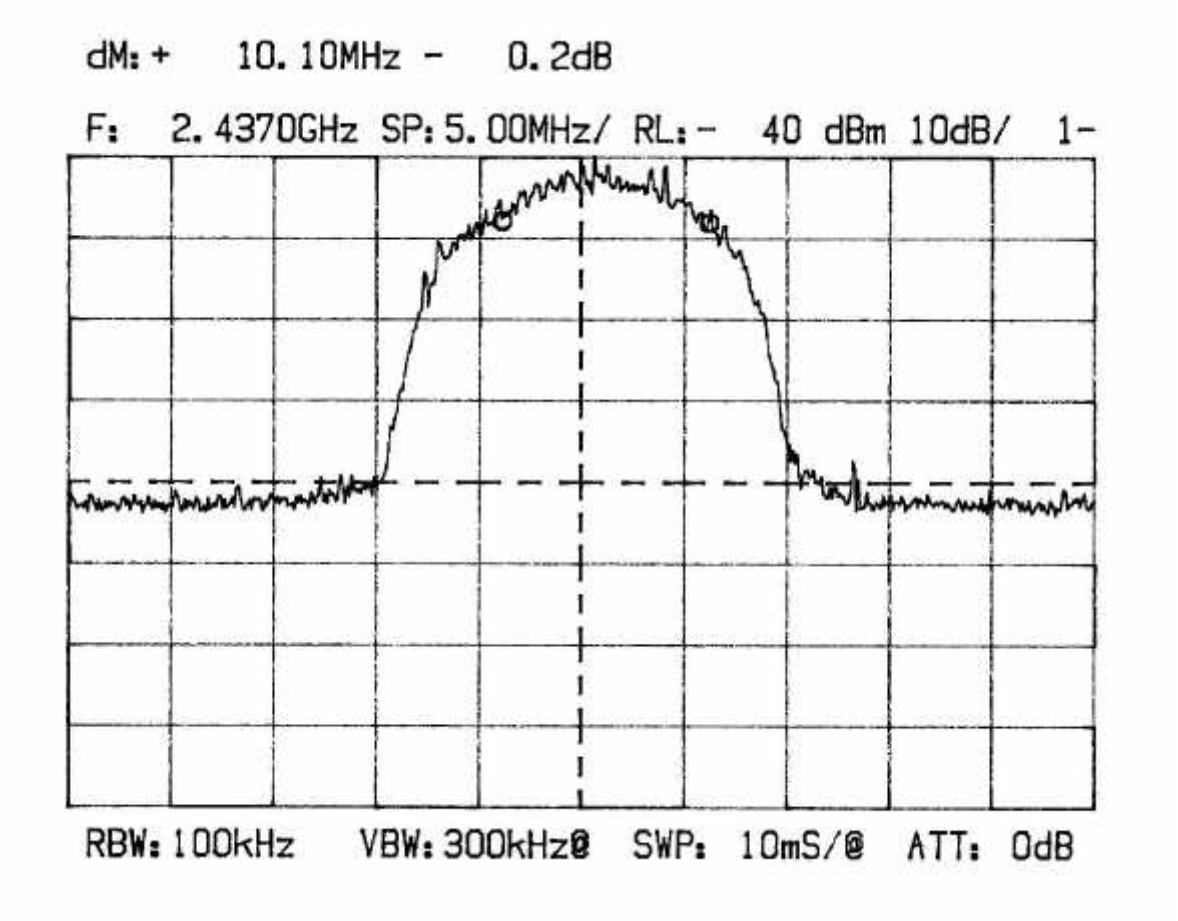
Plot 4.1.1

Test specification: § 15.247(a)(2)
Minimum bandwidth test results
Channel 1



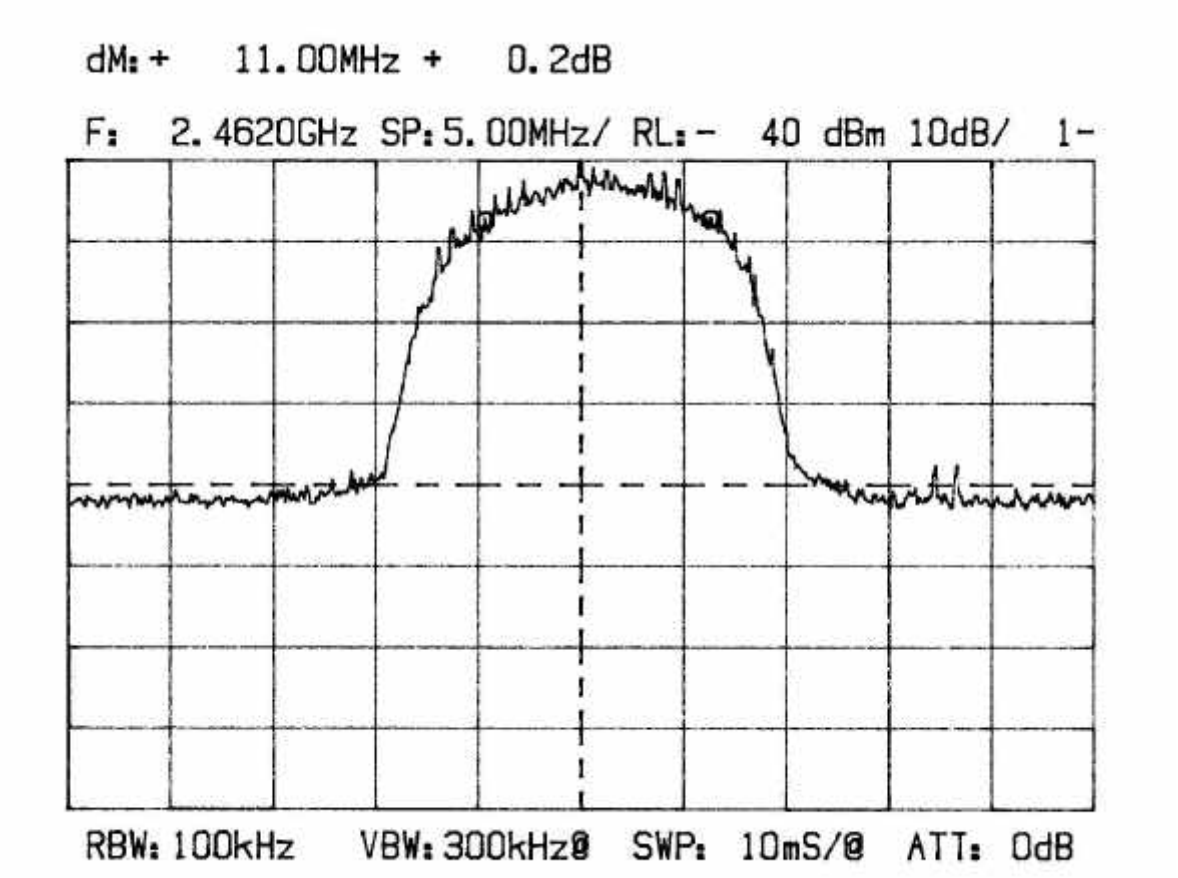
Plot 4.1.2

Test specification: § 15.247(a)(2)
Minimum bandwidth test results
Channel 6



Plot 4.1.3

Test specification: § 15.247(a)(2)
Minimum bandwidth test results
Channel 11



Photograph 4.1.1
Setup for minimum bandwidth measurements

4.2 Maximum peak output power according to § 15.247(b)

4.2.1 General

This test was performed to demonstrate that the maximum RF peak output power of the transmitter does not exceed 1 W (30 dBm) (§15.247 (b)(1)).
If the transmitting antenna gain is greater than 6 dBi, the peak output power from the intentional radiator shall be reduced below the stated values by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For our case the limits for different antennas are shown in Table 4.2.1.

Table 4.2.1 Limits for different antennas

Antenna gain, dBi	Calculated limit, dBm
8 (external antenna)	30 – (8-6) = 28
16 (integral antenna)	30 – (16-6) = 20
24 (external antenna)	30 – (24-6) = 12

4.2.2 Test procedure

The EUT transmitting antenna was removed and RF output was connected to the power meter.

Table 4.2.2 demonstrates the test results of the maximum peak output power measurements.

Reference numbers of test equipment used

Hl 0316	HL 0460	HL 0940

Full description is given in Appendix A.

Table 4.2.2 Maximum peak output power test results

Carrier frequency, MHz	Measured peak output power, dBm	Antenna gain, dBi	Limit, dBm	Result
2412	19.2	8 (external)	28	Pass
2412	14.4	16 (integral)	20	Pass
2412	6.8	24 (external)	12	Pass
2437	18.2	8 (external)	28	Pass
2437	13.6	16 (integral)	20	Pass
2437	6.4	24 (external)	12	Pass
2462	18.3	8 (external)	28	Pass
2462	13.9	16 (integral)	20	Pass
2462	6.8	24 (external)	12	Pass

