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Electrical

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TEST REPORT

ACCORDING TO: FCC CFR 47 PART 15 Subpart C, section 15.209 and subpart B

FOR:

Baran Advanced Technologies Ltd.

PROXIMITY READER WITH KEYPAD AND FINGER PRINT RECOGNITION

Model: BIO-007

Report ID: BARRAD_FCC.16415.doc
Date of Issue: 6/15/2005

Table of contents

1 Applicant information

Client name:	Baran Advanced Technologies Ltd.
Address:	Baran House, 8 Omarim Street, Industrial Zone, Omer, 84965, Israel
Telephone:	+972 8620 0020
Fax:	+972 8620 0021
E-mail:	raul@baran-at.com
Contact name:	Mr. Raul Kafka

2 Equipment under test attributes

Product name:	Proximity reader with a keypad and finger print recognition
Product type:	Transmitter
Model(s):	BIO-007
Serial number:	2004090005
Receipt date	5/4/2005

3 Manufacturer information

Manufacturer name:	Baran Advanced Technologies Ltd.
Address:	Baran House, 8 Omarim Street, Industrial Zone, Omer, 84965, Israel
Telephone:	+972 8620 0020
Fax:	+972 8620 0021
E-Mail:	raul@baran-at.com
Contact name:	Mr. Raul Kafka

4 Test details

Project ID:	16415
Location:	Hermon Laboratories Ltd. P.O.Box 23, Binyamina 30500, Israel
Test started:	5/4/2005
Test completed:	6/14/2005
Test specification(s):	FCC Part 15, subpart C, §15.209; subpart B, §15.109
Test suite:	FCC_15.225 (5/3/2004 5:43:04 PM, modified)

5 Tests summary

Test	Status
Transmitter characteristics	
Section 15.209 (a), Fundamental radiated emissions	Pass
Section 15. 209 (c), Unwanted radiated emissions	Pass
Section 15.207 (a), Conducted emissions	Pass
Unintentional emissions	
Section 15.107, Conducted emissions at AC power port	Pass
Section 15.109, Radiated emissions	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. A. Lane, test engineer	June 14, 2005	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	June 15, 2005	
	Mr. M. Nikishin, EMC group leader	June 16, 2005	
Approved by:	Mr. A. Usoskin, CEO	June 16, 2005	

6 EUT description

6.1 General information

The EUT is a proximity reader operating at 125 kHz which performs 3 functions:

1. Reads proximity card and sends the data. When an appropriate encoded Proximity Card is presented within the antenna sensing range (approx 5 cm) the data from the card is transferred to the electronic board. The electronic board decodes the encryption into a Serial Protocol (for example Wiegand) and sends it to a host computer.
2. Piezoelectric Keypad is used to KEY-In the PIN number which is sent as a Serial Protocol (for example Wiegand) and sends it to a host computer.
3. The Finger Print Reader reads finger prints and sends to host via RS232.

6.2 Ports and lines

Port type	Port description	Connected		Connector type	Qty.	Cable type	Cable length	Indoor / outdoor
		From	To					
Power	12 V DC	EUT	adapter	Non-detachable	1	Unshielded	1.5 m	indoor
Power	AC	adapter	mains	Two-pole	1	NA (wall-outlet)	NA	NA
Signal	RS-232	EUT	laptop	D-type	1	Shielded	1.5 m	indoor
Signal	Data 0	EUT	Open circuit	Termination block		Unshielded	1.5 m	indoor
Signal	Data 1	EUT	Open circuit			Unshielded	1.5 m	indoor
Signal	LED Input	EUT	Open circuit			Unshielded	1.5 m	indoor

