HERMON LABORATORIES

839.01
Electrical

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TEST REPORT

ACCORDING TO:

FCC 47CFR part 15: 2008, subpart B, Class B

ICES-003: 2004 Issue 4, Class B

EN 55022: 2006 + A1(07), Class A

EN 61000-3-2: 2006

EN 61000-3-3: 1995+A1(01)+A2(05)

EN 55024: 1998+A1(01)+A2(03)

FOR:

Given Imaging Ltd.

Data Recorder in a cradle

Data Recorder model: DR3

Cradle model: DR3-Cradle

Mode: Charging / Data download

Table of contents

1 Applicant information

Client name:	Given Imaging Ltd.
Address:	P.O.Box 258, Hermon Building, New Industrial Park, Yokneam, 20692, Israel
Telephone:	+972 4909 7746
Fax:	+972 4993 8060
E-mail:	tuvi@givenimaging.com
Contact name:	Mr. Tuvi Moalem

2 Equipment under test attributes

Product name:	Data Recorder, model DR3, hardware version E, software release FFFF, serial number 2002 in a cradle, model DR3-Cradle
Receipt date:	8/12/2009

3 Manufacturer information

Manufacturer name:	Given Imaging Ltd.
Address:	P.O.Box 258, Hermon Building, New Industrial Park, Yokneam, 20692, Israel
Telephone:	+972 4909 7746
Fax:	+972 4993 8060
E-mail:	tuvi@givenimaging.com
Contact name:	Mr. Tuvi Moalem

4 Test details

Project ID:	19944
Location:	Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started:	8/12/2009
Test completed:	8/27/2009
Test specifications:	FCC 47CFR part 15: 2008, subpart B, Class B ICES-003: 2004 Issue 4, Class B EN 55022: 2006 + A1(07), Class A EN 61000-3-2: 2006 EN 61000-3-3: 1995+A1(01)+A2(05) EN 55024: 1998+A1(01)+A2(03)

5 Tests summary

Test	Status
FCC 47 CFR part 15, subpart B	
Section 15.107 Class B, AC power lines conducted emissions	Pass
Section 15.109 Class B, Radiated emissions	Pass
ICES-003	
Section 5.3 Class B, Conducted disturbance measurements	Pass
Section 5.5 Class B, Radiated disturbance measurements	Pass
EN 55022	
Section 5.1 Class B, Conducted disturbance at mains terminals	Pass
Section 5.2 Class B, Conducted disturbance at telecommunication port/s	Not required
Section 6 Class B, Radiated disturbance	Pass
EN 61000-3-2	
Harmonic current emissions	Pass
EN 61000-3-3	
Voltage fluctuations and flicker	Pass
EN 55024	
Immunity to electrostatic discharge (ESD)	Pass
Radiated immunity to radio frequency electromagnetic field	Pass
Conducted immunity to electrical fast transients/ bursts (EFT/ B)	Pass
Conducted immunity to voltage surges	Pass
Conducted immunity to disturbances induced by radio frequency field	Pass
Radiated immunity to power frequency magnetic field	Pass
Conducted immunity to voltage dips and short interruptions	Pass

Testing was completed against all relevant requirements of the test standard. The results obtained indicate that the product under test complies in full with the requirements tested.
The test results relate only to the items tested. Pass/ fail decision was based on nominal values.

	Name and Title	Date	Signature
Tested by:	Mr. G. Briskin, test engineer	August 27, 2009	
	Mr. I. Zahavi, test engineer		
	Mr. V. Shmelkin, test engineer		
Reviewed by:	Ms. N. Averin, certification engineer	August 31, 2009	
Approved by:	Mr. M. Nikishin, EMC and radio group leader	September 8, 2009	

6 EUT description

6.1 General information

The EUT is a data recorder. The EUT was placed in a cradle and tested in charging / data download mode (transferring data to PC station). The EUT in a cradle was powered from AC mains via AC/DC adapter.

6.2 Ports and lines

Port type	Port description	Connected from	Connected to	Qty.	Cable type	Cable length	Indoor / outdoor
Power	AC power	AC/DC adapter	AC mains	1	Unshielded	1 m	Indoor
Power	DC power	Cradle	AC/DC adapter	1	Unshielded	1 m	Indoor
Signal	USB	Cradle	PC	1	Shielded	1.8 m	Indoor
Signal	USB	Cradle	DR3	1	NA	NA	Indoor
Signal	SD	Cradle	SD card reader	1	NA	NA	Indoor
Signal	DVI	PC	Monitor	1	Shielded	1.5 m	Indoor
Signal	Keyboard	PC	Keyboard	1	Unshielded	1.5 m	Indoor
Signal	Mouse	PC	Mouse	1	Unshielded	1.5 m	Indoor
Signal	Parallel	PC	Open circuit	1	Unshielded	1.5 m	Indoor

6.3 EUT system parts

Description	Manufacturer	Model or P/N	Serial number
Data Recorder	Given Imaging	DR3	2002
Cradle	Given Imaging	DR3-Cradle	NA
AC/DC adapter of cradle	MeanWell	MES30A-1	NA
Desktop PC	Dell	Precision T3400	C5JG54J

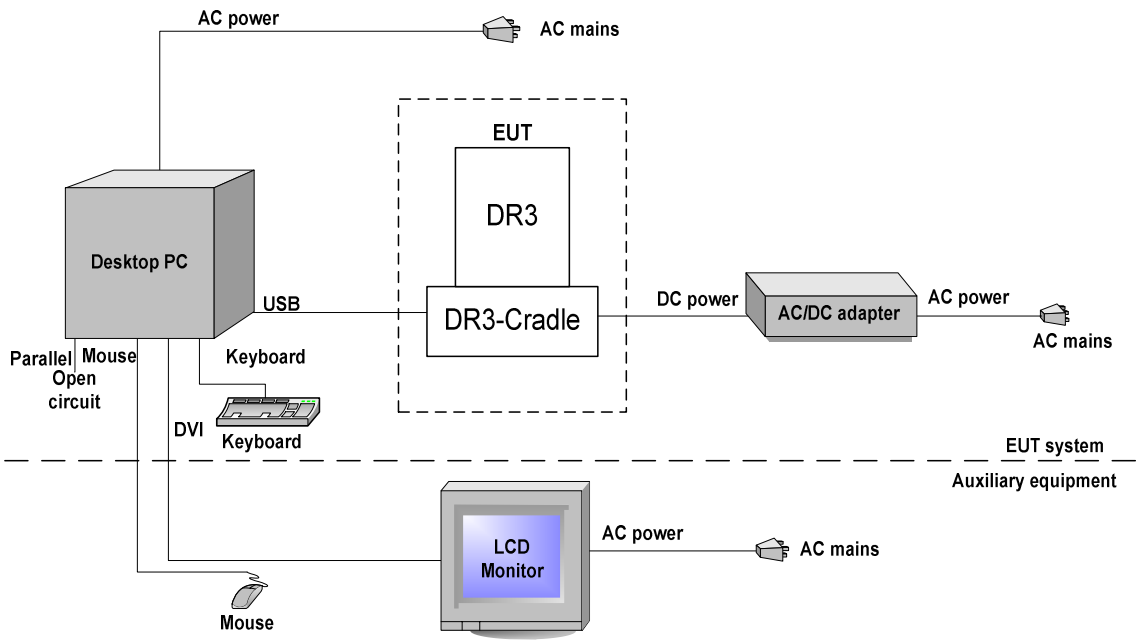
6.4 Auxiliary equipment

Description	Manufacturer	Model number	Serial number
LCD monitor	Samsung	2053BW	AQ20HVDQ600170P
Keyboard	Dell	SK-8115	NA
Mouse	Dell	0XN967	NA

6.5 Operating frequencies

Source	Frequency, MHz					
Clock	27	24	64.1	NA	NA	NA
Internal generator	162	202	404	480	NA	NA

6.6 Test configuration



6.7 Changes made in the EUT

To withstand standard requirements, the following changes were made in the EUT during the testing.

A ferrite bead manufactured by Fair Rite Corp., part number 0431164951 was installed at the USB cable from cradle to PC close to PC. The ferrite location is shown in Photograph 6.7.1.

It is manufacturer responsibility to implement the changes in the production version of the EUT. In any case the test report applies to the tested item only.

Photograph 6.7.1 Changes made in the EUT

6.8 Performance criteria

6.8.1 General performance criteria of EN 55024, Section 7

6.8.1.1 Performance criterion A

The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the manufacturer does not specify the minimum performance level or the permissible performance loss, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

6.8.1.2 Performance criterion B

After the test the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance.

During the test degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test.

If the manufacturer does not specify the minimum performance level or the permissible performance loss, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

6.8.1.3 Performance criterion C

Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions.

Functions and information, stored in non-volatile memory or protected by a battery backup, shall not be lost.

6.8.2 Specific performance criteria of EN 55024, Annex B (Data processing equipment)

6.8.2.1 B.1 Read, write and storage of data

Performance criterion A

Storage devices shall maintain normal operation both in read/write and in standby conditions.

Performance criterion B

Failures, which can be recovered by read and write retries are permissible (temporary delay in processing caused by this process is acceptable).

Normal operation of the EUT shall be restored after the test, self-recovery to the conditions immediately prior to the application of the test is accepted, where this is a normal means of recovery. In these cases, operator response is permitted to re-initialize an operation.

Performance criterion C

Failures resulting in a delay in processing after the external disturbance is removed, but which can be recovered to normal operation by reset or reboot are permissible.

Failures resulting in a system abort, which can be recovered to normal operation by reset or reboot are permissible.

6.8.2.2 B.3 Data input

Performance criterion A

Unintended input from input device is not allowed.

Input devices shall maintain the specified quality image data.

Performance criterion B

Keyboard/mouse "lock up" is not allowed.

For equipment with manually inputted data, which can be recognized by the operator and easily corrected are permissible.

Performance criterion C

Failures resulting in a delay in processing after the external disturbance is removed, but which can be recovered to normal operation by reset or reboot are permissible.

Failures resulting in a system abort, which can be recovered to normal operation by reset or reboot are permissible.

6.8.2.3 B.5 Data processing

Performance criterion A

Failures, which do not influence the specified operation within the product specification, and which do not prevent automatic recovery are permissible.

Performance criterion B

Failures, which are recovered automatically but caused temporary delay in processing, are permissible.

Performance criterion C

Failures resulting in a delay in processing after the external disturbance is removed, but which can be recovered to normal operation by reset or reboot are permissible.

Failures resulting in a system abort, which can be recovered to normal operation by reset or reboot are permissible.

Failures, which are followed by alarms and can be recovered to normal operation by the operator's intervention are permissible.

6.9 Acceptance criteria

The data progress bar on the PC shall not be stopped during the test.

Test specification:	Section 15.107 Class B, AC power lines conducted emissions		
Test procedure:	ANSI C63.4, Section 7.2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 4:33:04 PM		
Temperature: 24.6 ºC	Air Pressure: 1006 hPa	Relative Humidity: 34 %	Power Supply: 120 VAC
Remarks:			

7 Emissions tests according to FCC 47CFR part 15 subpart B requirements

7.1 Conducted emissions

7.1.1 General

This test was performed to measure the common mode conducted emissions at the EUT power ports. The specification test limits are given in Table 7.1.1.

Table 7.1.1 Limits for conducted emissions

Frequency, MHz	Class B limit, dB(µV)		Class A limit, dB(µV)	
	QP	AVRG	QP	AVRG
0.15 - 0.5	66 - 56*	56 - 46*	79	66
0.5 - 5.0	56	46	73	60
5.0 - 30	60	50	73	60

* - The limit decreases linearly with the logarithm of frequency.

7.1.2 Test procedure

7.1.2.1 The EUT was set up as shown in Figure 7.1.1 and the associated photograph, energized and the EUT performance was checked.

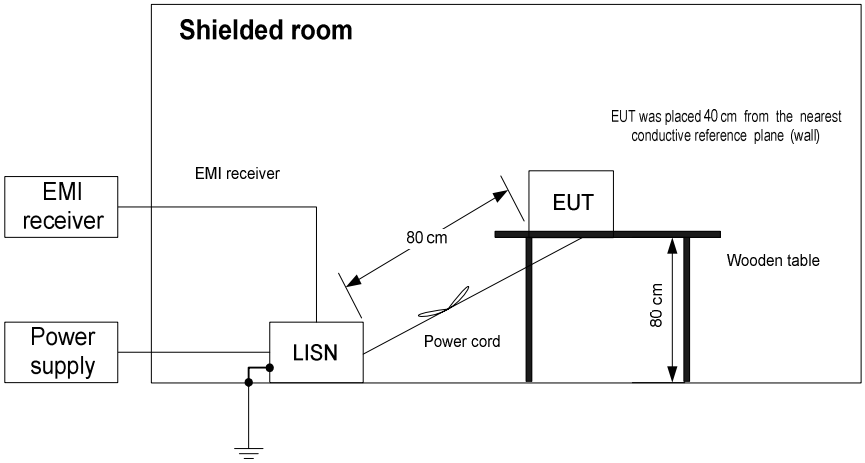
7.1.2.2 The measurements were performed at the EUT power terminals with the LISN connected to the EMI receiver in the frequency range referred to in Table 7.1.2. The unused coaxial connector of the LISN was terminated with 50 Ohm.

7.1.2.3 The position of the EUT cables was varied to find the highest emission.

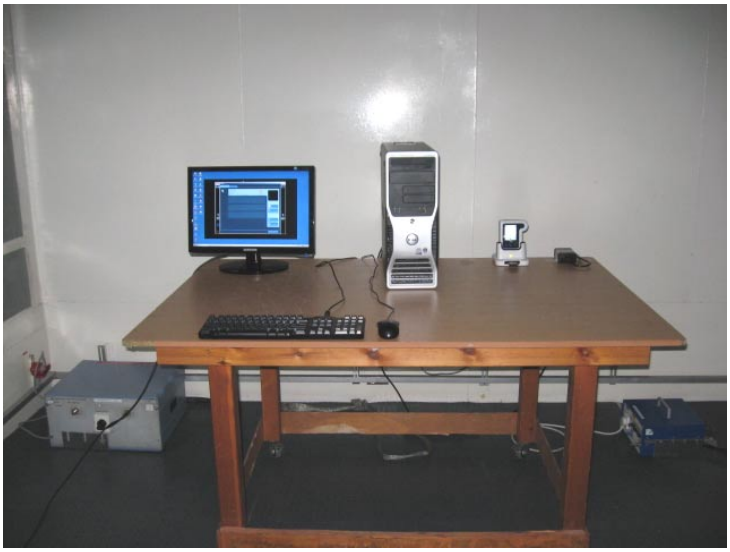
7.1.2.4 The worst test results with respect to the limits were recorded in Table 7.1.2 and shown in the associated plots.

Test specification:	Section 15.107 Class B, AC power lines conducted emissions		
Test procedure:	ANSI C63.4, Section 7.2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 4:33:04 PM		
Temperature: 24.6 ºC	Air Pressure: 1006 hPa	Relative Humidity: 34 %	Power Supply: 120 VAC
Remarks:			

Figure 7.1.1 Setup for conducted emission measurements, table-top EUT



Photograph 7.1.1 Setup for conducted emission measurements



Test specification:	Section 15.107 Class B, AC power lines conducted emissions		
Test procedure:	ANSI C63.4, Section 7.2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 4:33:04 PM		
Temperature: 24.6 ºC	Air Pressure: 1006 hPa	Relative Humidity: 34 %	Power Supply: 120 VAC
Remarks:			

Table 7.1.2 Conducted emissions test results

LINE: AC mains
EUT SET UP: TABLE-TOP
TEST SITE: SHIELDED ROOM
DETECTORS USED: PEAK / QUASI-PEAK / AVERAGE
FREQUENCY RANGE: 150 kHz - 30 MHz
RESOLUTION BANDWIDTH: 9 kHz

Frequency, MHz	Peak emission, dB(µV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*	Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*		
AC mains input of AC/DC adapter of cradle									
0.258580	45.67	42.68	61.53	-18.85	30.31	51.53	-21.22	L1	Pass
0.410363	47.09	44.91	57.68	-12.77	33.30	47.68	-14.38		
0.546910	42.57	41.31	56.00	-14.69	28.69	46.00	-17.31		
1.234308	43.01	41.41	56.00	-14.59	21.90	46.00	-24.10		
1.506843	43.98	42.02	56.00	-13.98	22.88	46.00	-23.12		
2.126800	48.26	45.80	56.00	-10.20	25.75	46.00	-20.25		
0.403420	44.24	42.51	57.81	-15.30	34.68	47.81	-13.13	L2	Pass
0.410498	44.49	42.90	57.67	-14.77	31.52	47.67	-16.15		
0.547333	42.13	40.88	56.00	-15.12	27.59	46.00	-18.41		
1.367130	43.83	41.94	56.00	-14.06	24.40	46.00	-21.60		
1.506340	44.16	42.22	56.00	-13.78	23.32	46.00	-22.68		
2.150038	48.99	46.65	56.00	-9.35	26.76	46.00	-19.24		
AC mains input of PC									
0.200836	50.98	48.64	63.62	-14.98	39.82	53.62	-13.80	L1	Pass
0.269676	39.14	37.95	61.19	-23.24	29.58	51.19	-21.61		
13.018141	33.65	31.30	60.00	-28.70	18.53	50.00	-31.47		
0.203064	48.22	47.24	63.54	-16.30	41.90	53.54	-11.64	L2	Pass
0.270543	37.74	36.77	61.17	-24.40	31.29	51.17	-19.88		
6.444798	34.68	32.43	60.00	-27.57	19.95	50.00	-30.05		

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

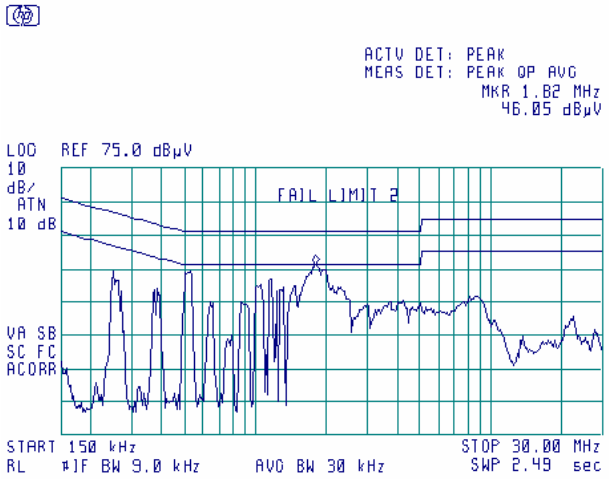
HL 0447	HL 0672	HL 1430	HL 1511	HL 2888	HL 3012	HL 3174	

Full description is given in Appendix A.

Test specification:	Section 15.107 Class B, AC power lines conducted emissions		
Test procedure:	ANSI C63.4, Section 7.2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 4:33:04 PM		
Temperature: 24.6 ºC	Air Pressure: 1006 hPa	Relative Humidity: 34 %	Power Supply: 120 VAC
Remarks:			

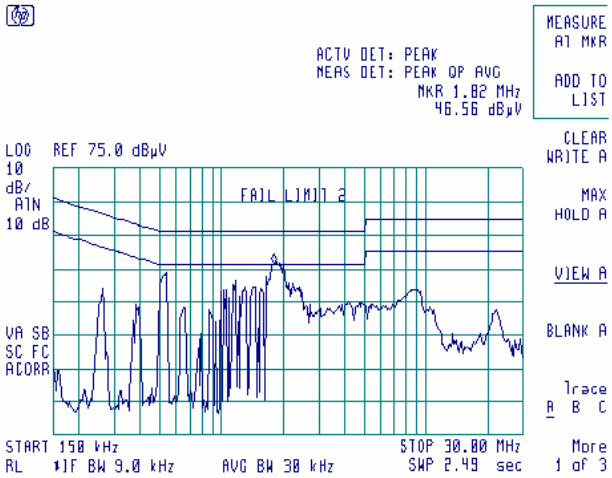
Plot 7.1.1 Conducted emission measurements, AC mains input of AC/DC adapter of cradle

LINE: L1
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 7.1.2 Conducted emission measurements, AC mains input of AC/DC adapter of cradle

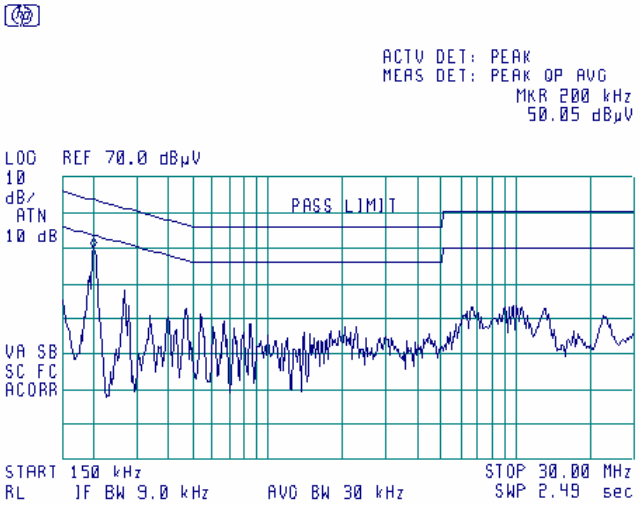
LINE: L2
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification:	Section 15.107 Class B, AC power lines conducted emissions		
Test procedure:	ANSI C63.4, Section 7.2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 4:33:04 PM		
Temperature: 24.6 ºC	Air Pressure: 1006 hPa	Relative Humidity: 34 %	Power Supply: 120 VAC
Remarks:			

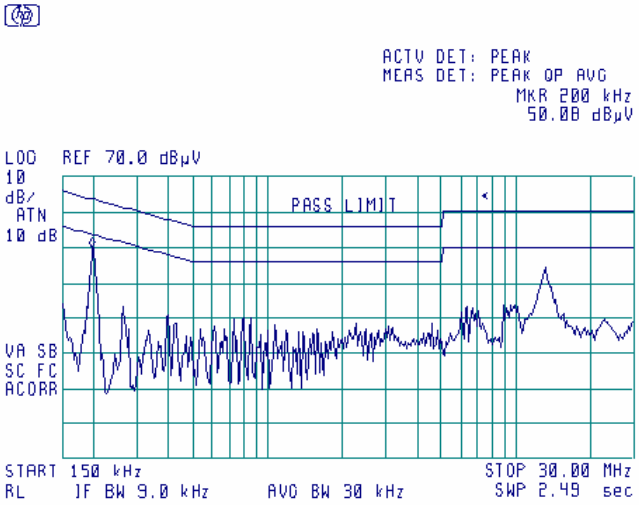
Plot 7.1.3 Conducted emission measurements, AC mains input of PC

LINE: L1
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 7.1.4 Conducted emission measurements, AC mains input of PC

LINE: L2
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification:	Section 15.109 Class B, Radiated emissions		
Test procedure:	ANSI C63.4, Section 8.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 7:54:46 AM		
Temperature: 24.9 ºC	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: 120 VAC
Remarks: The highest frequency used in the EUT is 480 MHz; therefore the test was performed in 30 – 2000 MHz range.			