4.2.3 Exposure limit according to part 1, §1.1310

Limit for power density for general population/uncontrolled exposure is 1 mW/cm^2.

The power density $\mathbf{P\ (mW/cm^2) = P_T / 4p\ r^2}$, where

P_T - the transmitted power, which is equal to the transmitter output plus antenna gain.
Maximal P_T = 6.8 dBm + 24 dBi = 30.8 dBm = 1202 mW .

$$1(mW/cm^2) = 1202\ mW / 4\pi\ r^2$$

The minimum allowed distance “r”, where RF exposure limits may not be exceeded, is 9.8 cm.

$$r = sqrt\ (P_T / 4\pi) = sqrt(\ 1202/\ 4 \times 3.14) = 9.8\ (cm).$$

The EUT is an outdoor mounted unit, therefore the public cannot be exposed to dangerous RF level.

4.3 Peak power spectral density according to § 15.247(d)

4.3.1 General

The test was performed to prove that the peak power spectral density conducted from the intentional radiator to the antenna was not greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

4.3.2 Test procedure

The test setup was the same as in test 4.1.
The measurements were performed in all three channels (1, 6 and 11).

Table 4.3.1 demonstrates the test results of the peak power spectral density measurements.

Table 4.3.1 Peak power spectral density test results

Channel	frequency*, MHz	Antenna gain, dBi	Measured spectral density, dBm	Limit, dBm	Result
1	2413	8	-0.9	8	Pass
	2408	16	-6.1	8	Pass
	2410	24	-13.1	8	Pass
6	2437	8	-2.4	8	Pass
	2438	16	-7.0	8	Pass
	2438	24	-12.6	8	Pass
11	2462	8	-2.6	8	Pass
	2461	16	-2.0	8	Pass
	2463	24	-11.7	8	Pass

* frequency inside the channel, where the maximum spectral density was found.

Reference numbers of test equipment used

HL 0025	HL 0740

Full description is given in Appendix A.

4.4 Processing gain according to §15.247 (e)(2)

4.4.1 General

This test was performed to demonstrate that the processing gain of the system was at least 10 dB.