6.3 Support and test equipment

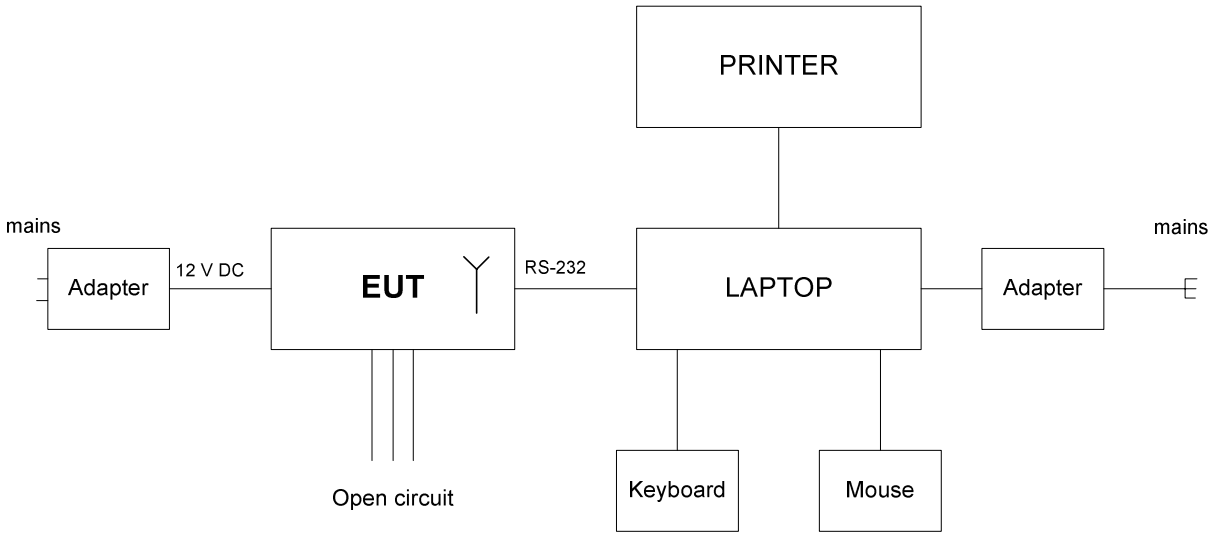
Description	Manufacturer	Model number	Serial number
AC/DC adapter	FWGM	FW75550/12	NA
Lap top	Compaq	2105EA	CN30828506
AC/DC power adaptor of laptop	Hewlett Packard	hp f4600a	2102281701
Keyboard	Fujitsu	FKB8729	OZ614979
Printer	Epson	P80SA	44B1127035
Mouse PS2	Microsoft	2.1A	00075621

6.4 Changes made in the EUT

The following changes were made in the EUT to withstand the standard requirements:

1) Three capacitors: 470 pF, 10 nF and 3.9 nF were installed in parallel at DC input;
2) One ferrite bead manufactured by Fair-Rite, P/N 0443167251 was installed on DC and RS-232 cables inside the EUT case and another, P/N 0444164181, outside the EUT case.

6.5 Test configuration



Test specification:	Section 15.209(a), (c) - Field strength of fundamental and unwanted emissions		
Test procedure:	ANSI C63.4, Sections 5.3 and 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	6/14/2005 6:53:34 PM		
Temperature: 21 ºC	Air Pressure: 1012 hPa	Relative Humidity: 45%	Power Supply: 120 V AC
Remarks:			

7 Transmitter tests according to 47CFR part 15 subpart C requirements

7.1 Field strength of fundamental and unwanted emissions

7.1.1 General

This test was performed to measure field strength of spurious emissions from the EUT. Specification test limits are given in Table 7.1.1 and Table 7.1.2.

Table 7.1.1 Radiated emission limits

Frequency, MHz	Class B limit, dB(μV/m) @3 m distance*		
	Peak	Quasi-peak	Average
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**
0.090 – 0.110	NA	108.5 – 106.8**	NA
0.110 – 0.490	126.8 – 113.8	NA	106.8 – 93.8**
0.490 – 1.705	NA	73.8 – 63.0**	NA
1.705 – 30.0		69.5	
30 - 88		40.0	
88 - 216		43.5	
216 - 960		46.0	
960 - 1000		54.0	
1000 –10thharmonic	74.0	NA	54.0

* The limit for test distance other than specified was calculated using the inverse linear distance extrapolation factor as follows: $Lim_{S2} = Lim_{S1} + 40 \log (S_1/S_2)$,
where S_1 and S_2 – standard defined and test distance respectively in meters
***- The limit decreases linearly with the logarithm of frequency.

Table 7.1.2 Radiated fundamental emission limits

Fundamental frequency, kHz	Field strength at 3 m, dB(μV/m)
	Average
125	105.67

7.1.2 Test procedure for spurious emission field strength measurements in 9 kHz to 30 MHz band

7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and the performance check was conducted.