7.2 Radiated emission measurements

7.2.1 General

This test was performed to measure radiated emissions from the EUT enclosure. The specification test limits are given in Table 7.2.1.

Table 7.2.1 Radiated emission test limits

Frequency, MHz	Class B limit, dB(μV/m)		Class A limit, dB(μV/m)	
	10 m distance	3 m distance	10 m distance	3 m distance
30 - 88	29.5*	40.0	39.0	49.5*
88 - 216	33.0*	43.5	43.5	54.0*
216 - 960	35.5*	46.0	46.4	56.9*
Above 960	43.5*	54.0	49.5	60.0*

* - The limit for a test distance other than specified was calculated using the inverse linear distance extrapolation factor as follows: $Lim_{S2} = Lim_{S1} + 20 \log (S_1/S_2)$,
where S_1 and S_2 – the standard defined and the test distance respectively in meters.

7.2.2 Test procedure

7.2.2.1 The EUT was set up as shown in Figure 7.2.1 and the associated photographs, energized and the EUT performance was checked.

7.2.2.2 The preliminary measurements were performed in the anechoic chamber at 3 m test distance. The specified frequency range was investigated with the antenna connected to the EMI receiver. To find the highest emission the turntable was rotated 360^0 and the measuring antenna height was swept from 1 to 1.8 m in both, vertical and horizontal polarizations. The EUT cables position was varied to maximize emission.

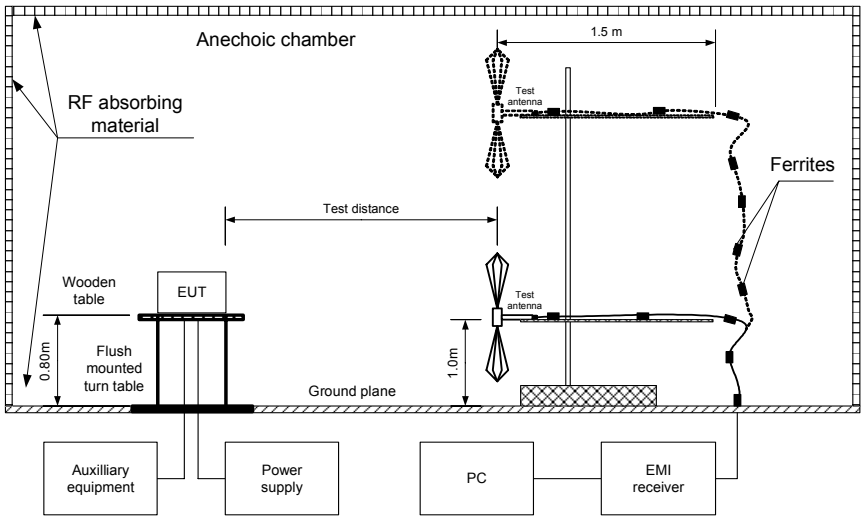
7.2.2.3 The EUT was set up as shown in Figure 7.2.2 and the associated photographs, energized and the EUT performance was checked.

7.2.2.4 The final measurements were performed at the open area test site at 10 m test distance with the antenna connected to the EMI receiver. The EUT wires and cables were arranged to produce the highest emission as it was found during the preliminary measurements. The frequencies, produced the highest emissions with respect to the limits during the preliminary test were investigated. To find the highest emission the turntable was rotated 360^0 and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal polarizations. At frequencies, where the high ambient noise was encountered, the final measurements were taken at 3 m distance.

7.2.2.5 The worst test results with respect to the limits were recorded in Table 7.2.2 and shown in the associated plots.

Test specification:	Section 15.109 Class B, Radiated emissions		
Test procedure:	ANSI C63.4, Section 8.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 7:54:46 AM		
Temperature: 24.9 ºC	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: 120 VAC
Remarks: The highest frequency used in the EUT is 480 MHz; therefore the test was performed in 30 – 2000 MHz range.			

Figure 7.2.1 Setup for radiated emission measurements in anechoic chamber, table-top EUT

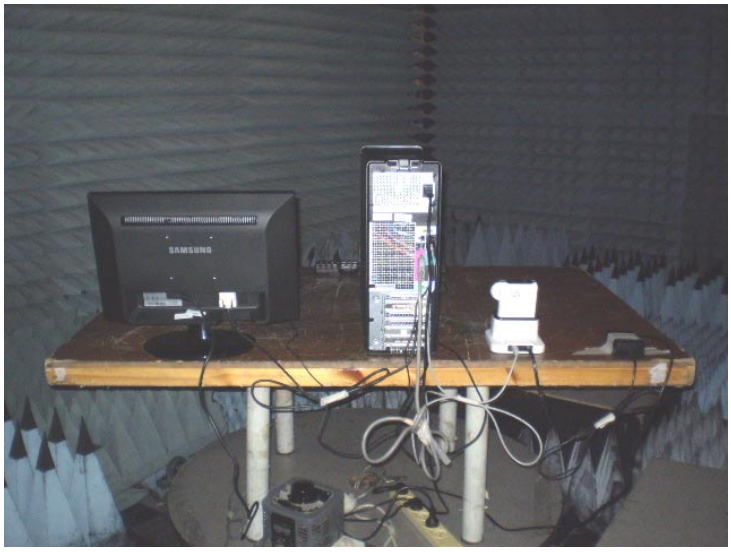


Photograph 7.2.1 Setup for preliminary radiated emission measurements below 1 GHz, general view

Test specification:	Section 15.109 Class B, Radiated emissions		
Test procedure:	ANSI C63.4, Section 8.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 7:54:46 AM		
Temperature: 24.9 ºC	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: 120 VAC
Remarks: The highest frequency used in the EUT is 480 MHz; therefore the test was performed in 30 – 2000 MHz range.			

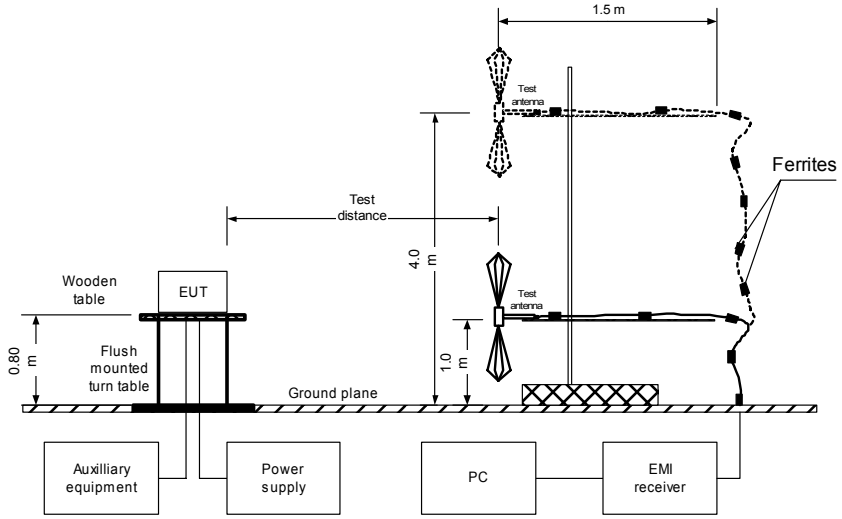
Photograph 7.2.2 Setup for preliminary radiated emission measurements above 1 GHz, general view

Photograph 7.2.3 Setup for preliminary radiated emission measurements, EUT cabling



Test specification:	Section 15.109 Class B, Radiated emissions		
Test procedure:	ANSI C63.4, Section 8.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 7:54:46 AM		
Temperature: 24.9 ºC	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: 120 VAC
Remarks: The highest frequency used in the EUT is 480 MHz; therefore the test was performed in 30 – 2000 MHz range.			

Figure 7.2.2 Setup for radiated emission measurements at OATS, table-top EUT



Photograph 7.2.4 Setup for final radiated emission measurements below 1 GHz, general view

Test specification:	Section 15.109 Class B, Radiated emissions		
Test procedure:	ANSI C63.4, Section 8.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 7:54:46 AM		
Temperature: 24.9 ºC	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: 120 VAC
Remarks: The highest frequency used in the EUT is 480 MHz; therefore the test was performed in 30 – 2000 MHz range.			

Photograph 7.2.5 Setup for final radiated emission measurements above 1 GHz, general view

Photograph 7.2.6 Setup for final radiated emission measurements, EUT cabling

Test specification:	Section 15.109 Class B, Radiated emissions		
Test procedure:	ANSI C63.4, Section 8.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 7:54:46 AM		
Temperature: 24.9 ºC	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: 120 VAC
Remarks: The highest frequency used in the EUT is 480 MHz; therefore the test was performed in 30 – 2000 MHz range.			

Table 7.2.2 Radiated emission test results

EUT SET UP: TABLE-TOP
FREQUENCY RANGE: 30 MHz – 1000 MHz
DETECTORS USED: PEAK / QUASI-PEAK
RESOLUTION BANDWIDTH: 120 kHz
TEST SITE: OATS
TEST DISTANCE: 10 m

Frequency, MHz	Peak emission, dB(μV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
119.134700	34.83	23.68	33.00	-9.32	Vertical	1.0	160	Pass
240.001600	31.32	28.90	35.50	-6.60	Vertical	1.0	240	
357.267300	33.39	30.95	35.50	-2.55	Horizontal	2.1	160	
480.010500	38.53	33.60	35.50	-1.90	Vertical	1.0	320	
717.662400	29.06	22.50	35.50	-13.00	Vertical	1.0	180	
818.594000	33.99	28.15	35.50	-7.35	Horizontal	1.2	180	
826.926500	31.52	26.84	35.50	-8.66	Vertical	1.0	85	

FREQUENCY RANGE: 1000 MHz – 2000 MHz
DETECTORS USED: PEAK / AVERAGE
RESOLUTION BANDWIDTH: 1000 kHz
TEST SITE: OATS
TEST DISTANCE: 3 m

Frequency, MHz	Peak			Average			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
	Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*	Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
1200.112000	49.49	74.00	-24.51	34.00	54.00	-20.00	Vertical	1.0	170	Pass
1667.267500	52.74	74.00	-21.26	39.41	54.00	-14.59	Horizontal	1.0	220	
1786.366500	51.87	74.00	-22.13	36.85	54.00	-17.15	Horizontal	1.0	120	
1905.455000	52.87	74.00	-21.13	39.27	54.00	-14.73	Horizontal	1.8	260	
1945.063000	49.77	74.00	-24.23	36.12	54.00	-17.88	Vertical	1.0	200	
1995.585000	52.72	74.00	-21.28	36.07	54.00	-17.93	Vertical	1.0	160	

*- Margin = Measured emission - specification limit.
**- EUT front panel refers to 0 degrees position of turntable.

Reference numbers of test equipment used

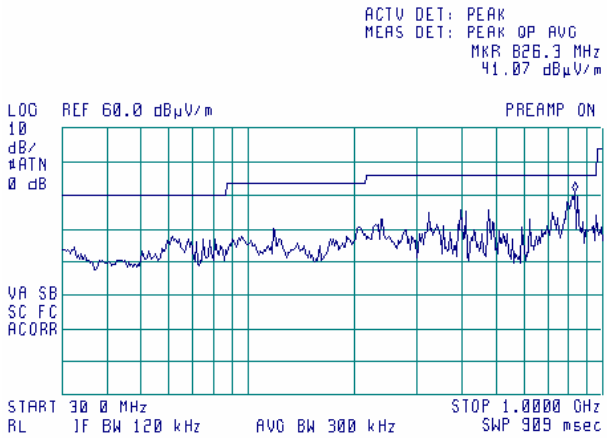
HL 0415	HL 0784	HL 0812	HL 0813	HL 1425	HL 1430	HL 1552	HL 1849
HL 1850	HL 2109	HL 2432	HL 2697	HL 2882	HL 2883		

Full description is given in Appendix A.

Test specification:	Section 15.109 Class B, Radiated emissions		
Test procedure:	ANSI C63.4, Section 8.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 7:54:46 AM		
Temperature: 24.9 ºC	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: 120 VAC
Remarks: The highest frequency used in the EUT is 480 MHz; therefore the test was performed in 30 – 2000 MHz range.			

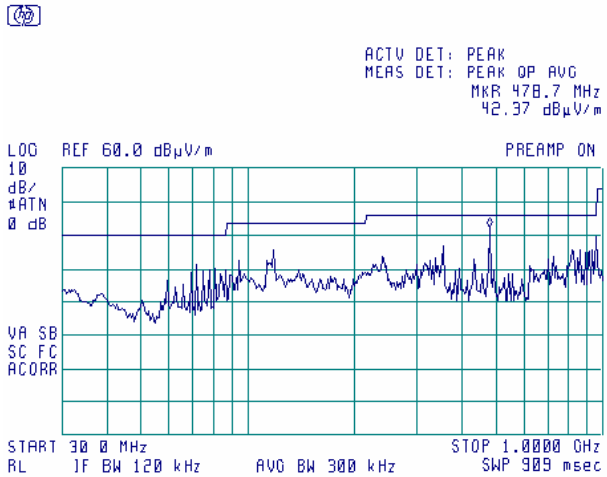
Plot 7.2.1 Radiated emission measurements in 30 - 1000 MHz range, vertical antenna polarization

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



Plot 7.2.2 Radiated emission measurements in 30 - 1000 MHz range, horizontal antenna polarization

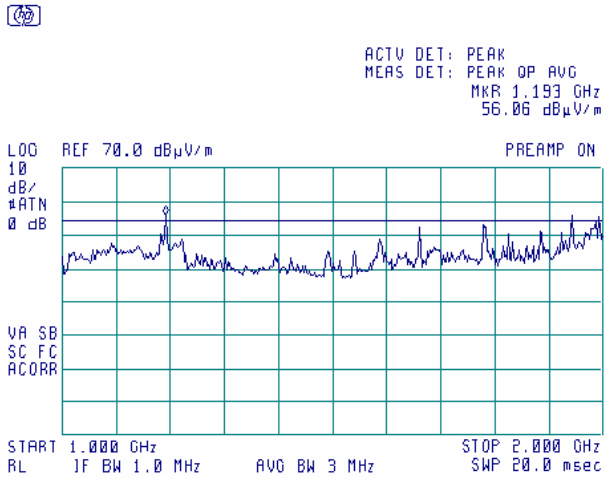
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



Test specification:	Section 15.109 Class B, Radiated emissions		
Test procedure:	ANSI C63.4, Section 8.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 7:54:46 AM		
Temperature: 24.9 ºC	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: 120 VAC
Remarks: The highest frequency used in the EUT is 480 MHz; therefore the test was performed in 30 – 2000 MHz range.			

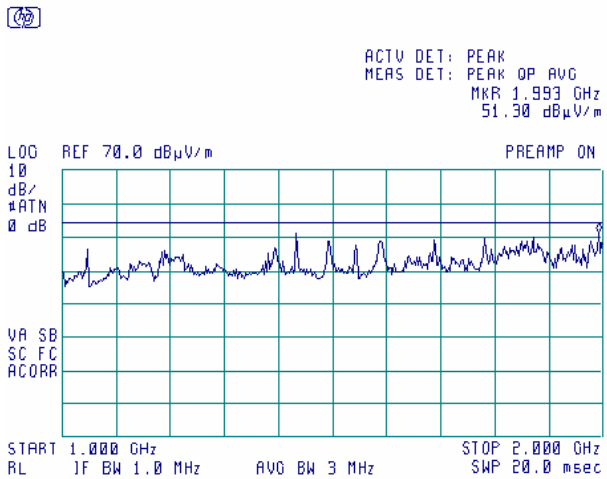
Plot 7.2.3 Radiated emission measurements in 1000 – 2000 MHz range, vertical antenna polarization

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



Plot 7.2.4 Radiated emission measurements in 1000 – 2000 MHz range, horizontal antenna polarization

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



Test specification:	Section 5.3 Class B, Conducted disturbance measurements		
Test procedure:	CAN/CSA-CEI/IEC CISPR 22, Section 5.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 2:18:48 PM		
Temperature: 24.6 ºC	Air Pressure: 1006 hPa	Relative Humidity: 34 %	Power Supply: 120 VAC
Remarks:			

8 Emissions tests according to ICES-003 requirements

8.1 Conducted emissions

8.1.1 General

This test was performed to measure the common mode conducted emissions at the EUT power ports. The specification test limits are given in Table 8.1.1.

Table 8.1.1 Limits for conducted disturbances

Frequency, MHz	Class B limit, dB(µV)		Class A limit, dB(µV)	
	QP	AVRG	QP	AVRG
0.15 - 0.5	66 - 56*	56 - 46*	79	66
0.5 - 5.0	56	46	73	60
5.0 - 30	60	50	73	60

* - The limit decreases linearly with the logarithm of frequency.

8.1.2 Test procedure

8.1.2.1 The EUT was set up as shown in Figure 8.1.1 and the associated photograph, energized and the EUT performance was checked.

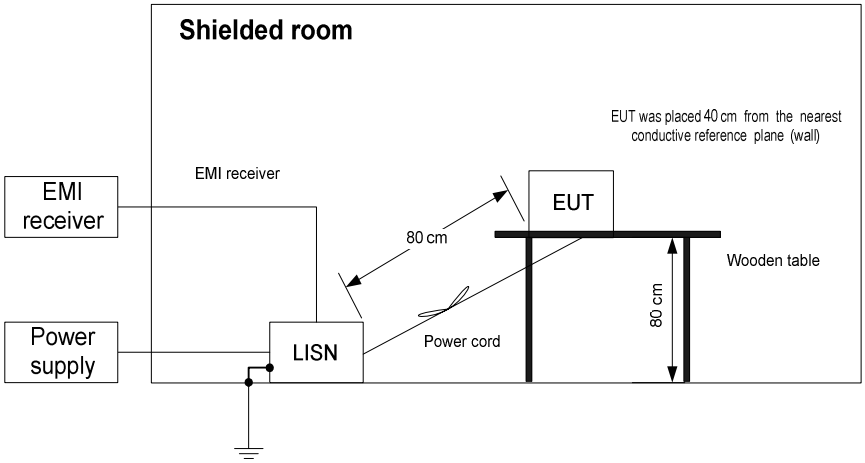
8.1.2.2 The measurements were performed at the EUT power terminals with the LISN connected to the EMI receiver in the frequency range referred to in Table 8.1.2. The unused coaxial connector of the LISN was terminated with 50 Ohm.