4.4.2 Test procedure

The processing gain was measured using the CW jamming margin method according to the following formula:

$$\mathbf{G_p = (S/N)_o + M_j + L_{sys}},\ \text{where}$$

G_p = processing gain of the system,
$(S/N)_o$ = signal to noise ratio = 16.4 dB @ BER 10^{-5} (Breezcom declaration, dated June 13, 2000),
M_j = J/S ratio, the worst case, was found –5.6 dB,
L_{sys} = system losses = 2 dB;

hence

$$\mathbf{G_p = 16.4 - 5.6 + 2 = 12.8\ dB.}$$

Reference numbers of test equipment used

HL 0056	HL 0316	HL 0460	HL 0661	HL 0740

Full description is given in Appendix A.

4.5 Out of band radiated emissions test according to §15.247(c) and § 15.205, 15.209(a)

4.5.1 General

This test was performed to measure spurious emissions emanated from the EUT case and to prove that

1) the EUT out-of-band emissions in any 100 kHz bandwidth outside 2400 to 2483.5 MHz are at least 20 dB below maximum power content as measured in any 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, and
2) radiated emissions which fall in the restricted bands comply with §15.209(a) limits.

4.5.2 Test procedure and results

Radiated spurious emissions measurements were performed in the anechoic chamber with the biconilog and double ridged guide antennas from 30 MHz to 2.9 GHz and at open field test site with double ridged guide horn antenna from 2.9 GHz to 12.6 GHz at 3 meters test distance as shown in Photographs 4.5.1, 4.5.2. For test configuration refer to Figure 2.4.1.

The EUT was set up on the wooden turntable. The EUT antenna output was terminated with dummy load. To find the maximum radiation measuring antenna height was changed from 1 to 4 m, the turntable was rotated 360° and the antennas polarization was changed from vertical to horizontal.

The test was performed for two EUT configurations (with external and with integral antennas) with transmitter operating at each of three channels (1, 6 and 11).

All spurious emissions in 1 – 12.6 GHz range were found at least 20 dB below the specified limit. Emissions found in 30 – 1000 MHz range were due to incorporated digital device, refer to section 4.7 of this test report.

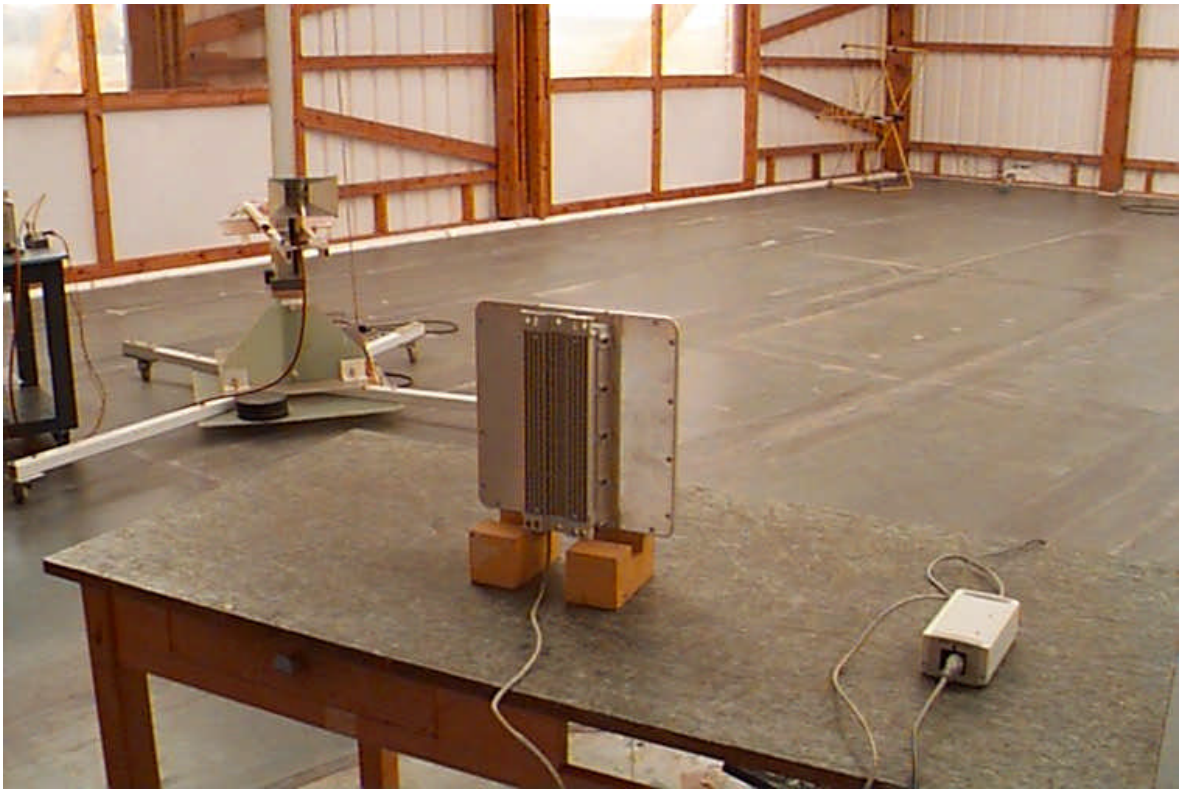
The EUT met standard requirements and successfully passed the test.