7.1.2.2 The specified frequency range was investigated with loop antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0, the measuring antenna was rotated around its vertical axis and the measuring antenna polarization was switched from vertical to horizontal.

7.1.2.3 The worst test results (the lowest margins) were recorded in Table 7.1.3 and shown in the associated plots.

7.1.3 Test procedure for spurious emission field strength measurements above 30 MHz

7.1.3.1 The EUT was set up as shown in Figure 7.1.2, energized and the performance check was conducted.

7.1.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal.

7.1.3.3 The worst test results (the lowest margins) were recorded in Table 7.1.3 and shown in the associated plots.

Test specification:	**Section 15.209(a), (c) - Field strength of fundamental and unwanted emissions**		
Test procedure:	ANSI C63.4, Sections 5.3 and 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	6/14/2005 6:53:34 PM		
Temperature: 21 ºC	**Air Pressure:** 1012 hPa	**Relative Humidity:** 45%	**Power Supply:** 120 V AC
Remarks:			

Figure 7.1.1 Radiated emissions below 30 MHz test set up

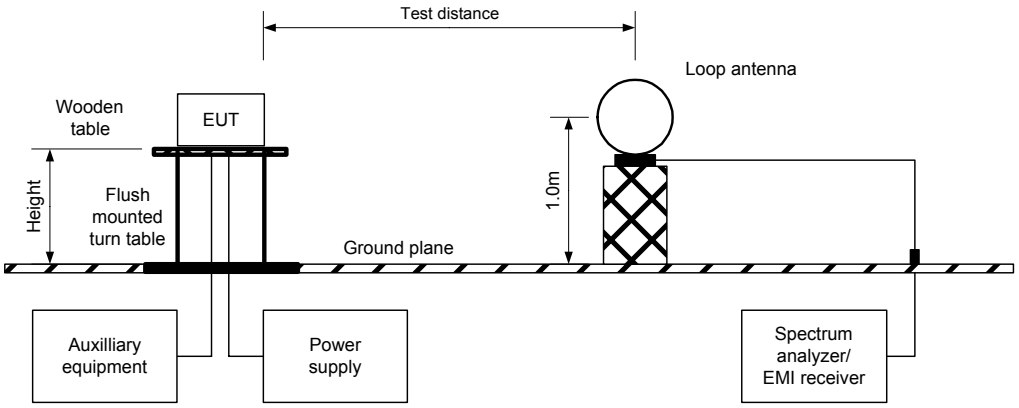
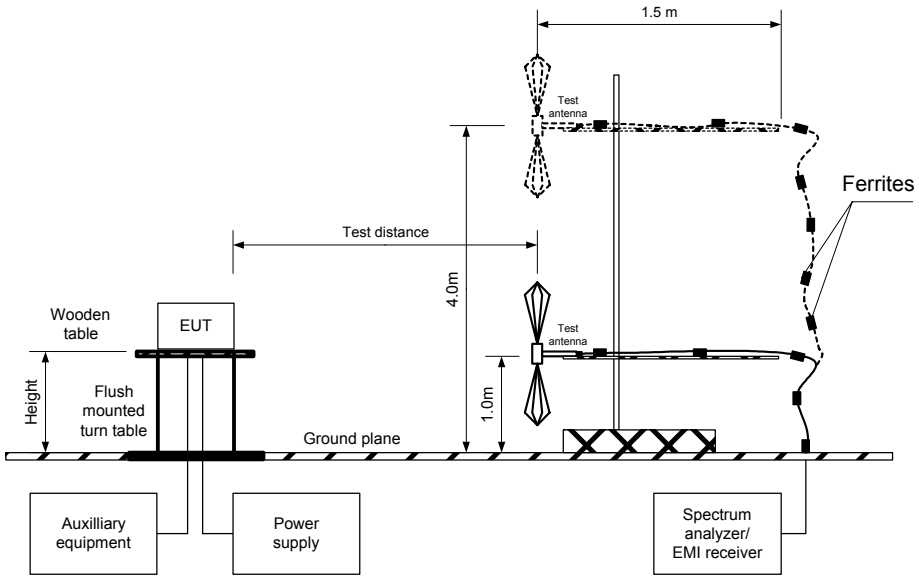