8.1.2.3 The position of the EUT cables was varied to find the highest emission.

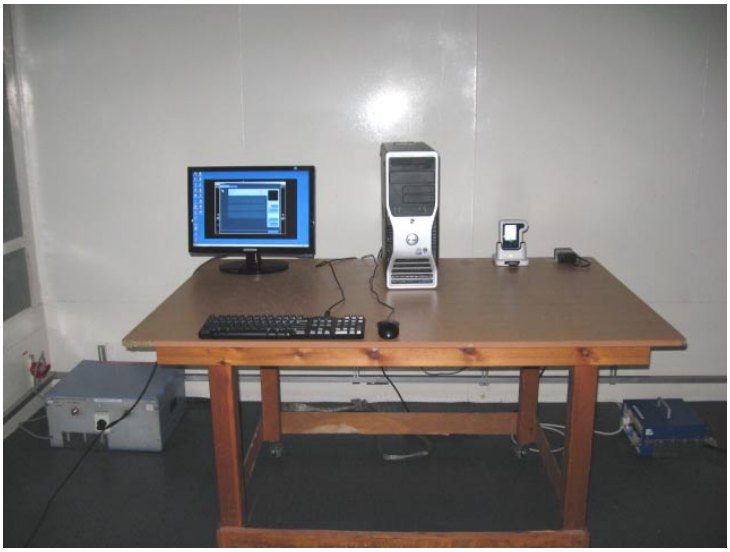
8.1.2.4 The worst test results with respect to the limits were recorded in Table 8.1.2 and shown in the associated plots.

Test specification:	Section 5.3 Class B, Conducted disturbance measurements		
Test procedure:	CAN/CSA-CEI/IEC CISPR 22, Section 5.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 2:18:48 PM		
Temperature: 24.6 ºC	Air Pressure: 1006 hPa	Relative Humidity: 34 %	Power Supply: 120 VAC
Remarks:			

Figure 8.1.1 Setup for conducted disturbances measurements, table-top EUT



Photograph 8.1.1 Setup for conducted disturbances measurements



Test specification:	Section 5.3 Class B, Conducted disturbance measurements		
Test procedure:	CAN/CSA-CEI/IEC CISPR 22, Section 5.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 2:18:48 PM		
Temperature: 24.6 ºC	Air Pressure: 1006 hPa	Relative Humidity: 34 %	Power Supply: 120 VAC
Remarks:			

Table 8.1.2 Conducted disturbances test results

LINE: AC mains
EUT SET UP: TABLE-TOP
TEST SITE: SHIELDED ROOM
DETECTORS USED: PEAK / QUASI-PEAK / AVERAGE
FREQUENCY RANGE: 150 kHz - 30 MHz
RESOLUTION BANDWIDTH: 9 kHz

Frequency, MHz	Peak emission, dB(µV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*	Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*		
AC mains input of AC/DC adapter of cradle									
0.258580	45.67	42.68	61.53	-18.85	30.31	51.53	-21.22	L1	Pass
0.410363	47.09	44.91	57.68	-12.77	33.30	47.68	-14.38		
0.546910	42.57	41.31	56.00	-14.69	28.69	46.00	-17.31		
1.234308	43.01	41.41	56.00	-14.59	21.90	46.00	-24.10		
1.506843	43.98	42.02	56.00	-13.98	22.88	46.00	-23.12		
2.126800	48.26	45.80	56.00	-10.20	25.75	46.00	-20.25		
0.403420	44.24	42.51	57.81	-15.30	34.68	47.81	-13.13	L2	Pass
0.410498	44.49	42.90	57.67	-14.77	31.52	47.67	-16.15		
0.547333	42.13	40.88	56.00	-15.12	27.59	46.00	-18.41		
1.367130	43.83	41.94	56.00	-14.06	24.40	46.00	-21.60		
1.506340	44.16	42.22	56.00	-13.78	23.32	46.00	-22.68		
2.150038	48.99	46.65	56.00	-9.35	26.76	46.00	-19.24		
AC mains input of PC									
0.200836	50.98	48.64	63.62	-14.98	39.82	53.62	-13.80	L1	Pass
0.269676	39.14	37.95	61.19	-23.24	29.58	51.19	-21.61		
13.018141	33.65	31.30	60.00	-28.70	18.53	50.00	-31.47		
0.203064	48.22	47.24	63.54	-16.30	41.90	53.54	-11.64	L2	Pass
0.270543	37.74	36.77	61.17	-24.40	31.29	51.17	-19.88		
6.444798	34.68	32.43	60.00	-27.57	19.95	50.00	-30.05		

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

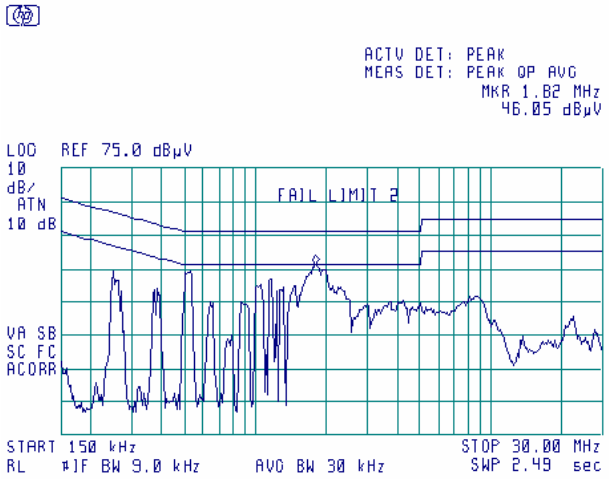
HL 0447	HL 0672	HL 1430	HL 1511	HL 2888	HL 3012	HL 3174	

Full description is given in Appendix A.

Test specification:	Section 5.3 Class B, Conducted disturbance measurements		
Test procedure:	CAN/CSA-CEI/IEC CISPR 22, Section 5.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 2:18:48 PM		
Temperature: 24.6 ºC	Air Pressure: 1006 hPa	Relative Humidity: 34 %	Power Supply: 120 VAC
Remarks:			

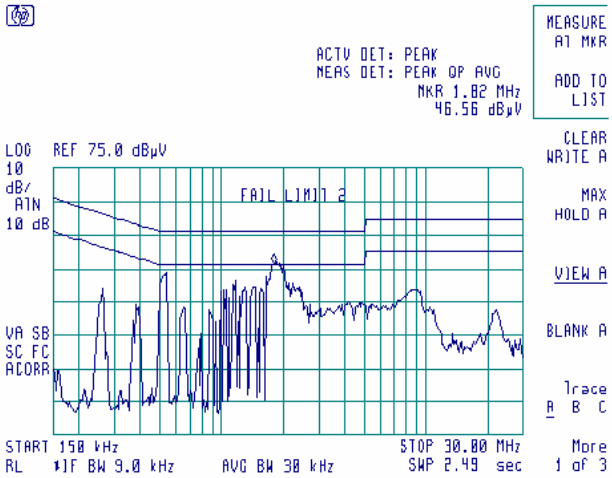
Plot 8.1.1 Conducted disturbances measurements, AC mains input of AC/DC adapter of cradle

LINE: L1
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 8.1.2 Conducted disturbances measurements, AC mains input of AC/DC adapter of cradle

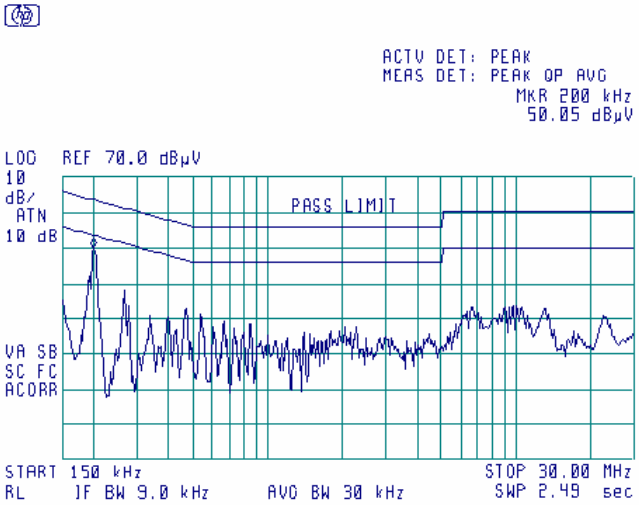
LINE: L2
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification:	Section 5.3 Class B, Conducted disturbance measurements		
Test procedure:	CAN/CSA-CEI/IEC CISPR 22, Section 5.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 2:18:48 PM		
Temperature: 24.6 ºC	Air Pressure: 1006 hPa	Relative Humidity: 34 %	Power Supply: 120 VAC
Remarks:			

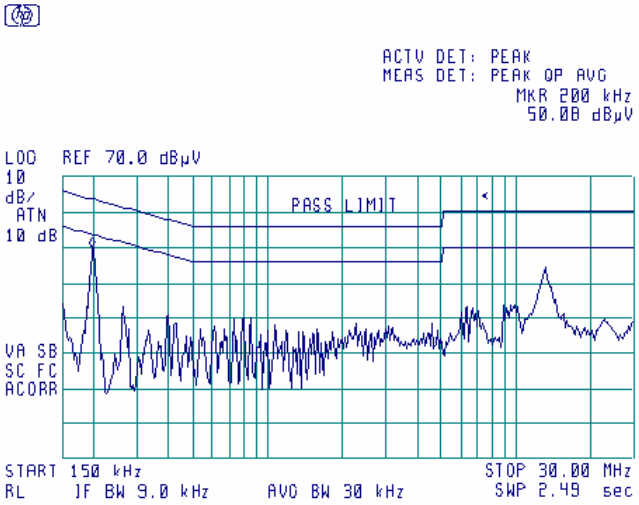
Plot 8.1.3 Conducted disturbances measurements, AC mains input of PC

LINE: L1
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 8.1.4 Conducted disturbances measurements, AC mains input of PC

LINE: L2
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification:	Section 5.5 Class B, Radiated disturbance measurements		
Test procedure:	CAN/CSA-CEI/IEC CISPR 22, Section 6		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 8:05:51 AM		
Temperature: 24.9 ºC	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: 120 VAC
Remarks:			

8.2 Radiated disturbance measurements

8.2.1 General

This test was performed to measure radiated emissions from the EUT enclosure. The specification test limits are given in Table 8.2.1.

Table 8.2.1 Radiated disturbance test limits

Frequency, MHz	Class B limit, dB(µV/m)		Class A limit, dB(µV/m)	
	10 m distance	3 m distance	10 m distance	3 m distance
30 - 230	30.0	40.5*	40.0	50.5*
230 - 1000	37.0	47.5*	47.0	57.5*

* The limit for test distance other than specified was calculated using the inverse linear distance extrapolation factor as follows: $Lim_{S2} = Lim_{S1} + 20 \log (S_1/S_2)$,
where S_1 and S_2 – standard defined and test distance respectively in meters.

8.2.2 Test procedure

8.2.2.1 The EUT was set up as shown in Figure 8.2.1 and the associated photographs, energized and the EUT performance was checked.

8.2.2.2 The preliminary measurements were performed in the anechoic chamber at 3 m test distance. The specified frequency range was investigated with the antenna connected to the EMI receiver. To find the highest emission the turntable was rotated 360^0 and the measuring antenna height was swept from 1 to 1.8 m in both, vertical and horizontal polarizations. The EUT cables position was varied to maximize emission.

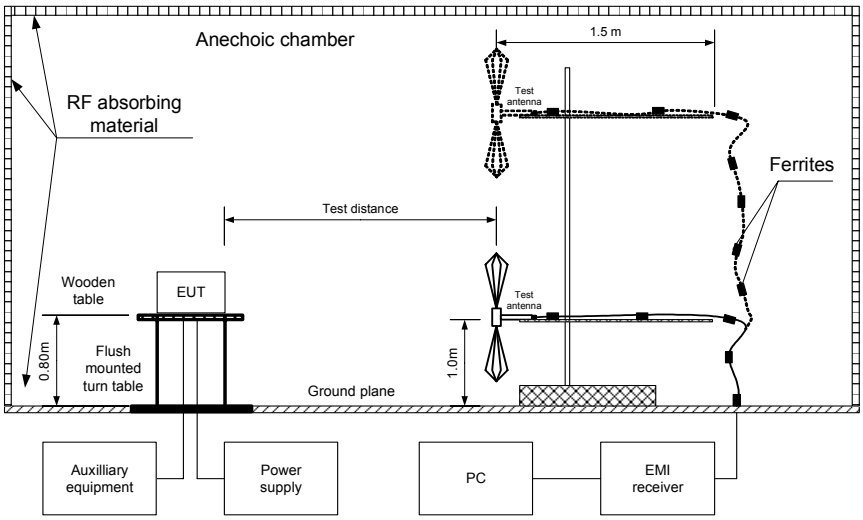
8.2.2.3 The EUT was set up as shown in Figure 8.2.2 and the associated photographs, energized and the EUT performance was checked.

8.2.2.4 The final measurements were performed at the open area test site at 10 m test distance with the antenna connected to the EMI receiver. The EUT wires and cables were arranged to produce the highest emission as it was found during the preliminary measurements. The frequencies, produced the highest emissions with respect to the limits during the preliminary test were investigated. To find the highest emission the turntable was rotated 360^0 and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal polarizations.

8.2.2.5 The worst test results with respect to the limits were recorded in Table 8.2.2 and shown in the associated plots.

Test specification:	Section 5.5 Class B, Radiated disturbance measurements		
Test procedure:	CAN/CSA-CEI/IEC CISPR 22, Section 6		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 8:05:51 AM		
Temperature: 24.9 ºC	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: 120 VAC
Remarks:			

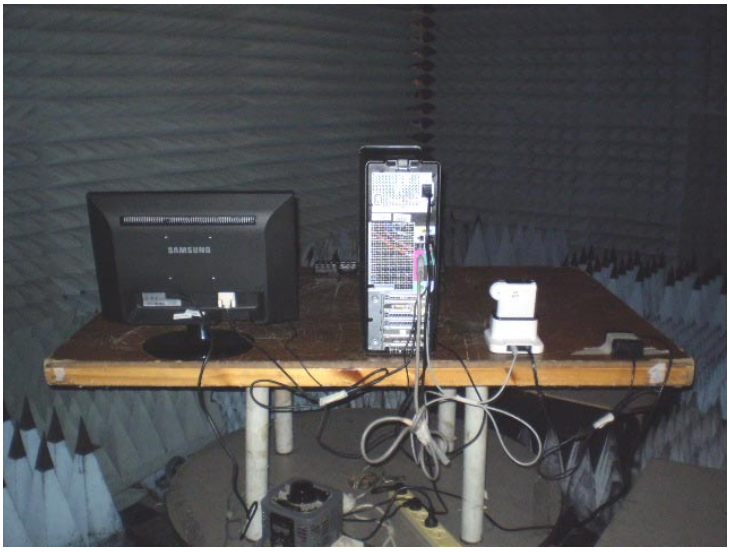
Figure 8.2.1 Setup for radiated disturbance measurements in anechoic chamber, table-top EUT



Test specification:	Section 5.5 Class B, Radiated disturbance measurements		
Test procedure:	CAN/CSA-CEI/IEC CISPR 22, Section 6		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 8:05:51 AM		
Temperature: 24.9 ºC	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: 120 VAC
Remarks:			

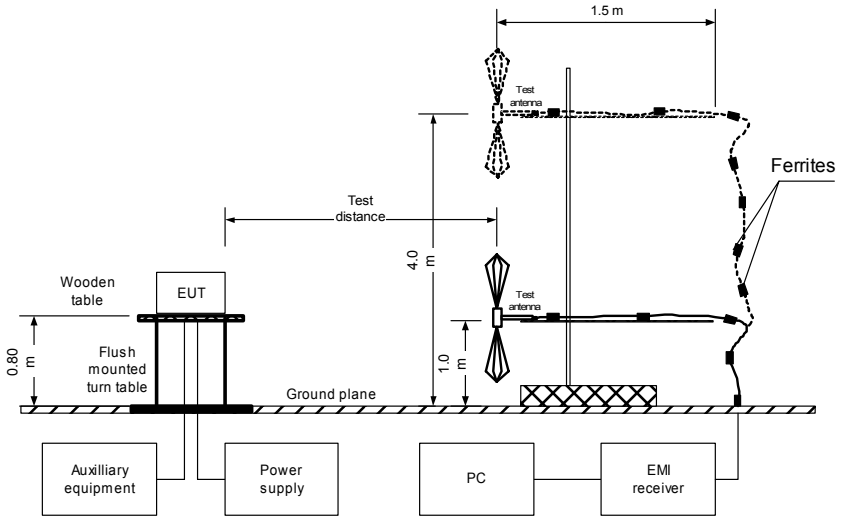
Photograph 8.2.1 Setup for preliminary radiated disturbance measurements, general view

Photograph 8.2.2 Setup for preliminary radiated disturbance measurements, EUT cabling



Test specification:	Section 5.5 Class B, Radiated disturbance measurements		
Test procedure:	CAN/CSA-CEI/IEC CISPR 22, Section 6		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 8:05:51 AM		
Temperature: 24.9 ºC	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: 120 VAC
Remarks:			

Figure 8.2.2 Setup for radiated disturbance measurements at OATS, table-top EUT



Test specification:	Section 5.5 Class B, Radiated disturbance measurements		
Test procedure:	CAN/CSA-CEI/IEC CISPR 22, Section 6		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 8:05:51 AM		
Temperature: 24.9 ºC	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: 120 VAC
Remarks:			

Photograph 8.2.3 Setup for final radiated disturbance measurements, general view

Photograph 8.2.4 Setup for final radiated disturbance measurements, EUT cabling

Test specification:	Section 5.5 Class B, Radiated disturbance measurements		
Test procedure:	CAN/CSA-CEI/IEC CISPR 22, Section 6		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 8:05:51 AM		
Temperature: 24.9 ºC	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: 120 VAC
Remarks:			

Table 8.2.2 Radiated disturbance test results

EUT SET UP: TABLE-TOP
FREQUENCY RANGE: 30 MHz – 1000 MHz
DETECTORS USED: PEAK / QUASI-PEAK
RESOLUTION BANDWIDTH: 120 kHz
TEST SITE: OATS
TEST DISTANCE: 10 m

Frequency, MHz	Peak emission, dB(µV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*				
119.134700	34.83	23.68	30.00	-6.32	Vertical	1.0	160	Pass
240.001600	31.32	28.90	37.00	-8.10	Vertical	1.0	240	
357.267300	33.39	30.95	37.00	-6.05	Horizontal	2.1	160	
480.010500	38.53	33.60	37.00	-3.40	Vertical	1.0	320	
717.662400	29.06	22.50	37.00	-14.50	Vertical	1.0	180	
818.594000	33.99	28.15	37.00	-8.85	Horizontal	1.2	180	
826.926500	31.52	26.84	37.00	-10.16	Vertical	1.0	85	

*- Margin = Measured emission - specification limit.
**- EUT front panel refers to 0 degrees position of turntable.

Reference numbers of test equipment used

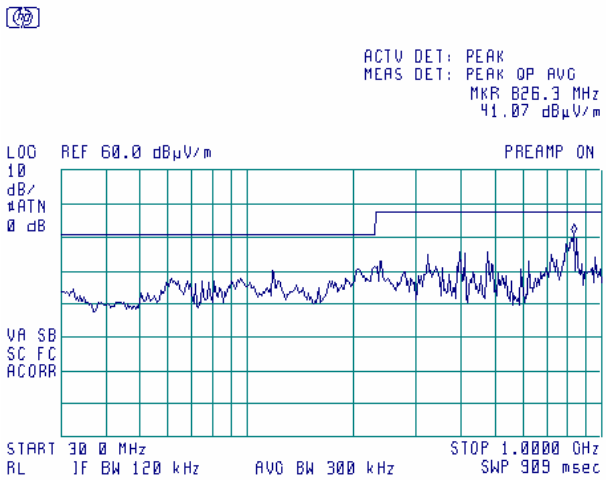
HL 0415	HL 0784	HL 0812	HL 0813	HL 1425	HL 1430	HL 1552	HL 1849
HL 1850	HL 2109	HL 2697					

Full description is given in Appendix A.

Test specification:	Section 5.5 Class B, Radiated disturbance measurements		
Test procedure:	CAN/CSA-CEI/IEC CISPR 22, Section 6		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 8:05:51 AM		
Temperature: 24.9 ºC	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: 120 VAC
Remarks:			

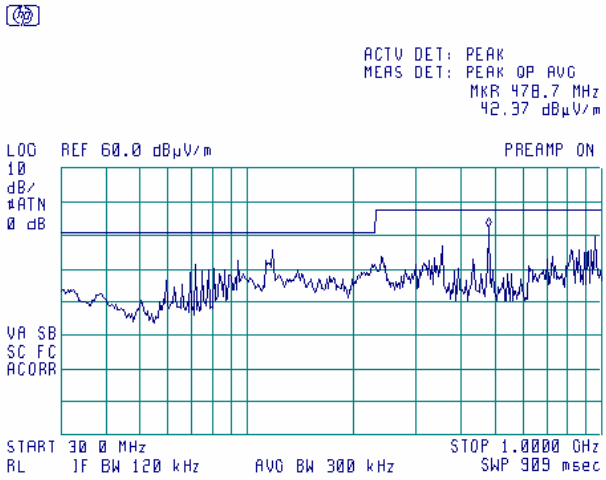
Plot 8.2.1 Radiated disturbance measurements in 30 - 1000 MHz range, vertical antenna polarization

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



Plot 8.2.2 Radiated disturbance measurements in 30 - 1000 MHz range, horizontal antenna polarization

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



Test specification:	Section 5.1 Class B, Conducted disturbance at mains terminals		
Test procedure:	EN 55022, Section 9		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 4:37:31 PM		
Temperature: 24.6 ºC	Air Pressure: 1006 hPa	Relative Humidity: 34 %	Power Supply: 230 VAC
Remarks:			

9 Emissions tests according to EN 55022 requirements

9.1 Conducted disturbance at mains terminals

9.1.1 General

This test was performed to measure the common mode conducted disturbance at the EUT mains terminals. The specification test limits are given in Table 9.1.1.