Reference numbers of test equipment used

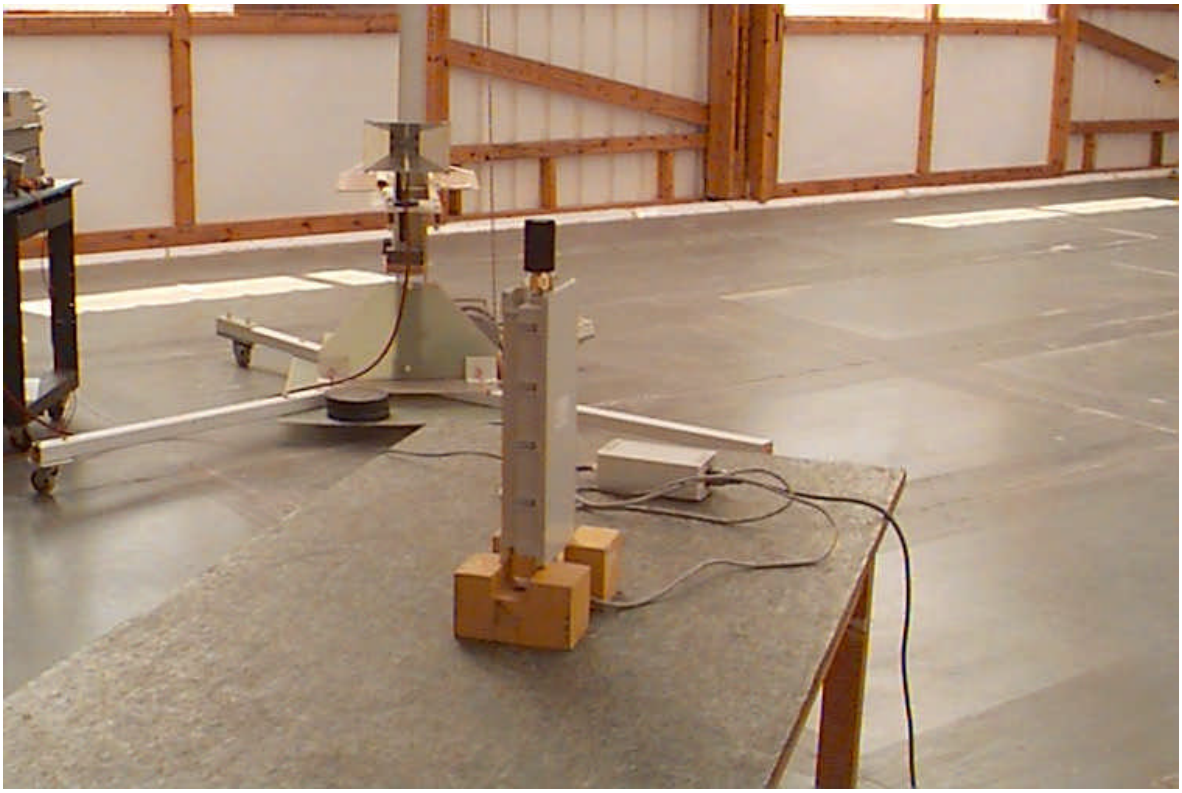
HL 0025	HL 0041	HL 0465	HL 0547	HL 0554	HL 0604

Full description is given in Appendix A.

Photograph 4.5.1
Radiated spurious emissions measurement setup
at the open field test site



Photograph 4.5.2
Radiated spurious emissions measurement setup
at the open field test site



4.6 Out of band conducted emissions test according to §15.247(c)

4.6.1 General

This test was performed to prove that

the EUT out-of-band emissions in any 100 kHz bandwidth outside 2400 to 2483.5 MHz are at least 20 dB below maximum power content as measured in any 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

4.6.2 Test procedure and results

The measurements were performed by means of spectrum analyzer connected to the transmitter RF output.

The measurements were performed with transmitter operating in each of three channels (1, 6, 11) and in stand by mode in frequency range 9 kHz to 12.6 GHz.

All spurious emissions were found at least 20 dB below the specified limit.

The EUT met the standard requirements and successfully passed the test.

Plots C1-C9 in Appendix C are given as an example of conducted emission measurements (channel 1, Tx mode).

Reference numbers of test equipment used

HL 0025	HL 1200

Full description is given in Appendix A.

4.7 Unintentional radiated emissions (class B digital device) test according to §15.109

4.7.1 General

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

Radiated emission measurements specification limits are given in Table 4.7.1 below:

Table 4.7.1
Limits for electric field strength, quasi-peak detector

Frequency, MHz	Class B equipment @ 3 meter distance, dB(mV/m)
30 - 88	40
88 - 216	43.5
216 - 960	46
960 - 5000	54

4.7.2 Test procedure

The test was performed for two EUT configurations: with integral or with external antenna.
In the case of external connector it was terminated with dummy load.
The radiated emissions measurements of the EUT incorporated digital device were performed in the anechoic chamber at 3 meters measuring distance with biconilog antenna. The measurements were performed in frequency range from 30 MHz to 1 GHz. The EUT was placed on the wooden table as shown in Figure 4.7.1.
To find maximum radiation the turntable was rotated 360^{o}, the measuring antenna height changed from 1 to 4 m, and the antennas polarization was changed from vertical to horizontal.

The results of measurements are recorded in Table 4.7.2.

Reference numbers of test equipment used

HL 0465	HL 0521	HL 0589	HL 0593	HL 0604	HL 1175

Full description is given in Appendix A.