Figure 7.1.2 Radiated emissions above 30 MHz test set up



Test specification:	**Section 15.209(a), (c) - Field strength of fundamental and unwanted emissions**		
Test procedure:	ANSI C63.4, Sections 5.3 and 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	6/14/2005 6:53:34 PM		
Temperature: 21 ºC	**Air Pressure:** 1012 hPa	**Relative Humidity:** 45%	**Power Supply:** 120 V AC
Remarks:			

Table 7.1.3 Out of band radiated emissions test results

TEST DISTANCE: 3 m
EUT POSITION: Typical (vertical)
MODULATION: ASK
MODULATING SIGNAL: ID code
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz
RESOLUTION BANDWIDTH: 0.2 kHz (9 kHz – 150 kHz)
9.0 kHz (150 kHz – 30 MHz)
120 kHz (30 MHz – 1000 MHz)
VIDEO BANDWIDTH: ≥ Resolution bandwidth
TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
Biconilog (30 MHz – 1000 MHz)

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*				
0.057338	78.15	77.44	112.5	-35.06	V	1	280	Pass
0.126125	52.63	45.89	105.6	-59.71	V	1	0	
0.170000	65.81	63.30	103	-39.7	V	1	333	
150.017500	43.23	41.21	43.50	-2.29	V	1	67	
225.010000	41.63	41.12	46.00	-4.88	H	1	20	
250.000000	37.24	35.79	46.00	-10.21	H	1	200	
399.999932	47.74	45.10	46.00	-0.90	V	1	307	
566.746400	41.38	35.45	46.00	-10.55	V	1	228	
599.978900	44.36	42.78	46.00	-3.22	V	1.8	360	

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

Reference numbers of test equipment used

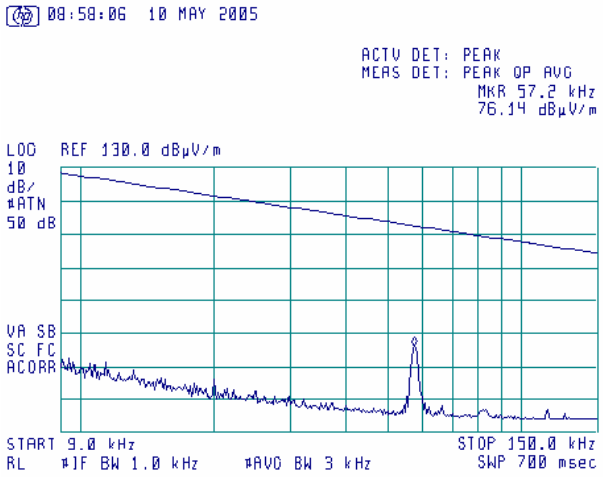
HL 0446	HL 0465	HL 0521	HL 0589	HL 0592	HL 0593	HL 0594	HL 0604
HL 2009							

Full description is given in Appendix A.

Test specification:	**Section 15.209(a), (c) - Field strength of fundamental and unwanted emissions**		
Test procedure:	ANSI C63.4, Sections 5.3 and 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	6/14/2005 6:53:34 PM		
Temperature: 21 ºC	**Air Pressure:** 1012 hPa	**Relative Humidity:** 45%	**Power Supply:** 120 V AC
Remarks:			

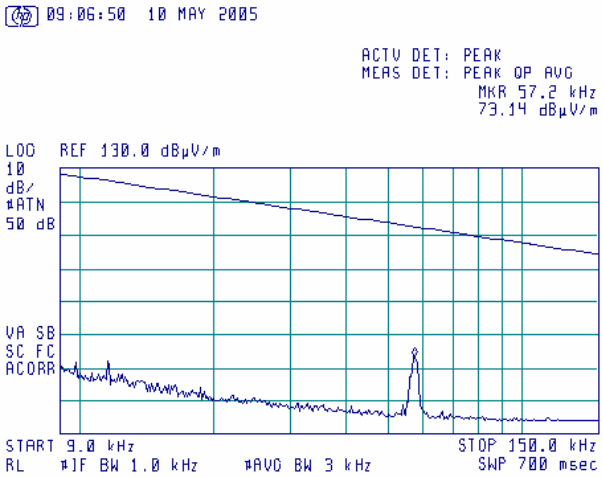
Plot 7.1.1 Radiated emission measurements from 9 to 150 kHz