Table 9.1.1 Limits for conducted disturbance at mains terminals

Frequency, MHz	Class B limit, dB(µV)		Class A limit, dB(µV)	
	QP	AVRG	QP	AVRG
0.15 - 0.5	66 - 56*	56 - 46*	79	66
0.5 - 5.0	56	46	73	60
5.0 - 30	60	50	73	60

* - The limit decreases linearly with the logarithm of frequency.

9.1.2 Test procedure

9.1.2.1 The EUT was set up as shown in Figure 9.1.1 and the associated photograph, energized and the EUT performance was checked.

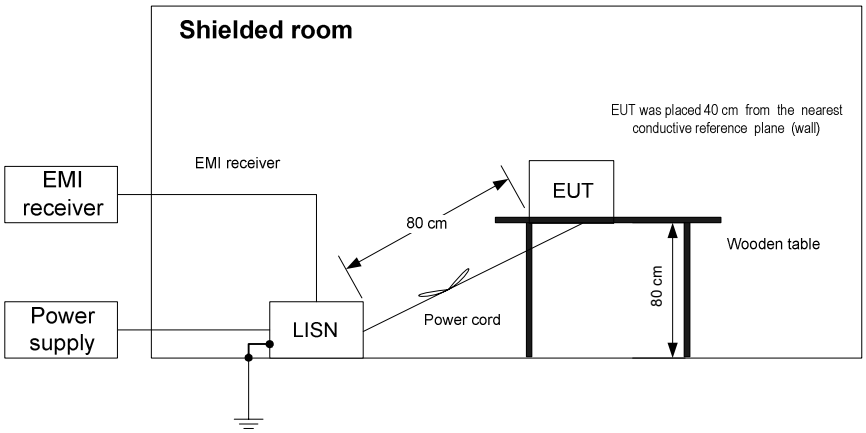
9.1.2.2 The measurements were performed at the EUT mains terminals with the LISN connected to the EMI receiver in the frequency range referred to in Table 9.1.2. The unused coaxial connector of the LISN was terminated with 50 Ohm.

9.1.2.3 The position of the EUT cables was varied to find the highest emission.

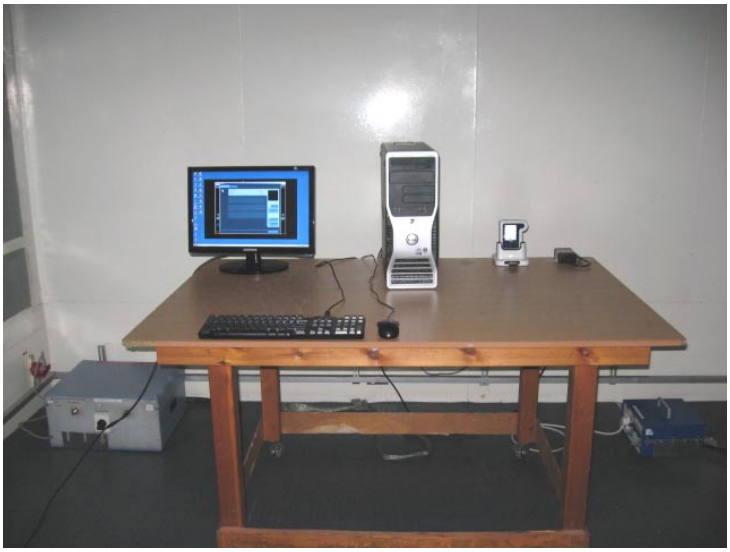
9.1.2.4 The worst test results with respect to the limits were recorded in Table 9.1.2 and shown in the associated plots.

Test specification:	Section 5.1 Class B, Conducted disturbance at mains terminals		
Test procedure:	EN 55022, Section 9		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 4:37:31 PM		
Temperature: 24.6 ºC	Air Pressure: 1006 hPa	Relative Humidity: 34 %	Power Supply: 230 VAC
Remarks:			

Figure 9.1.1 Setup for conducted disturbance measurements at mains terminals, table-top EUT



Photograph 9.1.1 Setup for conducted disturbance measurements at mains terminals



Test specification:	Section 5.1 Class B, Conducted disturbance at mains terminals		
Test procedure:	EN 55022, Section 9		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 4:37:31 PM		
Temperature: 24.6 ºC	Air Pressure: 1006 hPa	Relative Humidity: 34 %	Power Supply: 230 VAC
Remarks:			

Table 9.1.2 Conducted disturbance at mains terminals test results

LINE: AC mains
EUT SET UP: TABLE-TOP
TEST SITE: SHIELDED ROOM
DETECTORS USED: PEAK / QUASI-PEAK / AVERAGE
FREQUENCY RANGE: 150 kHz - 30 MHz
RESOLUTION BANDWIDTH: 9 kHz

Frequency, MHz	Peak emission, dB(µV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*	Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*		
AC mains input of AC/DC adapter of cradle									
0.258580	45.67	42.68	61.53	-18.85	30.31	51.53	-21.22	L1	Pass
0.410363	47.09	44.91	57.68	-12.77	33.30	47.68	-14.38		
0.546910	42.57	41.31	56.00	-14.69	28.69	46.00	-17.31		
1.234308	43.01	41.41	56.00	-14.59	21.90	46.00	-24.10		
1.506843	43.98	42.02	56.00	-13.98	22.88	46.00	-23.12		
2.126800	48.26	45.80	56.00	-10.20	25.75	46.00	-20.25		
0.403420	44.24	42.51	57.81	-15.30	34.68	47.81	-13.13	L2	Pass
0.410498	44.49	42.90	57.67	-14.77	31.52	47.67	-16.15		
0.547333	42.13	40.88	56.00	-15.12	27.59	46.00	-18.41		
1.367130	43.83	41.94	56.00	-14.06	24.40	46.00	-21.60		
1.506340	44.16	42.22	56.00	-13.78	23.32	46.00	-22.68		
2.150038	48.99	46.65	56.00	-9.35	26.76	46.00	-19.24		
AC mains input of PC									
0.193000	51.36	50.79	63.92	-13.13	36.57	53.92	-17.35	L1	Pass
0.268000	45.67	42.68	61.53	-18.85	30.31	51.53	-21.22		
6.651235	49.32	48.23	60.00	-11.77	35.36	50.00	-14.64		
7.350000	47.73	45.22	60.00	-14.78	32.87	50.00	-17.13		
13.36226	49.96	45.23	60.00	-14.77	31.05	50.00	-18.95		
0.193000	51.19	50.41	63.90	-13.49	35.94	53.90	-17.96	L2	Pass
0.268000	45.67	42.68	61.53	-18.85	30.31	51.53	-21.22		
6.388575	49.60	48.66	60.00	-11.34	35.69	50.00	-14.31		
7.384000	46.94	44.72	60.00	-15.28	31.59	50.00	-18.41		
13.36071	50.26	48.82	60.00	-11.18	36.50	50.00	-13.50		

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

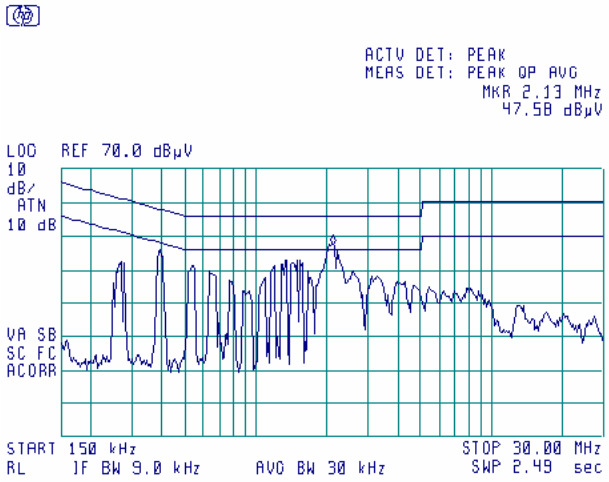
HL 0447	HL 0672	HL 1430	HL 1511	HL 2888	HL 3012	HL 3174	

Full description is given in Appendix A.

Test specification:	Section 5.1 Class B, Conducted disturbance at mains terminals		
Test procedure:	EN 55022, Section 9		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 4:37:31 PM		
Temperature: 24.6 ºC	Air Pressure: 1006 hPa	Relative Humidity: 34 %	Power Supply: 230 VAC
Remarks:			

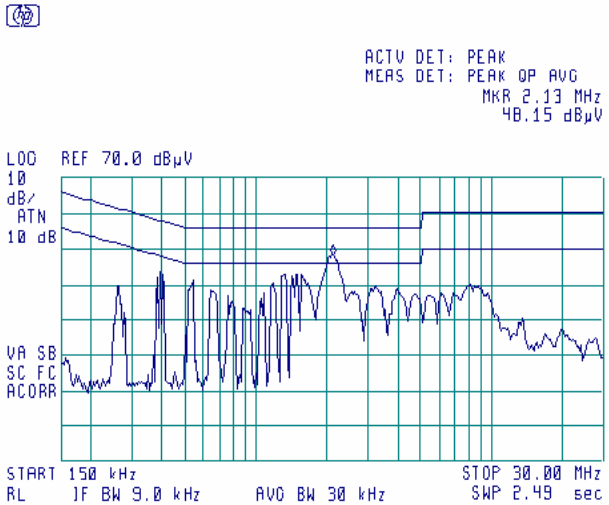
Plot 9.1.1 Conducted disturbance at mains terminals, AC mains input of AC/DC adapter of cradle

LINE: L1
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 9.1.2 Conducted disturbance at mains terminals, AC mains input of AC/DC adapter of cradle

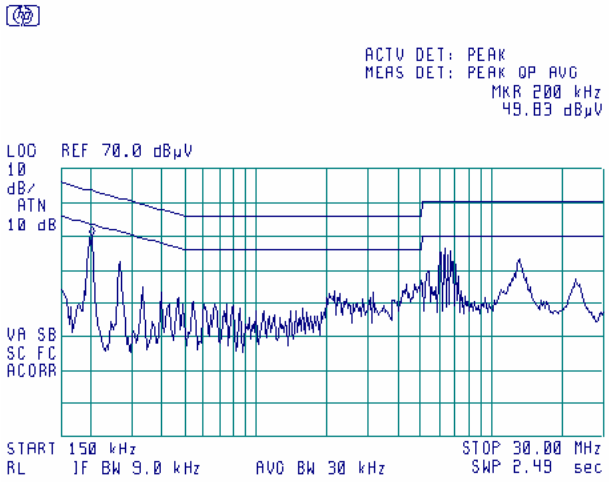
LINE: L2
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification:	Section 5.1 Class B, Conducted disturbance at mains terminals		
Test procedure:	EN 55022, Section 9		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 4:37:31 PM		
Temperature: 24.6 ºC	Air Pressure: 1006 hPa	Relative Humidity: 34 %	Power Supply: 230 VAC
Remarks:			

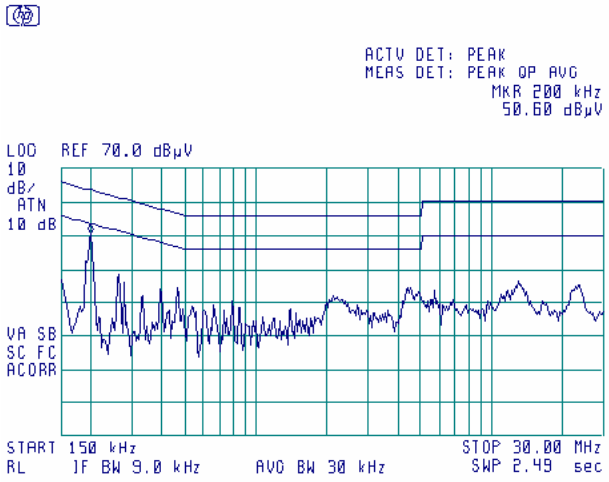
Plot 9.1.3 Conducted disturbance at mains terminals, AC mains input of PC

LINE: L1
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 9.1.4 Conducted disturbance at mains terminals, AC mains input of PC

LINE: L2
EUT Part Desktop PC
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification:	Section 6 Class B, Radiated disturbance		
Test procedure:	EN 55022, Section 10		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 8:06:12 AM		
Temperature: 24.9 ºC	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: 230 VAC
Remarks: The highest frequency used in the EUT is 480 MHz; therefore the test was performed in 30 – 2000 MHz range.			

9.2 Radiated disturbance

9.2.1 General

This test was performed to measure radiated disturbance from the EUT enclosure. The specification test limits are given in Table 9.2.1.

Table 9.2.1 Radiated disturbance limits

Frequency, MHz	Class B limit, dB(μV/m)				Class A limit, dB(μV/m)			
	Peak	Quasi-peak		Average	Peak	Quasi-peak		Average
	@3 m	@10 m	@3 m	@3 m	@3 m	@10 m	@3 m	@3 m
30 - 230	——	30.0	40.5*	——	——	40.0	50.5*	——
230 - 1000	——	37.0	47.5*	——	——	47.0	57.5*	——
1000 – 3000	70	——	——	50	76	——	——	56
3000 - 6000	74	——	——	54	80	——	——	60

* The limit for test distance other than specified was calculated using the inverse linear distance extrapolation factor as follows: $Lim_{S2} = Lim_{S1} + 20 \log (S_1/S_2)$,
where S_1 and S_2 – standard defined and test distance respectively in meters.

9.2.2 Test procedure

9.2.2.1 The EUT was set up as shown in Figure 9.2.1 and the associated photographs, energized and the EUT performance was checked.

9.2.2.2 The preliminary measurements were performed in the anechoic chamber at 3 m test distance. The specified frequency range was investigated with the antenna connected to the EMI receiver. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna height was swept from 1 to 1.8 m in both, vertical and horizontal polarizations.

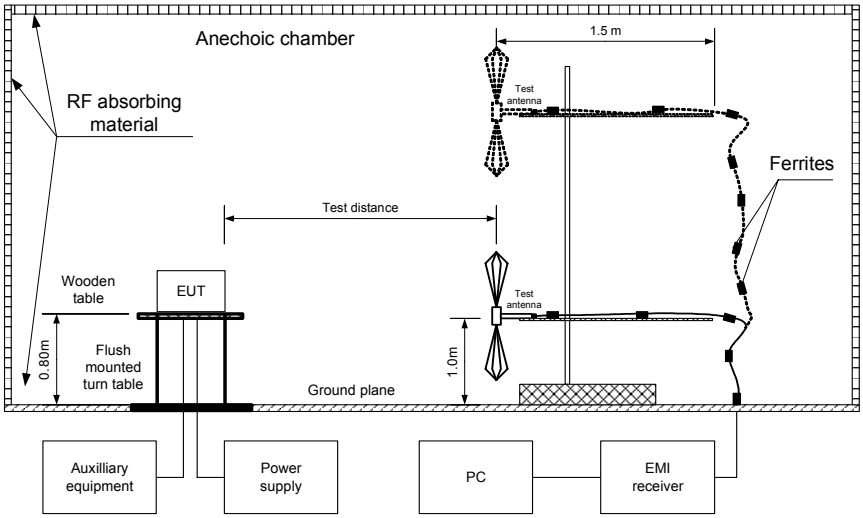
9.2.2.3 The EUT was set up as shown in Figure 9.2.2 and the associated photographs, energized and the EUT performance was checked.

9.2.2.4 The final measurements were performed at the open area test site at 10 m test distance with the antenna connected to the EMI receiver. The EUT wires and cables were arranged to produce the highest emission as it was found during the preliminary measurements. The frequencies, produced the highest emissions with respect to the limits during the preliminary test, were investigated. To find the highest emission the turntable was rotated 360^0 and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal polarizations. At frequencies, where high ambient noise was encountered, the final measurements were taken at 3 m distance.

9.2.2.5 The worst test results with respect to the limits were recorded in Table 9.2.2 and shown in the associated plots.

Test specification:	Section 6 Class B, Radiated disturbance		
Test procedure:	EN 55022, Section 10		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 8:06:12 AM		
Temperature: 24.9 ºC	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: 230 VAC
Remarks: The highest frequency used in the EUT is 480 MHz; therefore the test was performed in 30 – 2000 MHz range.			

Figure 9.2.1 Setup for radiated disturbance measurements in anechoic chamber, table-top EUT

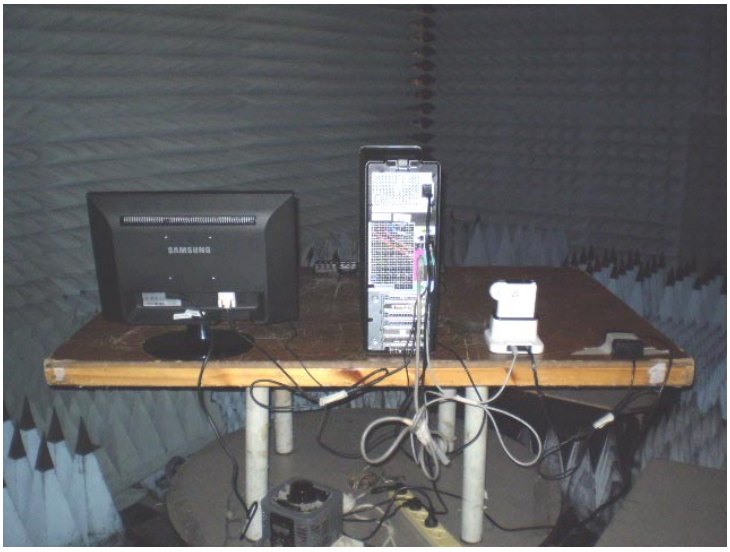


Photograph 9.2.1 Setup for preliminary radiated disturbance measurements below 1 GHz, general view

Test specification:	Section 6 Class B, Radiated disturbance		
Test procedure:	EN 55022, Section 10		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 8:06:12 AM		
Temperature: 24.9 ºC	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: 230 VAC
Remarks: The highest frequency used in the EUT is 480 MHz; therefore the test was performed in 30 – 2000 MHz range.			

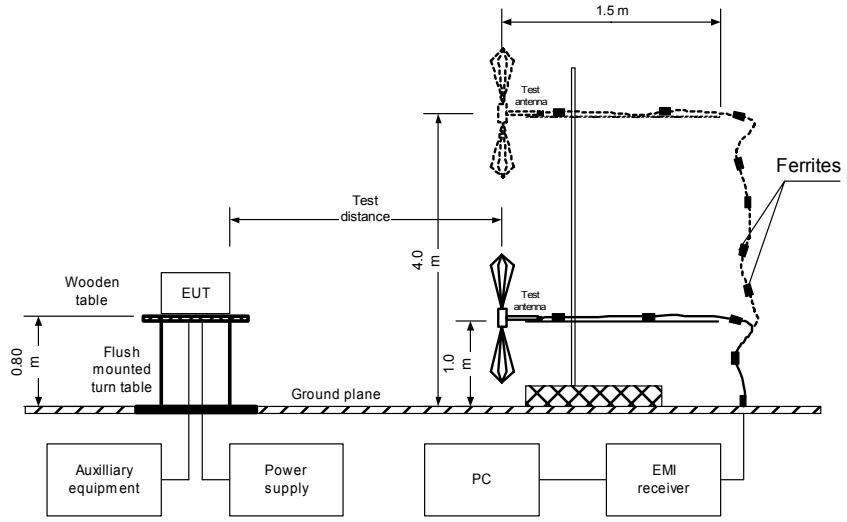
Photograph 9.2.2 Setup for preliminary radiated disturbance measurements above 1 GHz, general view

Photograph 9.2.3 Setup for preliminary radiated disturbance measurements, EUT cabling



Test specification:	Section 6 Class B, Radiated disturbance		
Test procedure:	EN 55022, Section 10		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 8:06:12 AM		
Temperature: 24.9 ºC	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: 230 VAC
Remarks: The highest frequency used in the EUT is 480 MHz; therefore the test was performed in 30 – 2000 MHz range.			

Figure 9.2.2 Setup for radiated disturbance measurements at OATS, table-top EUT



Photograph 9.2.4 Setup for final radiated disturbance measurements below 1 GHz, general view

Test specification:	Section 6 Class B, Radiated disturbance		
Test procedure:	EN 55022, Section 10		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 8:06:12 AM		
Temperature: 24.9 ºC	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: 230 VAC
Remarks: The highest frequency used in the EUT is 480 MHz; therefore the test was performed in 30 – 2000 MHz range.			