Table 4.7.2 Radiated emission measurements test results
frequency range 30 MHz – 5 GHz

DATE: April 10, 2000
RELATIVE HUMIDITY: 61%
AMBIENT TEMPERATURE: 24°C

MEASUREMENTS PERFORMED AT 3 METRES DISTANCE

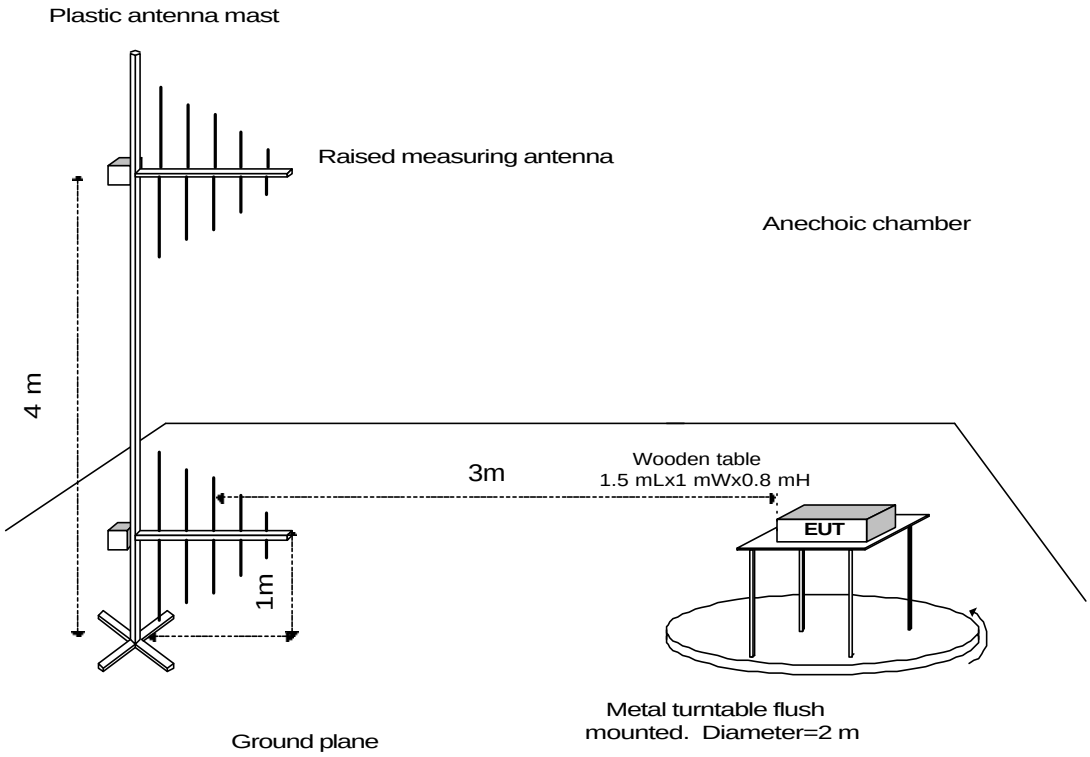
Frequency, MHz	EUT configuration: antenna type	Turntable position Deg.	Radiated emissions, dB (μV/m)	Spec. limit, dB (μV/m)	Margin, dB	Pass/ Fail
319.988	External	216	40.16	46.0	5.84	Pass
344.011	Integral	322	39.12	46.0	6.88	Pass
347.991	Integral	316	39.32	46.0	6.68	Pass
352.014	External	221	44.23	46.0	1.77	Pass
398.006	External	263	38.22	46.0	7.78	Pass
404.011	Integral	28	41.29	46.0	4.71	Pass
408.005	Integral	17	39.51	46.0	6.49	Pass
416.001	External	258	38.10	46.0	7.90	Pass

Test results recorded in this table were obtained throughout the testing with quasi-peak detector, resolution bandwidth 120 kHz, biconilog antenna in horizontal polarization at 1 m height.

Notes to table calculations:

Margin = dB below (negative if above) specification limit.

Figure 4.7.1
Radiated emission test setup



4.8 Unintentional conducted emissions (class B digital device) test according to §15.107

4.8.1 General

Conducted emission measurements specification limits are given in Table 4.8.1 below.

Table 4.8.1
Limits for conducted emission on AC power lines

Frequency MHz	Class B equipment limit dB(μV)
0.45 - 30	48

4.8.2 Test procedure

The test was performed in the shielded room. The EUT was set up on the wooden table as shown in Figure 4.8.1, Photographs 4.8.1, 4.8.2. Frequency range from 450 kHz to 30 MHz was investigated.
The measurements were performed on the 120 V AC 60 Hz power lines (both neutral and phase) by means of the LISN, connected to the spectrum analyzer. The unused coaxial connector of the LISN was resistively terminated in 50 Ω. The position of the EUT cables was varied to determine maximum emission level. Quasi peak detector (resolution bandwidth = 9 kHz) was used.

The test results are recorded in Table 4.8.2 and shown in Plots 4.8.1 to 4.8.4.

Reference numbers of test equipment used

HL 0026	HL 0447	HL 0466

Full description is in Appendix A.

Table 4.8.2 Conducted emission measurement results on EUT power lines

Frequency range : 450 kHz - 30 MHz
Detector : quasi peak
Resolution bandwidth = 9 kHz

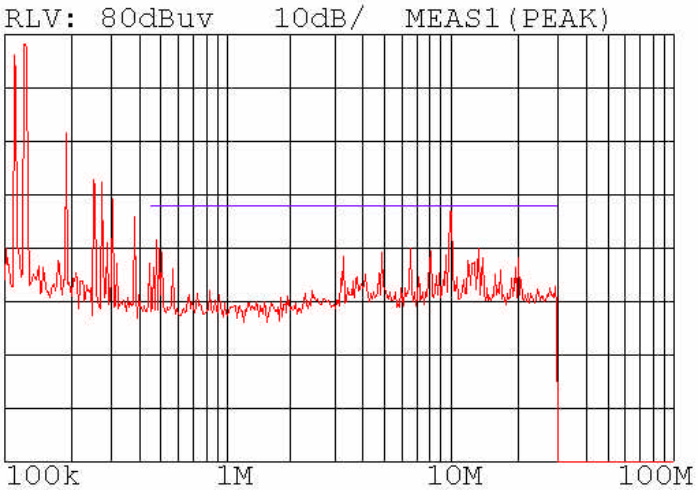
TEST SPECIFICATION: FCC part 15, subpart B, Class B
DATE: April 9, 2000
RELATIVE HUMIDITY: 60%
AMBIENT TEMPERATURE: 20°C

Frequency MHz	Line ID	Conducted Emissions dB (mV)	Limit dB (mV)	Limit margin dB	Pass/ Fail
9.937	Ph	35.12	48	12.88	Pass
9.99	Ph	41.7	48	6.3	Pass
10.00	N	45.05	48	2.95	Pass

Table calculations and abbreviations:
Conducted emission = EMI meter reading (dBµV) + cable loss (dB) + LISN correction factor (dB).
For LISN correction factor refer to Appendix B.
Limit margin = dB below (negative if above) limit.
Line ID = Line identification (Ph - phase, N - neutral).