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
DETECTOR: Peak hold



Plot 7.1.2 Radiated emission measurements from 9 to 150 kHz

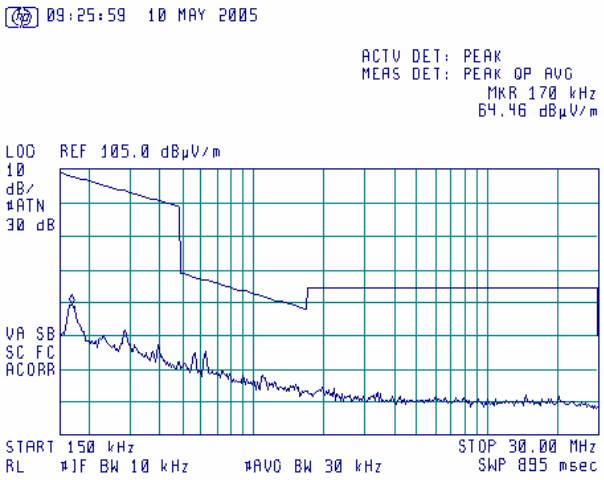
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
DETECTOR: Peak hold



Test specification:	**Section 15.209(a), (c) - Field strength of fundamental and unwanted emissions**		
Test procedure:	ANSI C63.4, Sections 5.3 and 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	6/14/2005 6:53:34 PM		
Temperature: 21 ºC	**Air Pressure:** 1012 hPa	**Relative Humidity:** 45%	**Power Supply:** 120 V AC
Remarks:			

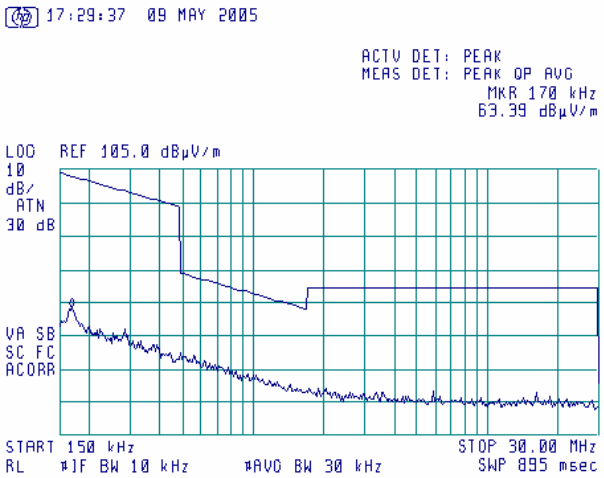
Plot 7.1.3 Radiated emission measurements from 0.15 to 30 MHz

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
DETECTOR: Peak hold



Plot 7.1.4 Radiated emission measurements from 0.15 to 30 MHz

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
DETECTOR: Peak hold



Test specification:	**Section 15.209(a), (c) - Field strength of fundamental and unwanted emissions**		
Test procedure:	ANSI C63.4, Sections 5.3 and 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	6/14/2005 6:53:34 PM		
Temperature: 21 ºC	**Air Pressure:** 1012 hPa	**Relative Humidity:** 45%	**Power Supply:** 120 V AC
Remarks:			

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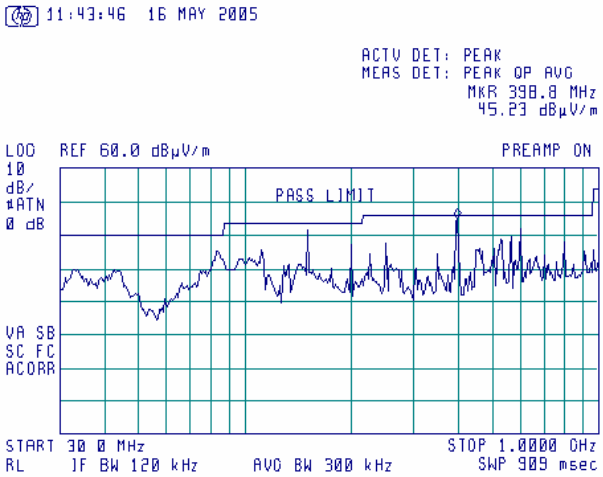
Test specification:	Section 15.209(a), (c) - Field strength of fundamental and unwanted emissions		
Test procedure:	ANSI C63.4, Sections 5.3 and 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	6/14/2005 6:53:34 PM		
Temperature: 21 ºC	Air Pressure: 1012 hPa	Relative Humidity: 45%	Power Supply: 120 V AC
Remarks:			