Photograph 9.2.5 Setup for final radiated disturbance measurements above 1 GHz, general view

Photograph 9.2.6 Setup for final radiated disturbance measurements, EUT cabling

Test specification:	**Section 6 Class B, Radiated disturbance**		
Test procedure:	EN 55022, Section 10		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	8/25/2009 8:06:12 AM		
Temperature: 24.9 ºC	**Air Pressure:** 1006 hPa	**Relative Humidity:** 38 %	**Power Supply:** 230 VAC
Remarks: The highest frequency used in the EUT is 480 MHz; therefore the test was performed in 30 – 2000 MHz range.			

Table 9.2.2 Radiated disturbance test results

EUT SET UP: TABLE-TOP
FREQUENCY RANGE: 30 MHz – 1000 MHz
DETECTORS USED: PEAK / QUASI-PEAK
RESOLUTION BANDWIDTH: 120 kHz
TEST SITE: OATS
TEST DISTANCE: 10 m

Frequency, MHz	Peak emission, dB(µV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*				
119.134700	34.83	23.68	30.00	-6.32	Vertical	1.0	160	Pass
240.001600	31.32	28.90	37.00	-8.10	Vertical	1.0	240	
357.267300	33.39	30.95	37.00	-6.05	Horizontal	2.1	160	
480.010500	38.53	33.60	37.00	-3.40	Vertical	1.0	320	
717.662400	29.06	22.50	37.00	-14.50	Vertical	1.0	180	
818.594000	33.99	28.15	37.00	-8.85	Horizontal	1.2	180	
826.926500	31.52	26.84	37.00	-10.16	Vertical	1.0	85	

FREQUENCY RANGE: 1000 MHz – 2000 MHz
DETECTORS USED: PEAK / AVERAGE
RESOLUTION BANDWIDTH: 1000 kHz
TEST SITE: OATS
TEST DISTANCE: 3 m

Frequency, MHz	Peak			Average			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
	Measured emission, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*	Measured emission, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*				
1200.067500	59.07	70.00	-10.93	26.73	50.00	-23.27	Vertical	1.2	171	Pass
1667.345000	55.10	70.00	-14.90	42.79	50.00	-7.21	Vertical	1.2	196	
1786.345000	56.60	70.00	-13.40	41.89	50.00	-8.11	Vertical	1.2	178	
1905.480000	48.97	70.00	-21.03	35.67	50.00	-14.33	Horizontal	1.2	180	
1945.062500	56.97	70.00	-13.03	30.89	50.00	-19.11	Vertical	1.2	360	
1995.587500	55.64	70.00	-14.36	26.09	50.00	-23.91	Vertical	1.2	290	

*- Margin = Measured emission - specification limit.
**- EUT front panel refers to 0 degrees position of turntable.

Reference numbers of test equipment used

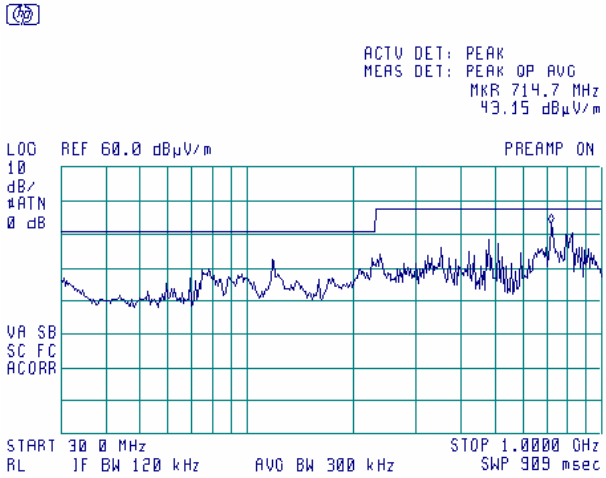
HL 0415	HL 0784	HL 0812	HL 0813	HL 1425	HL 1430	HL 1552	HL 1849
HL 1850	HL 2109	HL 2432	HL 2697	HL 2882	HL 2883		

Full description is given in Appendix A.

Test specification:	Section 6 Class B, Radiated disturbance		
Test procedure:	EN 55022, Section 10		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 8:06:12 AM		
Temperature: 24.9 ºC	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: 230 VAC
Remarks: The highest frequency used in the EUT is 480 MHz; therefore the test was performed in 30 – 2000 MHz range.			

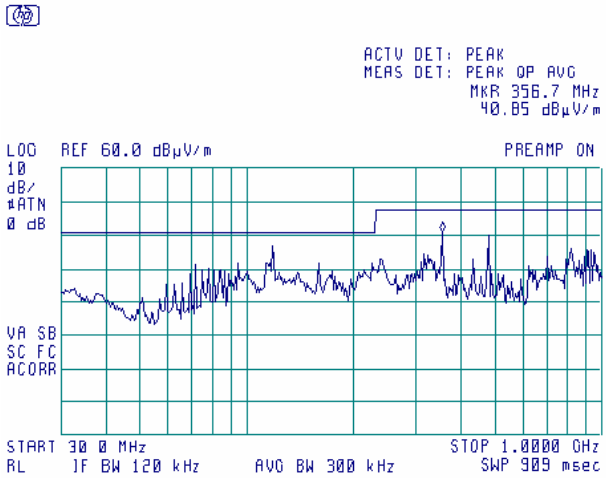
Plot 9.2.1 Radiated disturbance measurements in 30 - 1000 MHz range, vertical antenna polarization

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



Plot 9.2.2 Radiated disturbance measurements in 30 - 1000 MHz range, horizontal antenna polarization

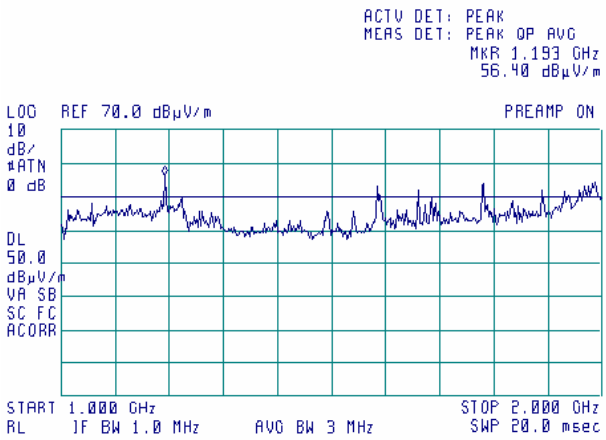
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



Test specification:	Section 6 Class B, Radiated disturbance		
Test procedure:	EN 55022, Section 10		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 8:06:12 AM		
Temperature: 24.9 ºC	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: 230 VAC
Remarks: The highest frequency used in the EUT is 480 MHz; therefore the test was performed in 30 – 2000 MHz range.			

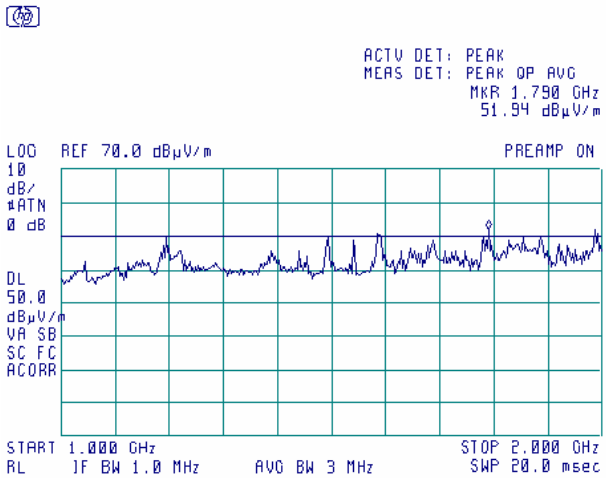
Plot 9.2.3 Radiated disturbance measurements in 1000 – 2000 MHz range, vertical antenna polarization

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



Plot 9.2.4 Radiated disturbance measurements in 1000 – 2000 MHz range, horizontal antenna polarization

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



Test specification:	Harmonic current emissions		
Test procedure:	EN 61000-3-2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/23/2009 11:10:33 AM		
Temperature: 25.8 ºC	Air Pressure: 1004 hPa	Relative Humidity: 36 %	Power Supply: 230 VAC
Remarks:			

10 Emissions tests according to EN 61000-3-2 requirements

10.1 Harmonic current emissions

10.1.1 General

This test was performed to measure the harmonic currents injected into the public supply system. The specification test limits are given in Table 10.1.1.

Table 10.1.1 Harmonic current emissions limits

Harmonic order, n	Equipment class A	Equipment class D	
	Maximum permissible harmonic current, A	Maximum permissible harmonic current per watt, mA/W	Maximum permissible harmonic current, A
Odd harmonics			
3	2.30	3.4	2.30
5	1.14	1.9	1.14
7	0.77	1.0	0.77
9	0.40	0.5	0.40
11	0.33	0.35	0.33
13	0.21	0.30	0.21
$15 \le n \le 39$	0.15 X 15/n	3.85/n	0.15 X 15/n
Even harmonics			
2	1.08	NA	
4	0.43		
6	0.30		
$8 \le n \le 40$	0.23 X 8/n		

10.1.2 Test procedure

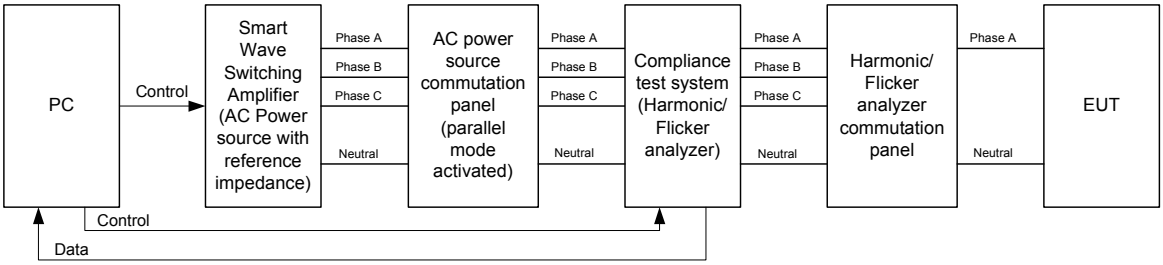
10.1.2.1 The EUT was set up as shown in Figure 10.1.1 and the associated photograph, energized and the EUT performance was checked.

10.1.2.2 The EUT was operated under normal operating and load conditions.

10.1.2.3 The harmonic currents for transitory and steady states conditions were measured with the computerized setup. The test results are provided in the associated tables.

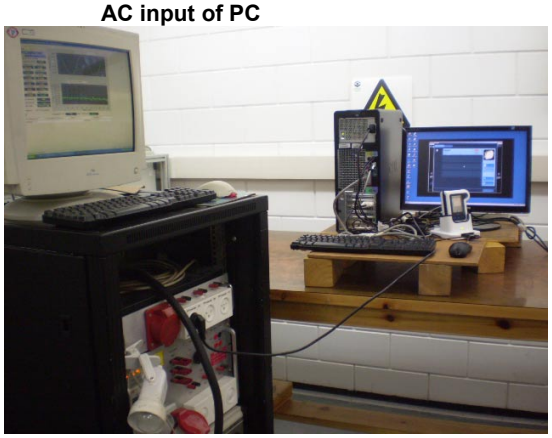
Test specification:	Harmonic current emissions		
Test procedure:	EN 61000-3-2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/23/2009 11:10:33 AM		
Temperature: 25.8 ºC	Air Pressure: 1004 hPa	Relative Humidity: 36 %	Power Supply: 230 VAC
Remarks:			

Figure 10.1.1 Setup for harmonic current emissions test

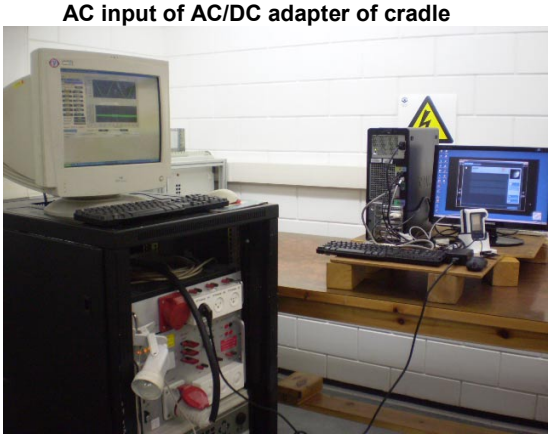


Photograph 10.1.1 Setup for harmonic current emissions test

AC input of PC



AC input of AC/DC adapter of cradle



Test specification:	Harmonic current emissions		
Test procedure:	EN 61000-3-2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/23/2009 11:10:33 AM		
Temperature: 25.8 ºC	Air Pressure: 1004 hPa	Relative Humidity: 36 %	Power Supply: 230 VAC
Remarks:			

Table 10.1.2 Fluctuating harmonics summary results, PC

Test category: Class-D (European limits) Test Margin: 100
Test Result: Pass Source qualification: Normal
Highest parameter values during test:

Voltage (Vrms):	233.28	Frequency(Hz):	50.00
I_Peak (Amps):	1.214	I_RMS (Amps):	0.688
I_Fund (Amps):	0.679	Crest Factor:	2.031
Power (Watts):	146.5	Power Factor:	0.913

Table 10.1.3 Fluctuating harmonics test results, PC

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
3	0.087	0.498	17.4	0.069	0.523	13.25	Pass
5	0.043	0.278	15.4	0.033	0.292	11.32	Pass
7	0.024	0.147	16.2	0.025	0.219	11.50	Pass
9	0.013	0.073	17.9	0.013	0.077	16.45	Pass
11	0.008	0.051	16.4	0.009	0.054	16.34	Pass
13	0.007	0.044	16.8	0.007	0.046	15.16	Pass
15	0.005	0.038	13.6	0.006	0.039	14.10	Pass
17	0.006	0.034	18.6	0.007	0.050	14.56	Pass
19	0.006	0.030	20.0	0.007	0.044	15.17	Pass
21	0.005	0.027	18.5	0.005	0.029	18.96	Pass
23	0.006	0.024	24.1	0.006	0.026	21.11	Pass
25	0.006	0.023	25.3	0.005	0.024	22.16	Pass
27	0.005	0.021	23.1	0.005	0.022	22.92	Pass
29	0.005	0.019	27.9	0.006	0.021	27.21	Pass
31	0.006	0.018	31.3	0.005	0.019	25.90	Pass
33	0.005	0.017	29.4	0.005	0.018	26.01	Pass
35	0.006	0.016	36.2	0.007	0.024	29.44	Pass
37	0.009	0.015	57.2	0.010	0.023	45.14	Pass
39	0.012	0.015	81.6	0.014	0.022	64.91	Pass

Test specification:	Harmonic current emissions		
Test procedure:	EN 61000-3-2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/23/2009 11:10:33 AM		
Temperature: 25.8 ºC	Air Pressure: 1004 hPa	Relative Humidity: 36 %	Power Supply: 230 VAC
Remarks:			

Table 10.1.4 Fluctuating harmonics summary results, AC/DC adapter of cradle

Test category: Class-A (European limits) Test Margin: 100
Test Result: Pass Source qualification: Normal
Highest parameter values during test:

V_RMS (Volts):	233.31	Frequency(Hz):	50.00
I_Peak (Amps):	0.443	I_RMS (Amps):	0.090
I_Fund (Amps):	0.049	Crest Factor:	5.144
Power (Watts):	7.4	Power Factor:	0.359

Table 10.1.5 Fluctuating harmonics test results, AC/DC adapter of cradle

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.006	1.080	0.5	0.008	1.620	0.46	Pass
3	0.028	2.300	1.2	0.031	3.450	0.89	Pass
4	0.006	0.430	1.3	0.007	0.645	1.03	Pass
5	0.028	1.140	2.4	0.028	1.710	1.64	Pass
6	0.005	0.300	1.8	0.006	0.450	1.25	Pass
7	0.026	0.770	3.4	0.027	1.155	2.33	Pass
8	0.005	0.230	2.2	0.005	0.345	1.55	Pass
9	0.025	0.400	6.2	0.025	0.600	4.21	Pass
10	0.005	0.184	2.5	0.005	0.276	1.79	Pass
11	0.023	0.330	7.0	0.023	0.495	4.74	Pass
12	0.004	0.153	2.8	0.004	0.230	1.91	Pass
13	0.021	0.210	10.1	0.022	0.315	6.84	Pass
14	0.004	0.131	2.9	0.004	0.197	1.97	Pass
15	0.019	0.150	12.6	0.019	0.225	8.54	Pass
16	0.003	0.115	2.9	0.003	0.173	1.99	Pass
17	0.017	0.132	12.7	0.017	0.199	8.50	Pass
18	0.003	0.102	2.8	0.003	0.153	1.93	Pass
19	0.014	0.118	12.2	0.015	0.178	8.20	Pass
20	0.002	0.092	2.7	0.003	0.138	1.86	Pass
21	0.012	0.107	11.3	0.012	0.161	7.62	Pass
22	0.002	0.084	2.6	0.002	0.125	1.79	Pass
23	0.010	0.098	10.1	0.010	0.147	6.82	Pass
24	0.002	0.077	2.4	0.002	0.115	1.74	Pass
25	0.008	0.090	8.7	0.008	0.135	5.85	Pass
26	0.002	0.071	2.3	0.002	0.106	1.61	Pass
27	0.006	0.083	7.1	0.006	0.125	4.82	Pass
28	0.002	0.066	2.3	0.002	0.099	1.58	Pass
29	0.004	0.078	5.4	0.004	0.116	3.72	Pass
30	0.001	0.061	2.4	0.002	0.092	1.65	Pass
31	0.003	0.073	3.7	0.003	0.109	2.59	Pass
32	0.001	0.058	2.5	0.001	0.086	1.71	Pass
33	0.002	0.068	2.2	0.002	0.102	1.61	Pass
34	0.001	0.054	2.6	0.001	0.081	1.78	Pass
35	0.001	0.064	1.3	0.001	0.096	0.92	Pass
36	0.001	0.051	2.6	0.001	0.077	1.79	Pass
37	0.001	0.061	1.8	0.001	0.091	1.26	Pass
38	0.001	0.048	2.6	0.001	0.073	1.76	Pass
39	0.002	0.058	2.7	0.002	0.087	1.87	Pass
40	0.001	0.046	2.4	0.001	0.069	1.68	Pass

Reference numbers of test equipment used

HL 2364	HL 2417	HL 2666	HL 2765				

Full description is given in Appendix A.

Test specification:	Voltage fluctuations and flicker		
Test procedure:	EN 61000-3-3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/23/2009 10:58:28 AM		
Temperature: 25.8 ºC	Air Pressure: 1004 hPa	Relative Humidity: 36 %	Power Supply: 230 VAC
Remarks:			

11 Emissions tests according to EN 61000-3-3 requirements

11.1 Voltage fluctuations and flicker

11.1.1 General

This test was performed to measure the voltage fluctuations and flicker impressed on the public low-voltage system at the supply terminals of the EUT. The specification test limits are given in Table 11.1.1.

Table 11.1.1 Voltage fluctuations and flicker limits

No.	Criteria
1.	The value of short term flicker shall not be greater then 1.0
2.	The value of long term flicker shall not be greater then 0.65
3.	The relative steady state voltage shall not exceed 3.3%
4.	The maximum relative voltage change shall not exceed 4%
5.	The value of the relative voltage change waveform shall not exceed 3.3% for more than 500 ms.

11.1.2 Test procedure

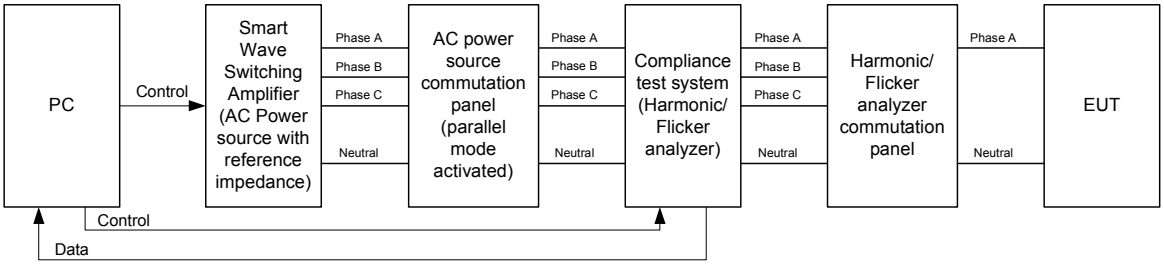
11.1.2.1 The EUT was set up as shown in Figure 11.1.1 and the associated photograph, energized and the EUT performance was checked.

11.1.2.2 The EUT was operated under normal operating and load conditions.

11.1.2.3 The voltage fluctuations and flickers for transitory and steady states conditions were measured with the computerized setup. The test results are provided in the associated tables.