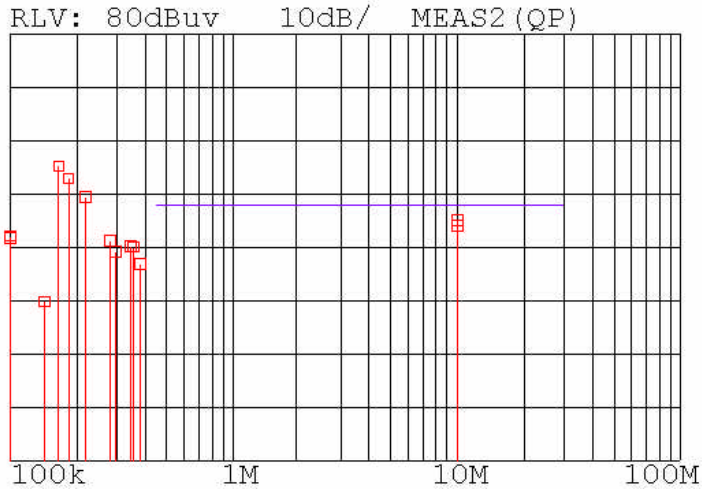
Plot 4.8.1

Test Specification: § 15.107, § 15.207
Conducted emission measurements on power line
Frequency range: 450 kHz-30 MHz
Line: neutral
Detector: peak



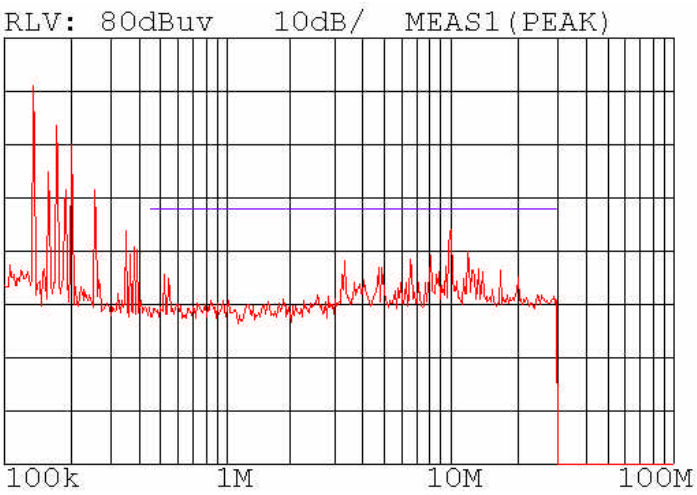
Plot 4.8.2

Test Specification: § 15.107, § 15.207
Conducted emission measurements on power line
Frequency range: 450 kHz-30 MHz
Line: neutral
Detector: quasi-peak



Plot 4.8.3

Test Specification: § 15.107, § 15.207
Conducted emission measurements on power line
Frequency range: 450 kHz-30 MHz
Line: phase
Detector: peak



Plot 4.8.4

Test Specification: § 15.107, § 15.207
Conducted emission measurements on power line
Frequency range: 450 kHz-30 MHz
Line: phase
Detector: quasi-peak

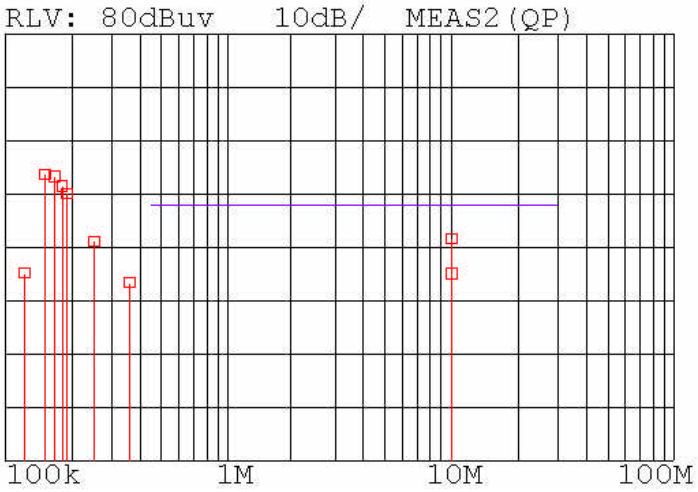
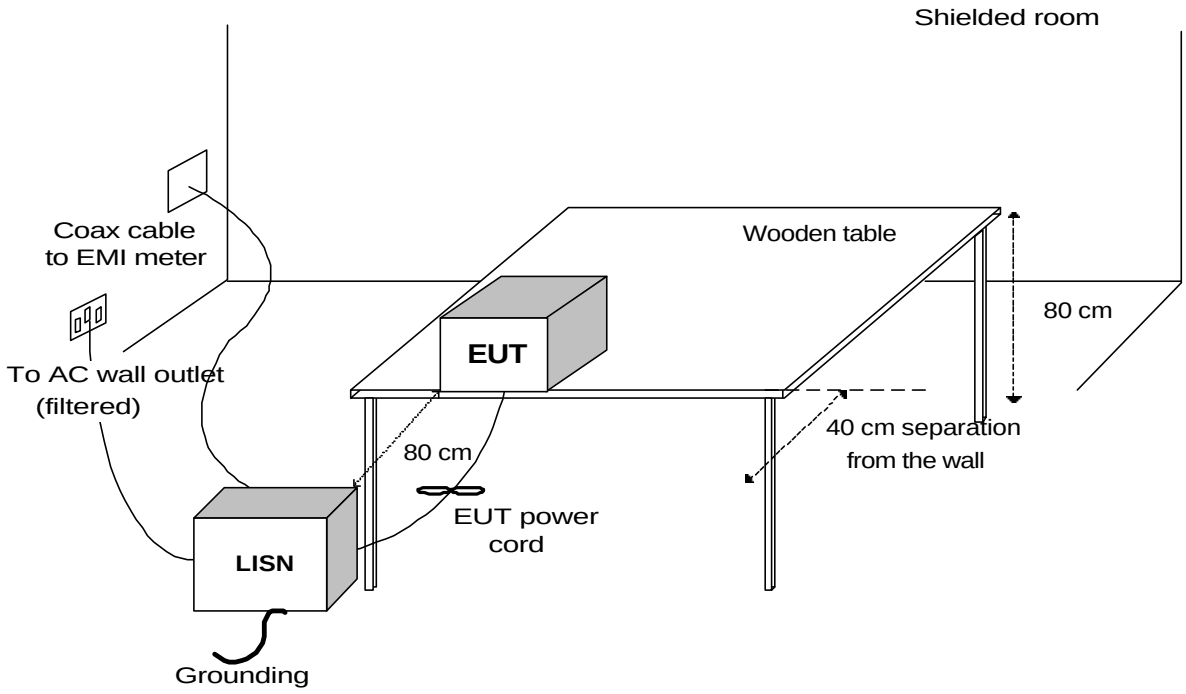
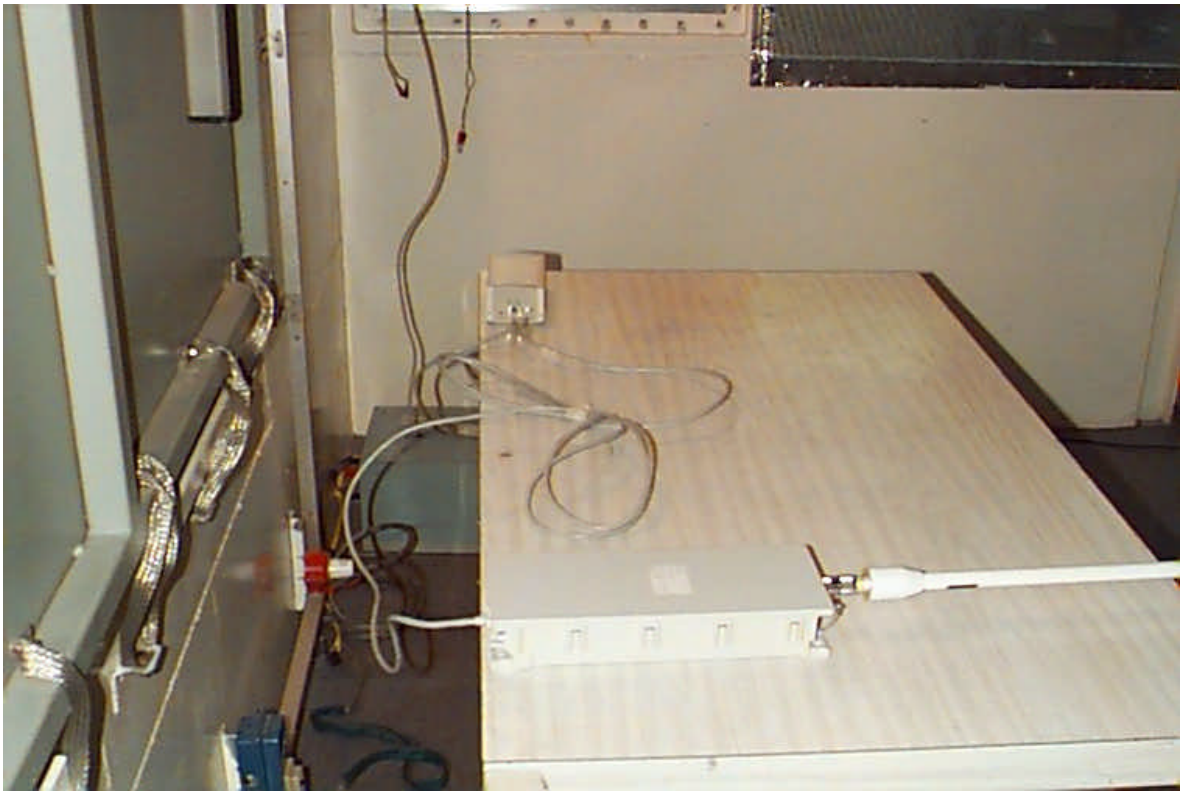