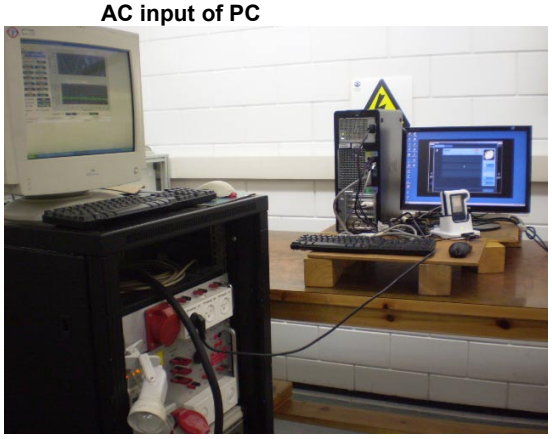
Test specification:	Voltage fluctuations and flicker		
Test procedure:	EN 61000-3-3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/23/2009 10:58:28 AM		
Temperature: 25.8 ºC	Air Pressure: 1004 hPa	Relative Humidity: 36 %	Power Supply: 230 VAC
Remarks:			

Figure 11.1.1 Setup for voltage fluctuations and flicker test

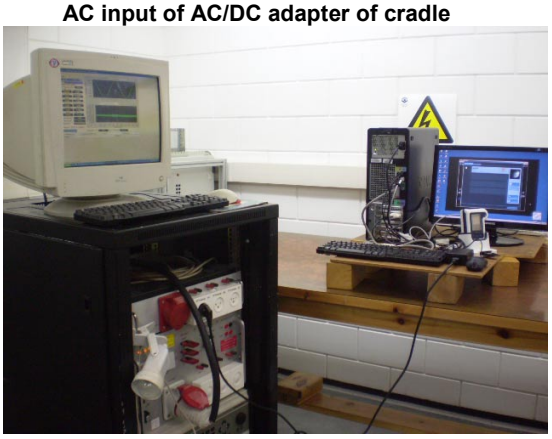


Photograph 11.1.1 Setup for voltage fluctuations and flicker test

AC input of PC



AC input of AC/DC adapter of cradle



Test specification:	Voltage fluctuations and flicker		
Test procedure:	EN 61000-3-3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/23/2009 10:58:28 AM		
Temperature: 25.8 ºC	Air Pressure: 1004 hPa	Relative Humidity: 36 %	Power Supply: 230 VAC
Remarks:			

Table 11.1.2 Voltage fluctuations and short term flicker test results, PC

Vrms at the end of test (Volt):	229.85			
Highest dt (%):	0.00	Test limit (%):	3.30	Pass
Time(mS) > dt:	0.0	Test limit (mS):	500.0	Pass
Highest dc (%):	0.00	Test limit (%):	3.30	Pass
Highest dmax (%):	0.00	Test limit (%):	4.00	Pass
Highest Pst (10 min. period):	0.001	Test limit:	1.000	Pass

Long term flicker test was considered unnecessary as the value of short term flicker was lower than 0.65 under the most unfavourable sequence of the EUT operation.

Table 11.1.3 Voltage fluctuations and short term flicker test results, AC/DC adapter of cradle

Vrms at the end of test (Volt):	230.02			
Highest dt (%):	0.00	Test limit (%):	3.30	Pass
Time(mS) > dt:	0.0	Test limit (mS):	500.0	Pass
Highest dc (%):	0.00	Test limit (%):	3.30	Pass
Highest dmax (%):	0.00	Test limit (%):	4.00	Pass
Highest Pst (10 min. period):	0.001	Test limit:	1.000	Pass

Long term flicker test was considered unnecessary as the value of short term flicker was lower than 0.65 under the most unfavourable sequence of the EUT operation.

Reference numbers of test equipment used

HL 2364	HL 2417	HL 2666	HL 2765				

Full description is given in Appendix A.

Test specification:	Immunity to electrostatic discharge (ESD)		
Test procedure:	EN 61000-4-2; EN 55024, Section 4.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/27/2009 11:39:34 AM		
Temperature: 24.5 ºC	Air Pressure: 1009 hPa	Relative Humidity: 35 %	Power Supply: 230 VAC
Remarks:			

12 Immunity tests according to EN 55024 requirements

12.1 Immunity to electrostatic discharge (ESD)

12.1.1 General

This test was performed to verify the EUT immunity to electrostatic discharges from operators directly and from adjacent objects. ESDs were applied to all parts of the EUT, which are accessible during normal operation and maintenance.
The ESD levels, performance criterion and test results are referred to in Table 12.1.1.

12.1.2 Test procedure

12.1.2.1 The EUT was set up as shown in Figure 12.1.1 and the associated photographs, energized and the EUT performance was checked.

12.1.2.2 Single contact discharges of both polarities with 1 s time interval between pulses were applied to the horizontal coupling plane (HCP) at 10 centimeter distance from the EUT. Each side of the EUT was subjected to ESDs.

12.1.2.3 Single contact discharges of both polarities with 1 s time interval between pulses were applied to the vertical coupling plane (VCP) placed 10 centimeters from the EUT. The VCP was moved, in turn, to all sides of the EUT and was subjected to ESDs.

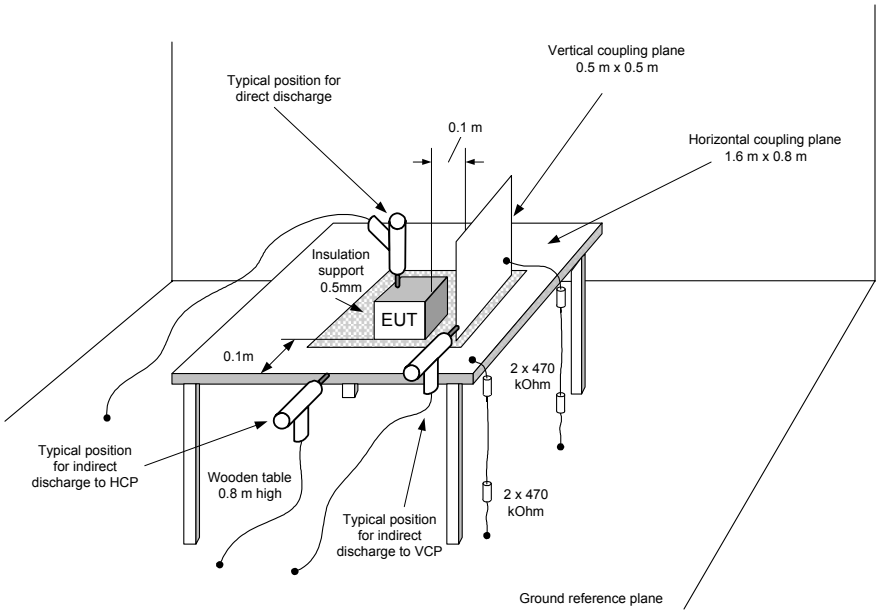
12.1.2.4 Single contact discharges of both polarities with 1 s time interval between pulses were applied to all conductive parts of the EUT cabinet.

12.1.2.5 Single air discharges of both polarities with 1 s time interval between pulses were applied to all non-conductive parts of the EUT.

12.1.2.6 The EUT operation was monitored throughout the test for any malfunction or degradation and its performance was recorded.

12.1.2.7 Upon this the test was completed.

Figure 12.1.1 Setup for immunity to ESD, table-top EUT



Test specification:	Immunity to electrostatic discharge (ESD)		
Test procedure:	EN 61000-4-2; EN 55024, Section 4.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/27/2009 11:39:34 AM		
Temperature: 24.5 ºC	Air Pressure: 1009 hPa	Relative Humidity: 35 %	Power Supply: 230 VAC
Remarks:			

Photograph 12.1.1 Setup for immunity to ESD, general view

Photograph 12.1.2 Setup for immunity to ESD, EUT test points

Test specification:	Immunity to electrostatic discharge (ESD)		
Test procedure:	EN 61000-4-2; EN 55024, Section 4.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/27/2009 11:39:34 AM		
Temperature: 24.5 ºC	Air Pressure: 1009 hPa	Relative Humidity: 35 %	Power Supply: 230 VAC
Remarks:			

Table 12.1.1 Immunity to ESD test results

EUT SET UP: TABLE-TOP
PERFORMANCE CRITERIA: B
NUMBER OF DISCHARGES AT EACH POINT & EACH LEVEL: 25 POSITIVE / 25 NEGATIVE

ESD applied to	Test voltage, kV	Number of test points	EUT performance description during the test	Verdict
Air discharge				
EUT	2	12*	NP	Pass
	4		NP	
	8		NP	
Contact discharge				
EUT	2	18	NP	Pass
	4		NP	
HCP	2	4	NP	Pass
	4		NP	
VCP	2	4	NP	Pass
	4		NP	

* 25 positive / 25 negative air discharges were applied only to the test points, where discharges occurred. At all other points dielectric was examined for sufficient insulation to prevent disruption.

Reference numbers of test equipment used

HL 2823	HL 2959	HL 3377	HL 3378				

Full description is given in Appendix A.

Test specification:	Radiated immunity to radio frequency electromagnetic field		
Test procedure:	EN 61000-4-3; EN 55024, Section 4.2.3.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/18/2009 12:00:37 PM		
Temperature: 24.9 ºC	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: 230 VAC
Remarks:			

12.2 Radiated immunity to radio frequency electromagnetic field

12.2.1 General

This test was performed to verify the EUT immunity to radiated radio frequency electromagnetic field.
The radiated RF electromagnetic field levels, performance criterion and test results are referred to in Table 12.2.1.

12.2.2 Test procedure

12.2.2.1 The EUT was set up as shown in Figure 12.2.1 and the associated photographs, energized and the EUT performance was checked.

12.2.2.2 The electric field generating antenna was installed facing the EUT front panel at the specified distance.

12.2.2.3 The test setup was adjusted to produce the required field strength level. The field strength was monitored by the isotropic field probe, which was placed near the EUT.

12.2.2.4 The signal frequency was scanned throughout the frequency range.

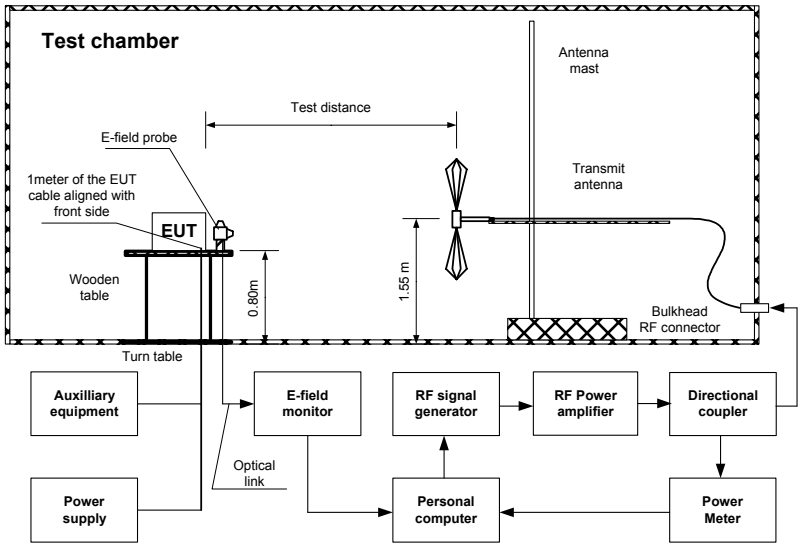
12.2.2.5 The test was performed with the antenna in both vertical and horizontal polarizations.

12.2.2.6 The test was repeated for the rest of the EUT orientations.

12.2.2.7 The EUT operation was monitored throughout the test for any malfunction or degradation and its performance was recorded.

12.2.2.8 Upon this the test was completed.

Figure 12.2.1 Setup for radiated immunity to RF electromagnetic field test, table-top EUT



Test specification:	Radiated immunity to radio frequency electromagnetic field		
Test procedure:	EN 61000-4-3; EN 55024, Section 4.2.3.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/18/2009 12:00:37 PM		
Temperature: 24.9 ºC	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: 230 VAC
Remarks:			

Photograph 12.2.1 Setup for radiated immunity to RF electromagnetic field test, general view

Photograph 12.2.2 Setup for radiated immunity to RF electromagnetic field test, EUT cabling

Test specification:	Radiated immunity to radio frequency electromagnetic field		
Test procedure:	EN 61000-4-3; EN 55024, Section 4.2.3.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/18/2009 12:00:37 PM		
Temperature: 24.9 ºC	Air Pressure: 1006 hPa	Relative Humidity: 38 %	Power Supply: 230 VAC
Remarks:			

Table 12.2.1 Radiated immunity to RF electromagnetic field test results

EUT SET UP: TABLE-TOP
PERFORMANCE CRITERIA: A
TEST SITE: ANECHOIC CHAMBER
ANTENNA TO EUT DISTANCE: 3 m
FREQUENCY RANGE: 80 – 1000 MHz
MODULATION: 80% AM with 1 kHz
DWELL TIME: 2.8 s
FREQUENCY STEP: 1 % of current frequency

EUT orientation*	Antenna polarization	Field strength**, V_{rms}/m	EUT performance description during the test	Verdict
0°	Vertical	3	NP	Pass
	Horizontal		NP	
90°	Vertical		NP	Pass
	Horizontal		NP	
180°	Vertical		NP	Pass
	Horizontal		NP	
270°	Vertical		NP	Pass
	Horizontal		NP	

* - 0° = antenna installed facing the EUT front panel.
**- Field strength measured prior to modulation.

Reference numbers of test equipment used

HL 0317	HL 0613	HL 0674	HL 1553	HL 1629	HL 1849	HL 1850	HL 2109
HL 2667	HL 2697	HL 2783	HL 3158				

Full description is given in Appendix A.

Test specification:	Conducted immunity to electrical fast transients/ bursts (EFT/ B)		
Test procedure:	EN 61000-4-4; EN 55024, Section 4.2.2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/23/2009 2:02:18 PM		
Temperature: 25.8 ºC	Air Pressure: 1004 hPa	Relative Humidity: 36 %	Power Supply: 230 VAC
Remarks:			

12.3 Conducted immunity to electrical fast transient/ burst (EFT/ B)

12.3.1 General

This test was performed to verify the EUT conducted immunity to electrical fast transient/ burst (EFT/B) applied to the EUT power lines.
The EFT/B levels, performance criterion and test results are referred to in Table 12.3.1.

12.3.2 Test procedure for three-wire power lines application

12.3.2.1 The EUT was set up as shown in Figure 12.3.1 and the associated photograph, energized and the EUT performance was checked.

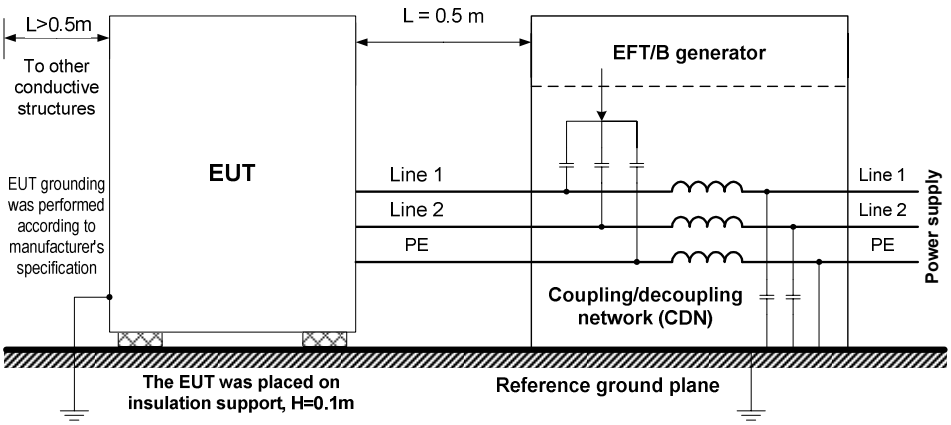
12.3.2.2 The EFT/B generator output parameters (voltage, frequency repetition and duration) were adjusted as referred to in Table 12.3.1 and the bursts were applied to the EUT power lines.

12.3.2.3 The EUT operation was monitored throughout the test for any malfunction or degradation and its performance was recorded.

12.3.2.4 Upon this the test was completed.

Test specification:	Conducted immunity to electrical fast transients/ bursts (EFT/ B)		
Test procedure:	EN 61000-4-4; EN 55024, Section 4.2.2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/23/2009 2:02:18 PM		
Temperature: 25.8 ºC	Air Pressure: 1004 hPa	Relative Humidity: 36 %	Power Supply: 230 VAC
Remarks:			

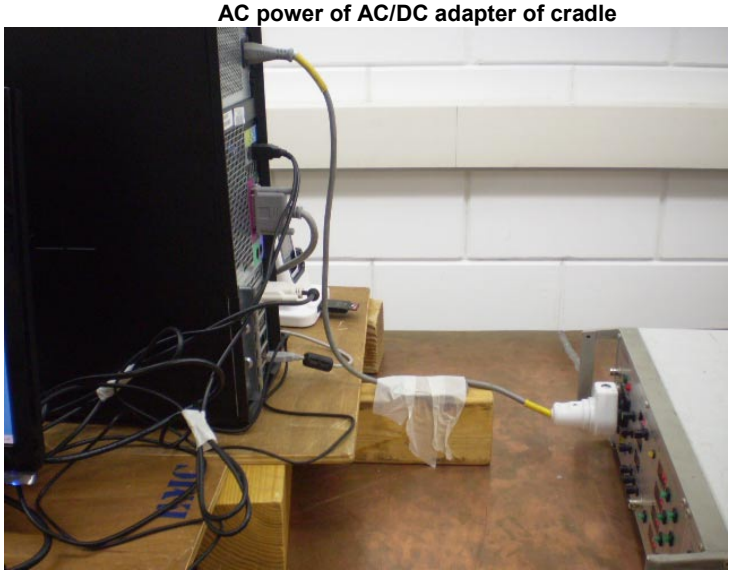
Figure 12.3.1 Setup for conducted immunity to EFT/B test at power supply line, table-top EUT



Photograph 12.3.1 Setup for conducted immunity to EFT/B at AC power supply line

AC power of PC

AC power of AC/DC adapter of cradle



Test specification:	Conducted immunity to electrical fast transients/ bursts (EFT/ B)		
Test procedure:	EN 61000-4-4; EN 55024, Section 4.2.2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/23/2009 2:02:18 PM		
Temperature: 25.8 ºC	Air Pressure: 1004 hPa	Relative Humidity: 36 %	Power Supply: 230 VAC
Remarks:			

Table 12.3.1 Conducted immunity to EFT/ B test results

EUT SET UP: TABLE-TOP
PERFORMANCE CRITERIA: B
DURATION: 1 min
REPETITION FREQUENCY: 5 kHz
PULSE RISE TIME/ DURATION: 5 / 50 ns
BURST DURATION/ PERIOD: 15 / 300 ms

Type of disturbed line	Line description	Test voltage, kV	EFT/B polarity	EUT performance description during the test	Verdict
AC power of AC/DC adapter of cradle	Line 1, Line 2 & PE	1	Positive	NP	Pass
			Negative	NP	
AC power of PC	Line 1, Line 2 & PE	1	Positive	NP	Pass
			Negative	NP	

Reference numbers of test equipment used

HL 0860	HL 2383						

Full description is given in Appendix A.

Test specification:	Conducted immunity to voltage surges		
Test procedure:	EN 61000-4-5; EN 55024, Section 4.2.5		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 12:26:19 PM		
Temperature: 25.8 ºC	Air Pressure: 1008 hPa	Relative Humidity: 35 %	Power Supply: 230 VAC
Remarks:			

12.4 Conducted immunity to voltage surges

12.4.1 General

This test was performed to verify the EUT immunity to high-energy surges produced by switching and indirect lightning transients.
The surge levels, performance criterion and test results are referred to in the associated table.

12.4.2 Test procedure for three-wire power line application

12.4.2.1 The EUT was set up as shown in Figure 12.4.1 and the associated photograph, energized and the EUT performance was checked.

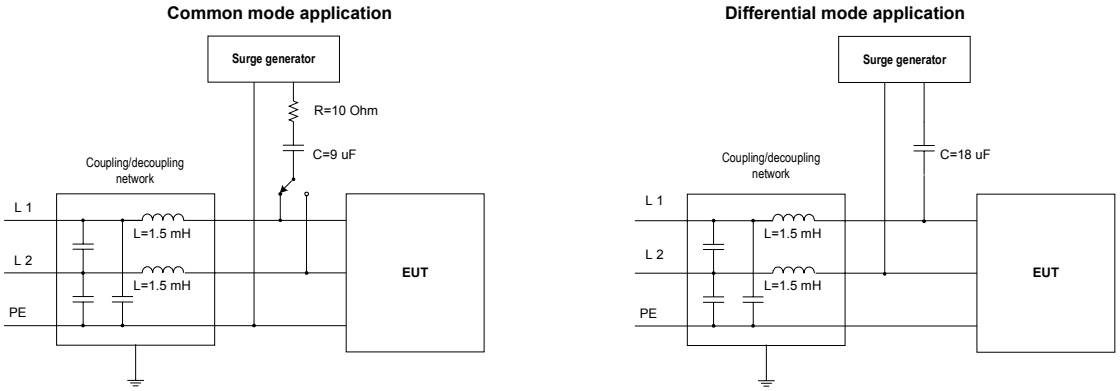
12.4.2.2 The surge generator output parameters (voltage and pulse shape) were adjusted as referred to in Table 12.4.1. Voltage surges of both polarities were applied to the EUT power port in differential (line to line) and common (line to ground) modes with 1 per minute repetition rate.

12.4.2.3 The EUT operation was monitored throughout the test for any malfunction or degradation and its performance was recorded.

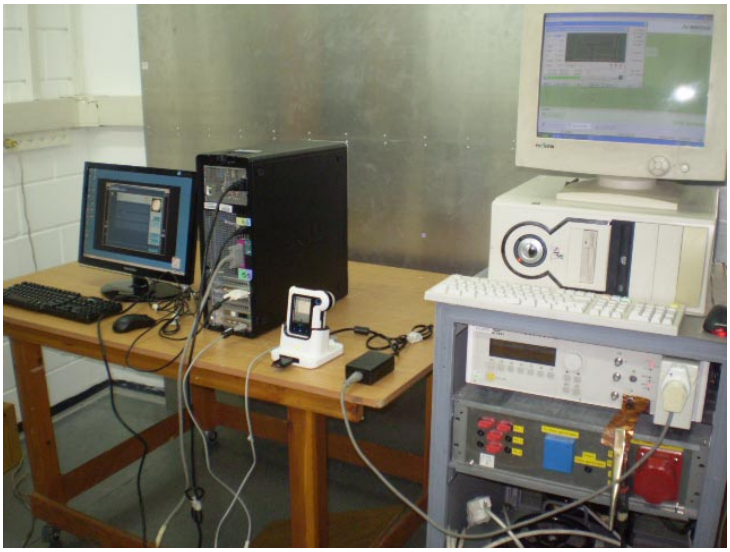
12.4.2.4 Upon this the test was completed.

Test specification:	Conducted immunity to voltage surges		
Test procedure:	EN 61000-4-5; EN 55024, Section 4.2.5		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 12:26:19 PM		
Temperature: 25.8 ºC	Air Pressure: 1008 hPa	Relative Humidity: 35 %	Power Supply: 230 VAC
Remarks:			

Figure 12.4.1 Setup for conducted immunity to voltage surges test, three-wire power line



Photograph 12.4.1 Setup for conducted immunity to voltage surges at AC power line



Test specification:	Conducted immunity to voltage surges		
Test procedure:	EN 61000-4-5; EN 55024, Section 4.2.5		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 12:26:19 PM		
Temperature: 25.8 ºC	Air Pressure: 1008 hPa	Relative Humidity: 35 %	Power Supply: 230 VAC
Remarks:			

Table 12.4.1 Conducted immunity to voltage surges test results, three-wire power line

PERFORMANCE CRITERIA: B
SURGE PULSE SHAPE, Tr/Th: 1.2/50 μs
NUMBER OF PULSES: 5/5 (positive/negative) in each phase
PHAZE SYNCHRONIZATION: 0°, 90°, 180° and 270° of sine wave

Line description	Surge application	Applied voltage, kV	EUT performance description during the test	Verdict
Common mode				
AC power of AC/DC adapter of cradle	L 1 to GND	0.5	NP	Pass
		1.0	NP	
		2.0	NP	
	L 2 to GND	0.5	NP	Pass
		1.0	NP	
		2.0	NP	
Differential mode				
AC power of AC/DC adapter of cradle	L 1 to L 2	0.5	NP	Pass
		1.0	NP	

Reference numbers of test equipment used

HL 3652							

Full description is given in Appendix A.

Test specification:	Conducted immunity to disturbances induced by radio frequency field		
Test procedure:	EN 61000-4-6; EN 55024, Section 4.2.3.2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 12:29:20 PM		
Temperature: 25.8 ºC	Air Pressure: 1008 hPa	Relative Humidity: 35 %	Power Supply: 230 VAC
Remarks:			

12.5 Immunity to conducted disturbances induced by radio frequency fields

12.5.1 General

This test was performed to verify the EUT immunity to conducted disturbances, induced by RF fields into the power lines in 0.15 - 80 MHz range.
The conducted disturbances levels, performance criterion and test results are referred to in Table 12.5.1.

12.5.2 Test procedure for power lines application

12.5.2.1 The EUT was set up as shown in Figure 12.5.1 and the associated photograph, energized and the EUT performance was checked.

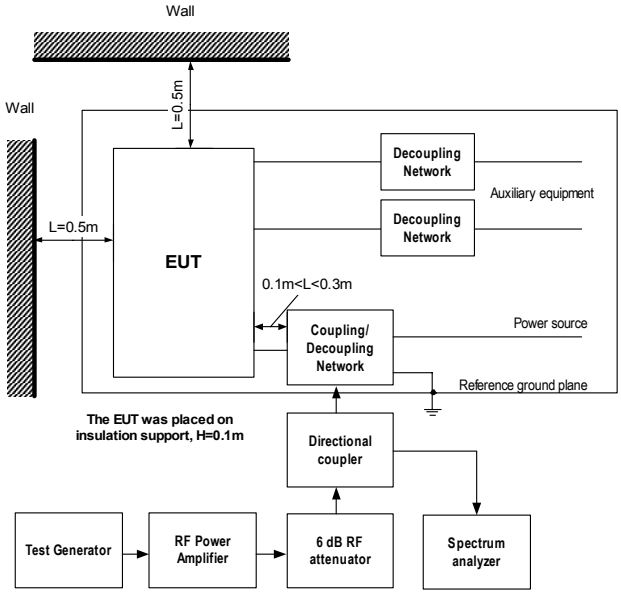
12.5.2.2 The test setup was adjusted to produce the disturbance signal as referred to in Table 12.5.1. The disturbance signal was injected into the EUT power lines. The signal frequency was scanned with the step less than 1% of the fundamental frequency and the sweep rate less than $1.5x10^{-3}$ decade/s throughout the specified frequency range.

12.5.2.3 The EUT operation was monitored throughout the test for any malfunction or degradation and its performance was recorded.

12.5.2.4 Upon this the test was completed.

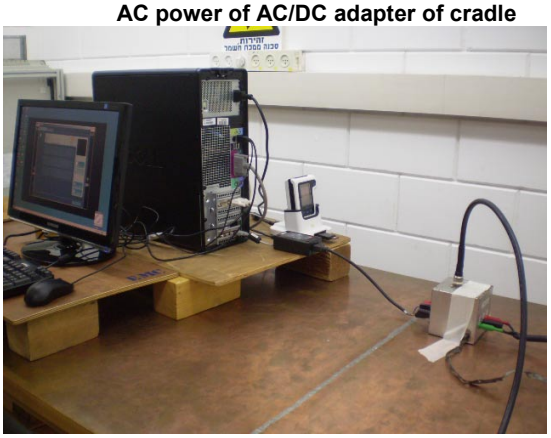
Test specification:	Conducted immunity to disturbances induced by radio frequency field		
Test procedure:	EN 61000-4-6; EN 55024, Section 4.2.3.2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 12:29:20 PM		
Temperature: 25.8 ºC	Air Pressure: 1008 hPa	Relative Humidity: 35 %	Power Supply: 230 VAC
Remarks:			

Figure 12.5.1 Setup for immunity to conducted disturbances induced by radio frequency fields at power supply line

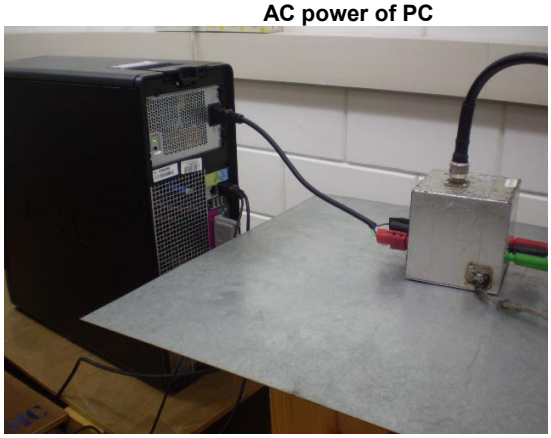


Photograph 12.5.1 Setup for immunity to conducted disturbances induced by RF fields at AC power supply line

AC power of AC/DC adapter of cradle



AC power of PC



Test specification:	Conducted immunity to disturbances induced by radio frequency field		
Test procedure:	EN 61000-4-6; EN 55024, Section 4.2.3.2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2009 12:29:20 PM		
Temperature: 25.8 ºC	Air Pressure: 1008 hPa	Relative Humidity: 35 %	Power Supply: 230 VAC
Remarks:			

Table 12.5.1 Immunity to conducted disturbances induced by radio frequency fields test results

EUT SET UP: TABLE-TOP
PERFORMANCE CRITERIA: A
FREQUENCY RANGE: 0.15 – 80 MHz
TYPE OF MODULATION: AM 80% @ 1 kHz
TEST VOLTAGE: 3 V_{rms} prior to modulation
DWELL TIME: 2.8 s
FREQUENCY STEP: 1 % of current frequency

Type of disturbed line	Test coupling	EUT performance during the test	Verdict
AC power of AC/DC adapter of cradle	CDN M3	NP	Pass
AC power of PC	CDN M3	NP	Pass

Reference numbers of test equipment used

HL 0027	HL 0557	HL 0728	HL 0795	HL 2205	HL 2754		

Full description is given in Appendix A.

Test specification:	Radiated immunity to power frequency magnetic field		
Test procedure:	EN 61000-4-8; EN 55024, Section 4.2.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/23/2009 8:59:58 AM		
Temperature: 25.8 ºC	Air Pressure: 1004 hPa	Relative Humidity: 36 %	Power Supply: 230 VAC
Remarks:			

12.6 Immunity to power frequency magnetic fields

12.6.1 General

This test was performed to verify the EUT immunity to magnetic fields caused by power frequency.
The magnetic field levels, performance criterion and test results are referred to in Table 12.6.1.

12.6.2 Test procedure

12.6.2.1 The EUT was set up as shown in Figure 12.6.1 and the associated photograph, energized and the EUT performance was checked.

12.6.2.2 The test setup was adjusted to produce the continuous magnetic field and the EUT was exposed.

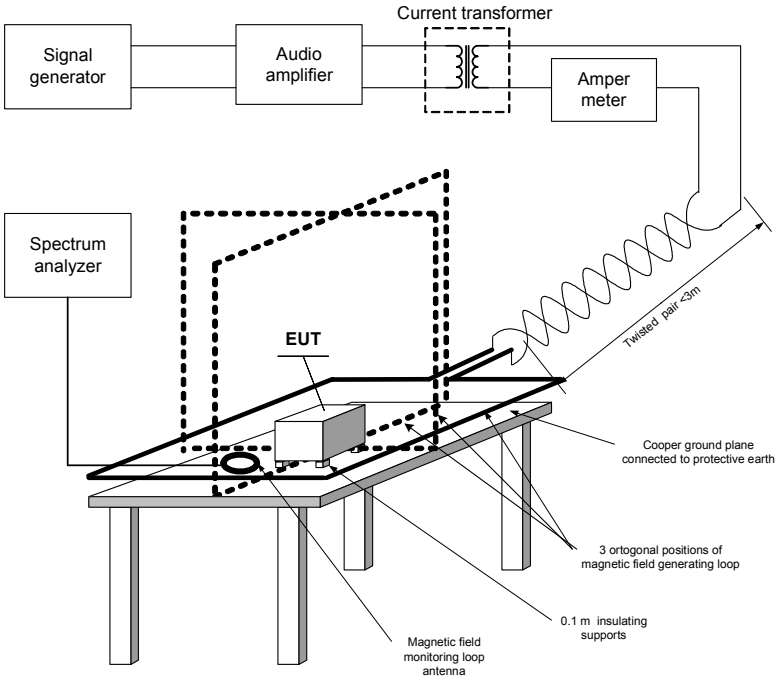
12.6.2.3 The procedure was repeated for the rest two orthogonal positions of the EUT.

12.6.2.4 The EUT operation was monitored throughout the test for any malfunction or degradation and its performance was recorded.

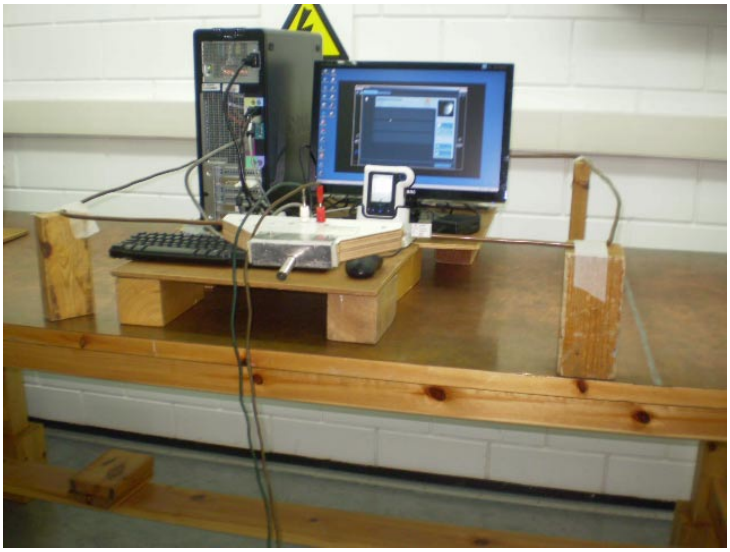
12.6.2.5 Upon this the test was completed.

Test specification:	Radiated immunity to power frequency magnetic field		
Test procedure:	EN 61000-4-8; EN 55024, Section 4.2.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/23/2009 8:59:58 AM		
Temperature: 25.8 ºC	Air Pressure: 1004 hPa	Relative Humidity: 36 %	Power Supply: 230 VAC
Remarks:			

Figure 12.6.1 Setup for immunity to power frequency magnetic field test



Photograph 12.6.1 Setup for immunity to power frequency magnetic field



Test specification:	Radiated immunity to power frequency magnetic field		
Test procedure:	EN 61000-4-8; EN 55024, Section 4.2.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/23/2009 8:59:58 AM		
Temperature: 25.8 ºC	Air Pressure: 1004 hPa	Relative Humidity: 36 %	Power Supply: 230 VAC
Remarks:			

Table 12.6.1 Immunity to power frequency magnetic fields test results

EUT SET UP: TABLE-TOP
PERFORMANCE CRITERIA: A
DURATION: 10 min
MAGNETIC FIELD STRENGTH: 1 A/m
FREQUENCY: 50 Hz

EUT orthogonal positions	EUT performance description during the test	Verdict
X	NP	Pass
Y	NP	Pass
Z	NP	Pass

Reference numbers of test equipment used

HL 0779	HL 0926	HL 1867	HL 2489	HL 3231			

Full description is given in Appendix A.

Test specification:	Conducted immunity to voltage dips and short interruptions		
Test procedure:	EN 61000-4-11, EN 55024, Section 4.2.6		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/27/2009 11:52:43 AM		
Temperature: 24.5 ºC	Air Pressure: 1009 hPa	Relative Humidity: 35 %	Power Supply: 230 VAC
Remarks:			

12.7 Immunity to voltage dips and short interruptions

12.7.1 General

This test was performed to verify the EUT immunity to voltage dips and short interruptions presented at AC power input.
The voltage dips and interruptions levels, performance criterion and test results are referred to in Table 12.7.1.

12.7.2 Test procedure

12.7.2.1 The EUT was set up as shown in Figure 12.7.1 and the associated photograph, energized and the EUT performance was checked.

12.7.2.2 The test setup was adjusted to produce voltage reductions as referred to in Table 12.7.1.

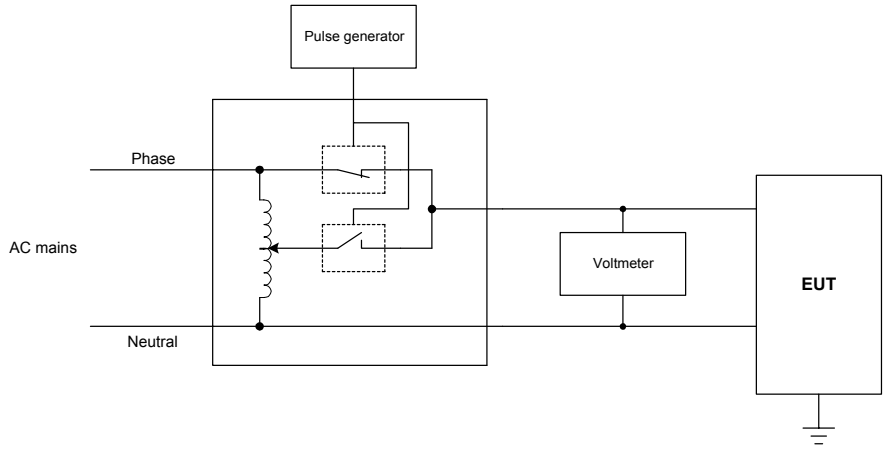
12.7.2.3 The voltage dips of each level were applied to the EUT power line.

12.7.2.4 The EUT operation was monitored throughout the test for any malfunction or degradation and its performance was recorded.

12.7.2.5 Upon this the test was completed.

Test specification:	Conducted immunity to voltage dips and short interruptions		
Test procedure:	EN 61000-4-11, EN 55024, Section 4.2.6		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/27/2009 11:52:43 AM		
Temperature: 24.5 ºC	Air Pressure: 1009 hPa	Relative Humidity: 35 %	Power Supply: 230 VAC
Remarks:			

Figure 12.7.1 Setup for immunity to voltage dips and short interruptions test



Photograph 12.7.1 Setup for immunity to voltage dips and short interruptions

Test specification:	Conducted immunity to voltage dips and short interruptions		
Test procedure:	EN 61000-4-11, EN 55024, Section 4.2.6		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/27/2009 11:52:43 AM		
Temperature: 24.5 ºC	Air Pressure: 1009 hPa	Relative Humidity: 35 %	Power Supply: 230 VAC
Remarks:			

Table 12.7.1 Immunity to voltage dips and short interruptions test results

EUT SET UP: TABLE-TOP
NUMBER OF DIPS: 3
REPETITION RATE: 0.1Hz

Voltage reduction, % of V nom	Test voltage, V	Duration, ms	Performance criterion	EUT performance description during and after the test	Verdict
>95% voltage dip	0	10	B	NP	Pass
30% voltage dip	161	500	C	NP	Pass
>95% voltage interruption	0	5000	C	The EUT system did not operate during the voltage interruption. When the nominal voltage was restored, the EUT system returned to normal operation after operator intervention.	Pass

Reference numbers of test equipment used

HL 3652							

Full description is given in Appendix A.