Figure 4.8.1
Conducted emissions test setup for table-top equipment



Photograph 4.8.1
Conducted emission measurements test setup

Photograph 4.8.2
Conducted emission measurements test setup



APPENDIX A – Test equipment and ancillaries used for tests

HL Serial No.	Serial No.	Description	Manufacturer	Model No.	Due Calibr.
0025	5837	Spectrum analyzer, 10 kHz-23 GHz	Anritsu	MS-710C	8/00
0026	3460	Spectrum analyzer, 100 Hz-2.2 GHz	Anritsu	MS 2601A	10/00
0041	2811	Ridged guide horn antenna, 1-18 GHz	Electro-Metrics,	RGA 50/60	7/00
0056	2627	Attenuator, 50 Ohm, 2W, 0-18 GHz, 30 dB	Hewlett Packard	8492A	2/01
0316	02BK	Power meter, RF, IEEE-488, 100 kHz-100GHz, -70 to +37 dBm	Boonton	4220-01	2/01
0447	0447	LISN, 16/2, 300 V RMS	Hermon Labs	LISN 16-1	12/00
0460	27705	Power sensor 500 kHz to 18 GHz, 50 Ohm	Boonton	51075	2/01
0465	023	Anechoic chamber 9 (L) x 6.5 (W) x 5.5 (H) m	Hermon Labs	AC-1	10/00
0466	024	Shielded room 3 (L) x 3 (W) x 2.4 (H) m	Hermon Labs	SR-1	5/02 Check
0521	0319	Spectrum Analyzer with RF filter section (EMI Receiver 9 kHz - 6.5 GHz)	Hewlett Packard	8546A	7/00
0547	400	Amplifier, GaAs FET,RF 6-18 GHz,2 W30 dB,12 V/1.2 A, N.F4.5 dB	Avantek	AMT - 12407 M	12/00
0554 0589	4300 589	Amplifier, RF, 2-18 GHz Cable Coaxial, GORE A2POL118.2, 3m	Miteq Hermon Labs	AFD4 GORE-3	12/00 11/00
0593	101	Antenna Mast, 1-4 m/ 1-6 m Pneumatic	Hermon Labs	AM-F1	2/01
0604	9611-1011	Antenna Biconilog Log-Periodic/T Bow-Tie, 26 - 2000 MHz	EMCO	3141	12/00
0661	0266	Generator Swept Signal, 10MHz to 40GHz+ 10dBm	Hewlett Packard	83640B	2/01
0740	08167	Coupler coaxial directional 1.7-4.2 GHz	Narda	3043B-30	4/01
0872	8767	Cable coax	Amplifier Research	PFP01P010394	7/00
0940	8468	Attenuator, 50 Ohm, 2W, 0-12.4 GHZ,	Hewlett Packard	8491A	2/01
1175	NA	Microwave 5 m cable	Gore	01C02245.2	2/01
1200	0240	QUADRUPLEXER	Elettronica	UE 84	2/01

APPENDIX B-Test equipment correction factors

Correction Factor
Line Impedance Stabilization Network
Model LISN 16 - 1
Hermon Laboratories

Frequency, kHz	Correction Factor
10	4.9
15	2.86
20	1.83
25	1.25
30	0.91
35	0.69
40	0.53
50	0.35
60	0.25
70	0.18
80	0.14
90	0.11
100	0.09
125	0.06
150	0.04

The correction factor dB is to be added to the meter readings (dB/μv) of the interference analyzer or spectrum analyzer.

Antenna factor
Double ridged guide antenna
Electro-Metrics, model RGA-50/60
Ser.No.2811

Frequency, MHz	Antenna Factor, dB(1/m)	Frequency, MHz	Antenna Factor, dB(1/m)
1000	24.3	10,000	38.2
1500	25.4	10,500	38.5
2000	28.4	11,000	39.0
2500	29.2	11,500	40.1
3000	30.5	12,000	40.2
3500	31.6	12,500	39.3
4000	33.7	13,000	39.9
4500	32.2	13,500	40.6
5000	34.5	14,000	41.1
5500	34.5	14,500	40.5
6000	34.6	15,000	39.9
6500	35.3	15,500	37.8
7000	35.5	16,000	39.1
7500	35.9	16,500	41.1
8000	36.6	17,000	41.7
8500	37.3	17,500	45.1
9000	37.7	18,000	44.3
9500	37.7		

Antenna factor dB(1/m) 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)	Frequency, MHz	Antenna Factor, dB(1/m)
26	7.8	940	24.0
28	7.8	960	24.1
30	7.8	980	24.5
40	7.2	1000	24.9
60	7.1	1020	25.0
70	8.5	1040	25.2
80	9.4	1060	25.4
90	9.8	1080	25.6
100	9.7	1100	25.7
110	9.3	1120	26.0
120	8.8	1140	26.4
130	8.7	1160	27.0
140	9.2	1180	27.0
150	9.8	1200	26.7
160	10.2	1220	26.5
170	10.4	1240	26.5
180	10.4	1260	26.5
190	10.3	1280	26.6
200	10.6	1300	27.0
220	11.6	1320	27.8
240	12.4	1340	28.3
260	12.8	1360	28.2
280	13.7	1380	27.9
300	14.7	1400	27.9
320	15.2	1420	27.9
340	15.4	1440	27.8
360	16.1	1460	27.8
380	16.4	1480	28.0
400	16.6	1500	28.5
420	16.7	1520	28.9
440	17.0	1540	29.6
460	17.7	1560	29.8
480	18.1	1580	29.6
500	18.5	1600	29.5
520	19.1	1620	29.3
540	19.5	1640	29.2
560	19.8	1660	29.4
580	20.6	1680	29.6
600	21.3	1700	29.8
620	21.5	1720	30.3
640	21.2	1740	30.8
660	21.4	1760	31.1
680	21.9	1780	31.0
700	22.2	1800	30.9
720	22.2	1820	30.7
740	22.1	1840	30.6
760	22.3	1860	30.6
780	22.6	1880	30.6
800	22.7	1900	30.6
820	22.9	1920	30.7
840	23.1	1940	30.9
860	23.4	1960	31.2
880	23.8	1980	31.6
900	24.1	2000	32.0
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).