13 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
0027	Analyzer, Spectrum, 50 Hz - 2 GHz	Anritsu	MS-611A	4838	26-May-09	26-May-10
0317	Power Sensor, 30 MHz - 18 GHz, -70 to 20 dBm	Boonton	51072	26163	24-Dec-08	24-Dec-09
0415	Cable, Coax, RF, RG-214	Hermon Laboratories	CC-3	056	02-Dec-08	02-Dec-09
0447	LISN, 16/2, 300V RMS, 50 Ohm/50 uH + 5 Ohm, STD CISPR 16-1	Hermon Laboratories	LISN 16 - 1	066	04-Nov-08	04-Nov-09
0557	Generator Signal, 9 KHz - 1.2 GHz	Marconi Instruments	2023	112225/080	15-Feb-09	15-Feb-10
0613	Sensor Electric Field 10 kHz-1.0 GHz, 1-300 V/m (probe), w/charger	Amplifier Research	FP2000	18677	07-Dec-08	07-Dec-09
0672	Shielded Room 4,6(L) x 4,2(W) x 2,4(H) m	Hermon Laboratories	SR - 3	027	11-Nov-08	11-Nov-09
0674	Coupler Directional, high power 80 - 1000 MHz, 1500 W	WERLATONE	C3908	5843	17-May-09	17-May-10
0728	PC computer P200,RAM 64MB, HD 3GB	Siemens-Nixdorf	Scenic Pro M5 166	QK 079909	13-Aug-09	13-Aug-10
0779	Generator, oscillator 10 Hz - 1 MHz	Hewlett Packard	4204A	1204J02920	19-Feb-09	19-Feb-10
0784	Antenna X-WING BILOG, 20 MHz - 2 GHz	Schaffner-Chase EMC	CBL6140A	1120	11-Jan-09	11-Jan-10
0795	Coupling-decoupling network, 150 kHz - 230 MHz	Hermon Laboratories	230-M3	143	01-Jan-09	01-Jan-10
0812	Cable Coax, RG-214, 11.5 m, N-type connectors	Hermon Laboratories	C214-11	148	02-Dec-08	02-Dec-09
0813	Cable Coax, RG-214, 12 m, N-type connectors	Hermon Laboratories	C214-12	149	02-Dec-08	02-Dec-09
0860	Generator Burst, IEC 61000-4-4, EFT	EMV-System Schloder	SFT 400	811270	24-Mar-09	24-Mar-10
0926	Power Source AC, 150/230 VAC	Elgar	751A	479	18-Feb-09	18-Feb-10
1425	EMI Receiver, 9 kHz - 2.9 GHz	Agilent Technologies	8542E	3710A00222, 3705A00204	28-Aug-09	28-Aug-10
1430	EMI Receiver, 9 kHz - 2.9 GHz	Agilent Technologies	8542E	3807A00262,3705A00217	31-Aug-08	31-Aug-09
1511	Cable RF, 8 m, BNC/BNC	Belden	M17/167 MIL-C-17	1511	04-Sep-08	04-Sep-09
1552	Cable RF, 8 m	Alpha Wire	RG-214	1552	02-Dec-08	02-Dec-09
1553	Cable RF, 3.5 m, N/N-type	Alpha Wire	RG-214	1553	01-Jan-09	01-Jan-10
1629	Isotropic Field Monitor	Amplifier Research	FM2000	23308	07-Dec-08	07-Dec-09
1849	Antenna mast with polarity control (Small Anechoic chamber)	Sh. I. Machines	AM-F4	1849	20-Jan-09	20-Jan-10
1850	Turntable	Sh. I. Machines	TT-M-3	1850	11-Nov-08	11-Nov-09
1867	Induction coil according to EN 61000-4-8, 1mx1m	Hermon Laboratories	IC-2	1867	03-May-09	03-May-10
2109	Anechoic Chamber 6(L) x 5.5(W) x 2.95(H) m	Hermon Laboratories	AC-2	2109	11-Nov-08	11-Nov-09
2205	Coupling-decoupling network, 150 kHz - 230 MHz	Hermon Laboratories	230-M3	2205	03-Jun-09	03-Jun-10
2364	SmartWave Switching Amplifier	Elgar	SW5250AE-4	0317A00596	03-Mar-09	03-Mar-10

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
2383	Transformer, Isolation, 230/230, 1.8 kVA	Taiyo Yuden, Inc.	LGY1.8-21	EJ0180	26-May-09	26-May-10
2417	Power source connection panel (for HL2364)	Hermon Laboratories	PCP-1	2417	06-Jul-09	06-Jul-10
2432	Antenna, Double-Ridged Waveguide Horn 1-18 GHz	EMC Test Systems	3115	00027177	23-Jan-09	23-Jan-10
2489	AC High current generator for magnetic field immunity tests	Hermon Laboratories	MFG-130A	2489	23-Mar-09	23-Mar-11
2666	Compliance Test System	California Instruments	PACS-3	72342	26-Jan-09	26-Jan-11
2667	Signal generator, 9 kHz - 3.3 GHz	Rohde & Schwarz	SML03	101909	25-Sep-08	25-Sep-10
2697	Antenna, 30 MHz - 3.0 GHz	Sunol Sciences. Corp. Pleasanton, California USA	JB3	A022805	11-Jan-09	11-Jan-10
2754	Wideband RF Amplifier, 0.01 to 1000 MHz, 100 W	Kalmus	757 LC	082395-4	04-May-09	04-May-10
2765	PC computer P4 2.4,RAM 512 MB, HD 40GB	INTEL ELECTRONICS	Pentium 4	041485109	01-Jan-09	01-Jan-10
2783	Power Meter, RF, IEEE-488, 100 kHz - 100 GHz, -70 to +37 dBm	Boonton	4220	156602BK	24-Dec-08	24-Dec-09
2823	ESD generator	Schloder	SESD 30000	509155	23-Aug-09	23-Aug-10
2882	Cable, 18 GHz N-type, M-F, 3 m	Bird	TC-MNFN-3.0	211539 001	04-Feb-09	04-Feb-10
2883	Cable, 18 GHz N-type, M-F, 3 m	Bird	TC-MNFN-3.0	211539 003	07-Dec-08	07-Dec-09
2888	LISN Two-line V-Network 50 Ohm / 50 uH + 5 Ohm, 16A, MIL STD 461E, CISPR 16-1	Rolf Heine	NNB-2/16Z	02/10018	06-Jul-09	06-Jul-10
2959	Coupling Plane Vertical, EN 61000-4-2	Hermon Laboratories	CPV-2	2959	11-Aug-09	11-Aug-10
3012	Digital Camera	FUJI PHOTO FILM CO., LTD	FinePix E550	5BL10354	21-Sep-08	21-Sep-09
3158	Amplifier, 80 to 1000 MHz, 500 W	Amplifier Research	500W1000A	032960	24-Jun-09	24-Jun-10
3174	Attenuator, N-type, 10 dB, DC to 18 GHz, 5 W	Mini-Circuits	BW-N10W5+	NA	07-May-09	07-May-10
3231	Multimeter	Fluke	115C	93771524	02-Jul-09	02-Jul-10
3377	Resistor for ESD tests EN 61000-4-2 470 kOhm X 2	Hermon Laboratories	R470 x 2	3377	16-Dec-08	16-Dec-09
3378	Resistor for ESD tests EN 61000-4-2 470 kOhm X 2	Hermon Laboratories	R470 x 2	3378	15-Jun-09	15-Jun-10
3652	Compact Simulator, 4.4 kV	EM Test	UCS 500M	1198-46	07-Jan-09	07-Jan-10

14 APPENDIX B Test laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental 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) and by Industry Canada for electromagnetic emissions (file numbers IC 2186A-1 for OATS and IC 2186A-2 for anechoic chamber), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, C-845 for conducted emissions site), assessed by TNO Certification EP&S (Netherlands) for a number of EMC, telecommunications, environmental, safety standards, and by AMTAC (UK) for safety of medical devices. The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing and environmental simulation (for exact scope please refer to Certificate No. 839.01) and approved by Israel Ministry of environmental protection, radiation hazards department (Permit number 1158).

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15 APPENDIX C Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
cm	centimeter
CDN	coupling/ decoupling network
dB	decibel
dB(μV)	decibel referred to one microvolt
dB(μV/m)	decibel referred to one microvolt per meter
dB(μA)	decibel referred to one microampere
DC	direct current
EMC	electromagnetic compatibility
EMI	electromagnetic interference
EN	European Norm
EUT	equipment under test
GHz	gigahertz
GND	ground
H	height
HCP	horizontal coupling plane
HL	Hermon laboratories
Hz	hertz
ITE	information technology equipment
IPG	implantable pulse generator
k	kilo
kHz	kilohertz
kV	kilovolt
L	length
LISN	line impedance stabilization network
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μs	microsecond
NA	not applicable
NP	normal performance
OATS	open area test site
Ω	Ohm
QP	quasi-peak
PS	power supply
RE	radiated emission
RF	radio frequency
rms	root mean square
s	second
V	volt
VCP	vertical coupling plane
W	width

16 APPENDIX D Test equipment correction factors

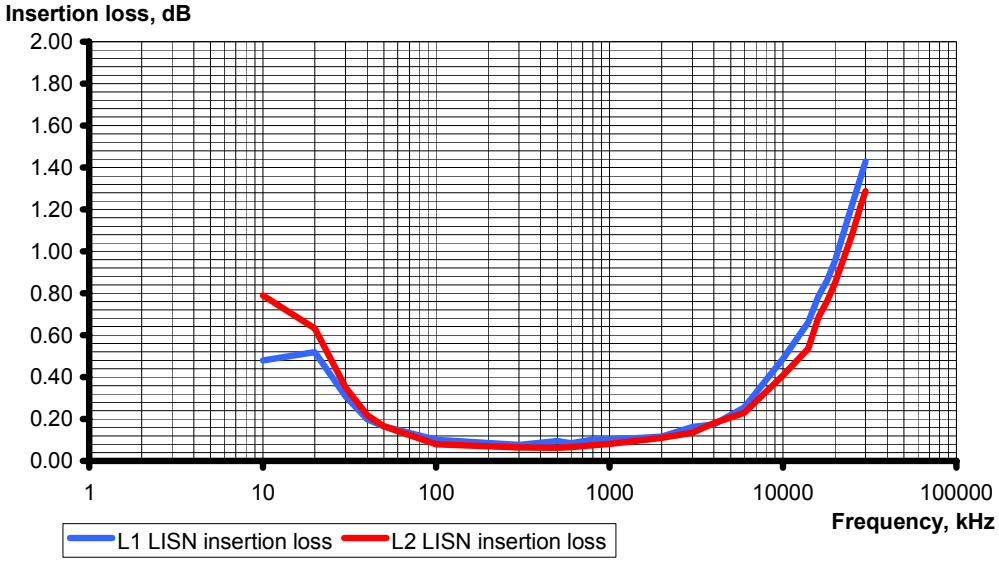
Correction factor
Line impedance stabilization network
Model LISN 16 - 1
Hermon Laboratories

Frequency, MHz	Correction factor, dB
0.01	5.0
0.02	2.2
0.03	1.1
0.04	0.7
0.05	0.5
0.1	0.2
0.2	0.1
0.4	0.1
0.6	0.1
0.8	0.1
1	0.1
2	0.1
3	0.1
4	0.1
6	0.2
10	0.3
12	0.4
16	0.5
18	0.6
20	0.7
25	0.9
28	1.2
30	1.3

The correction factor in dB is to be added to meter readings of an interference analyzer or a spectrum analyzer.

Correction factor
Line impedance stabilization network
Model LISN NNB-2/16Z, Rolf Heine
Insertion Loss Calibration result

Frequency, kHz	Insertion loss,dB		Measurement Uncertainty, dB
	L1	N	
10	0.48	0.79	±0.6
20	0.52	0.63	
30	0.31	0.35	
40	0.20	0.22	
50	0.16	0.17	
100	0.10	0.08	
300	0.08	0.06	
500	0.10	0.06	
600	0.09	0.07	
800	0.10	0.07	
1000	0.10	0.08	
2000	0.12	0.11	
3000	0.16	0.14	
4000	0.17	0.18	
6000	0.26	0.23	
10000	0.49	0.41	
14000	0.66	0.54	
16000	0.79	0.69	
18000	0.86	0.76	
20000	0.96	0.85	
25000	1.22	1.08	
28000	1.35	1.21	
30000	1.43	1.29	



The correction factor in dB is to be added to meter readings of an interference analyzer or a spectrum analyzer.

Biconilog antenna factor

Schaffner Chase EMC, model CBL 6140A, serial number 1120

Frequency, MHz	Antenna factor, dB(1/m)
20	12.1
22	8.8
24	5.5
26	3.0
28	2.8
30	3.9
40	8.4
50	9.3
60	9.7
70	9.3
80	7.5
90	6.8
100	7.6
110	6.6
120	6.9
140	7.6
160	11.6
170	8.3
190	9.2
200	9.9
220	10.5
240	11.2
260	12.9
280	12.1
300	12.9
320	13.2
340	13.9
360	15.2
380	15.3
400	15.7
420	16.6
440	16.8
460	17.6
480	18.3
500	18.0
520	18.0
540	18.7
560	19.2
580	19.0

Frequency, MHz	Antenna factor, dB(1/m)
600	19.1
620	19.8
640	20.6
660	20.7
680	20.9
700	21.0
720	21.4
740	21.7
760	21.6
780	21.6
800	21.9
820	22.2
840	22.6
860	22.7
880	22.7
900	22.9
920	23.2
940	23.7
960	24.3
980	24.6
1000	24.4
1.060	24.3
1.120	24.8
1.180	25.3
1.240	26.1
1.300	26.9
1.360	27.6
1.420	26.8
1.480	26.9
1.520	28.1
1.560	28.1
1.640	28.2
1.700	28.6
1.760	30.0
1.840	31.3
1.900	31.8
1.960	31.6
2.000	32.0

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μV) to convert it into field intensity in dB(μV/m).

Antenna calibration
Sunol Sciences Inc., model JB3, serial number A022805

Frequency, MHz	Antenna factor, dB(1/m)
30	22.7
35	18.4
40	14.5
45	10.9
50	8.3
60	7.9
70	9.0
80	9.3
90	9.7
100	11.2
120	14.4
140	13.7
160	13.8
180	11.8
200	12.8
250	12.3
300	13.4
400	16.0
500	17.7
600	18.1
700	20.7
800	21.1
900	22.2
1000	23.1
1100	24.2
1200	25.1
1300	25.1
1400	25.8
1500	26.3
1600	27.6
1700	28.1
1800	27.9
1900	28.1
2000	28.3
2500	31.9
3000	34.0

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μV) to obtain field strength in dB(μV/m).

Antenna factor
Double-ridged waveguide horn antenna
EMC Test Systems, model 3115, serial number: 00027177

Frequency, MHz	Antenna factor. dB(1/m)
1000.0	24.7
1500.0	25.7
2000.0	27.8
2500.0	28.9
3000.0	30.7
3500.0	31.8
4000.0	33.0
4500.0	32.8
5000.0	34.2
5500.0	34.9
6000.0	35.2
6500.0	35.4
7000.0	36.3
7500.0	37.3
8000.0	37.5
8500.0	38.0
9000.0	38.3
9500.0	38.3
10000.0	38.7
10500.0	38.7
11000.0	38.9
11500.0	39.5
12000.0	39.5
12500.0	39.4
13000.0	40.5
13500.0	40.8
14000.0	41.5
14500.0	41.3
15000.0	40.2
15500.0	38.7
16000.0	38.5
16500.0	39.8
17000.0	41.9
17500.0	45.8
18000.0	49.1

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μV) to convert it into field intensity in dB(μV/m).

17 APPENDIX E Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Conducted emissions at mains port with LISN and HP 8542E or HP 8546A receiver	9 kHz to 150 kHz: ± 3.9 dB 150 kHz to 30 MHz: ± 3.8 dB
Conducted emissions at telecommunication port with HP 8542E or HP 8546A receiver	ISN: ± 3.3 dB Current probe: ± 3.5 dB
Radiated emissions at 10 m measuring distance Horizontal polarization Vertical polarization	 Biconilog antenna: ± 5.0 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.1 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 5.5 dB Biconical antenna: ± 5.5 dB Log periodic antenna: ± 5.6 dB Double ridged horn antenna: ± 5.8 dB
Radiated emissions at 3 m measuring distance Horizontal polarization Vertical polarization	 Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 6.0 dB Biconical antenna: ± 5.7 dB Log periodic antenna: ± 6.0 dB Double ridged horn antenna: ± 6.0 dB
Harmonic current	± 4.0%
Voltage fluctuations and flickers	± 5.3%
ESD	It has been demonstrated that calibration results are within the limits specified in the EN 61000-4-2 standard reduced by uncertainty of calibration that prove compliance with standard requirements with at least a 95% confidence. Parameters that have been calibrated and tolerances are shown below: First peak current of discharge: ±10% (refer to standard Table 2) Current at 30 ns: ±30% (refer to standard Table 2) Current at 60 ns: ±30% (refer to standard Table 2) Rise time: 0.7 – 1 (ns)
Radiated immunity AR FP2000 E-field probe AR FP2080 E-field probe	 10 kHz to 250 MHz: ± 1.9 dB; 250 MHz to 1 GHz: ± 2.1 dB 80 MHz to 26 GHz: ± 2.7 dB; 26 GHz to 40 GHz: ± 4.0 dB
Conducted RF immunity - CDN injection - Current probe injection	 150 kHz to 230 MHz: ± 3.1 dB 10 kHz to 400 MHz: ± 2.3 dB

Test description	Expanded uncertainty
EFT - CDN injection - Capacitive clamp injection	It has been demonstrated that calibration results are within the limits specified in the EN 61000-4-4 standard reduced by uncertainty of calibration, that prove compliance with standard requirements with at least a 95% confidence. Parameters that have been calibrated and tolerances are shown below: Peak voltage: (0.125 to 2 kV) ±10% at 50 Ω Peak voltage: (0.24 to 3.8 kV) ±10% at 1000 Ω Rise time: 5 ns ±30% at 50 Ω / 5 ns ±30% at 1000 Ω Crest time: 50 ns ±30% at 50 Ω / 50 ns -15 ns / +100 ns at 1000 Ω Burst duration: 15 ms ± 20% at 5 kHz / 0.75 ms ± 20% at 100 kHz Burst period: 300 ms ± 20% Repetition frequency: 5 or 100 kHz ±20% Peak voltage at CDN output: (0.125 to 2 kV) ±10% at 50 Ω under 4 kV Rise time at CDN output: 5 ns ±30% at 50 Ω under 4 kV Crest time at CDN output: 50 ns ±30% at 50 Ω under 4 kV
High voltage surges	It has been demonstrated that calibration results are within the limits specified in the EN 61000-4-5 standard reduced by uncertainty of calibration, that prove compliance with standard requirements with at least a 95% confidence. Parameters that have been calibrated and tolerances are shown below: **1.2/50 µs combination wave generator:** Open-circuit output voltage: (0.5 to 6 kV) ±10% Short-circuit output current: (0.25 to 3 kA) ±10% Effective output impedance: 2 Ω ±10% Phase shifting: 0 to 360º ±10º Undershoot: < 30% of the output voltage Coupling: Direct / 18 µF / 9 µF+10 Ω Open-circuit front time: 1.2 µs ±30% / 1.2 µs ±30% / 1.2 µs ±30% Open-circuit time to half-value: 50 µs ±20% / 50 µs ±10 µs / 50 µs +10/-25 µs Short-circuit front time: 8 µs ±20% / 8 µs ±20% / 2.5 µs ±30% Short-circuit time to half-value: 20 µs ±20% / 20 µs ±20% / 25 µs ±30% **10/700 µs combination wave generator:** Open-circuit output voltage: (0.5 to 6 kV) ±10% Short-circuit output current: (12.5 A to 150 A) ±10% Effective output impedance: 40 Ω ±10% Open-circuit front time: 10 µs ± 30% Open-circuit time to half-value: 700 µs ± 20% Short-circuit front time: 5 µs ± 20% Short-circuit time to half-value: 320 µs ± 20%
Power frequency magnetic field immunity	± 2.5 dB
Voltage dips, short interruptions and variations	It has been demonstrated that calibration results are within the limits specified in the EN 61000-4-11 standard reduced by uncertainty of calibration, that prove compliance with standard requirements with at least a 95% confidence. Parameters that have been calibrated and tolerances are shown below: Open-circuit voltage: ±5% Voltage change under full load: Nominal voltage: ±5% 70% of nominal voltage: ±7% 40% of nominal voltage: ±10%

Hermon Laboratories is accredited by A2LA for calibration according to present requirements of ISO/IEC 17025 and NCSL Z540-1. The accreditation is granted to perform calibration of parameters that are listed in the Scope of Hermon Laboratories Accreditation.

Hermon Laboratories calibrates its reference and transfer standards by calibration laboratories accredited to ISO/IEC 17025 by a mutually recognized Accreditation Body or by a recognized national metrology institute. All reference and transfer standards used in the calibration system are traceable to national or international standards.

In-house calibration of all test and measurement equipment is performed on a regular basis according to Hermon Laboratories calibration procedures, manufacturer calibration/verification procedures or procedures defined in the relevant standards. The Hermon Laboratories test and measurement equipment is calibrated within the tolerances specified by the manufacturers and/or by the relevant standards.

18 APPENDIX F Specification references

FCC 47CFR part 15: 2008 subpart B	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: 2003	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.
ICES-003: 2004, Issue 4	Spectrum Management and Telecommunications Policy. Interference-Causing Equipment Standard. Digital Apparatus
CAN/CSA-CEI/IEC CISPR 22: 2002	Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement
EN 55022: 2006 + A1(07)	Limits and methods of measurement of interference characteristics of information technology equipment
CISPR 16-1-1: 2006	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus
EN 61000-3-2: 2006	Electromagnetic compatibility (EMC) - Part 3: Limits. Section 2. Limits for harmonic current emissions for equipment with input current <16 A
EN 61000-3-3: 1995+A1(01)+A2(05)	Electromagnetic compatibility (EMC) - Part 3: Limits. Section 3: Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current <16 A
EN 55024: 1998+ A1(01)+A2(03)	Information technology equipment – Immunity characteristics – Limits and methods of measurement
EN 61000-4-2: 1995+A1(98)+ A2(01)	Electromagnetic compatibility (EMC). Part 4: testing and measurement techniques. Section 2: Electrostatic discharge immunity test
EN 61000-4-3: 2006	Electromagnetic compatibility (EMC). Part 4: testing and measurement techniques. Section 3: Radiated, radio frequency, electromagnetic field immunity test
EN 61000-4-4: 2004	Electromagnetic compatibility (EMC). Part 4: testing and measurement techniques. Section 4: Electrical fast transient/burst immunity test
EN 61000-4-5: 2006	Electromagnetic compatibility (EMC). Part 4: testing and measurement techniques. Section 5: Surge immunity test
EN 61000-4-6: 2007	Electromagnetic compatibility (EMC) Part 4: testing and measurement techniques. Section 6: Immunity to conducted disturbances, inducted by radio-frequency fields
EN 61000-4-8: 1993+A1(01)	Electromagnetic compatibility (EMC). Part 4: testing and measurement techniques. Section 8: Power - frequency magnetic field immunity test
EN 61000-4-11: 2004	Electromagnetic compatibility (EMC). Part 4: testing and measurement techniques Section 11: Voltage dips, short interruptions and voltage variations immunity test

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