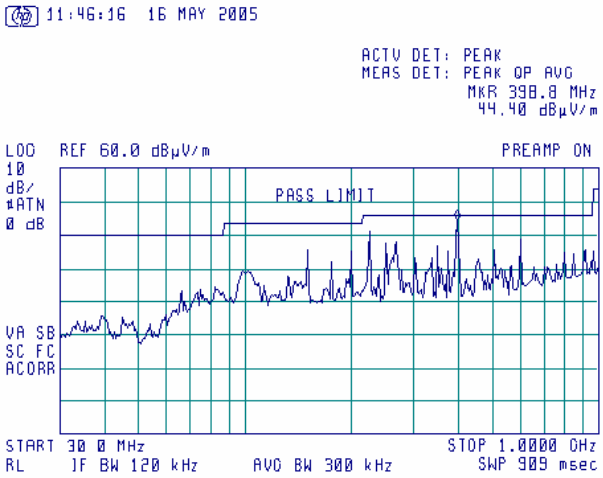
Plot 7.1.5 Radiated emission measurements from 30 to 1000 MHz

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
DETECTOR: Peak hold



Plot 7.1.6 Radiated emission measurements from 30 to 1000 MHz

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
DETECTOR: Peak hold



Test specification:	Section 15.207(a), Conducted emission		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/8/2005 4:16:45 PM		
Temperature: 24 ºC	Air Pressure: 1017 hPa	Relative Humidity: 52 %	Power Supply: 120 VAC
Remarks:			

7.2 Conducted emissions

7.2.1 General

This test was performed to measure common mode conducted emissions at the power port. Specification test limits are given in Table 7.2.1. The worst test results (the lowest margins) were recorded in Table 7.2.2 and shown in the associated plots.

Table 7.2.1 Limits for conducted emissions

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

* The limit decreases linearly with the logarithm of frequency.

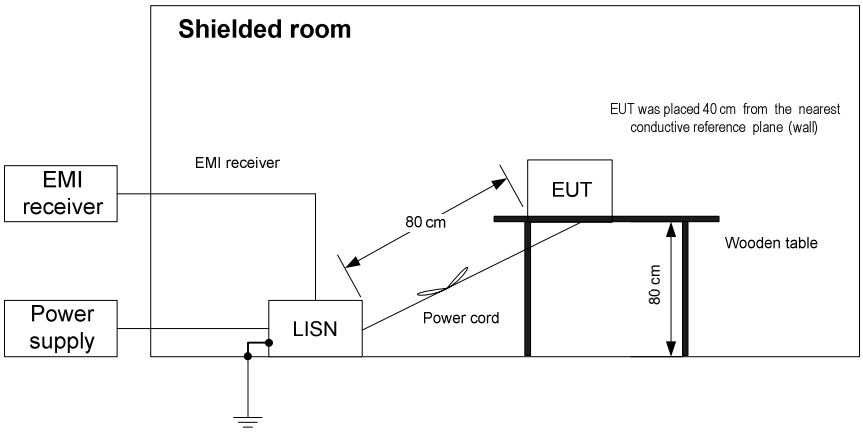
7.2.2 Test procedure

7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and the performance check was conducted.

7.2.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer in the frequency range referred to in Table 7.2.2. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and average detectors were used throughout the testing.

7.2.2.3 The position of the device cables was varied to determine maximum emission level.

Figure 7.2.1 Setup for conducted emission measurements, table-top equipment



Test specification:	**Section 15.207(a), Conducted emission**		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	5/8/2005 4:16:45 PM		
Temperature: 24 ºC	**Air Pressure:** 1017 hPa	**Relative Humidity:** 52 %	**Power Supply:** 120 VAC
Remarks:			

Table 7.2.2 Conducted emission test results at EUT power lines

LINE:	AC mains of EUT
EUT OPERATING MODE:	Transmit
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*		
0.156469	50.01	42.61	65.68	-23.07	26.07	55.68	-29.61	L1	Pass
0.199288	52.70	44.19	63.68	-19.49	20.89	53.68	-32.79		
0.215063	56.31	50.49	63.07	-12.58	27.63	53.07	-25.44		
0.420726	45.08	34.33	57.48	-23.15	10.47	47.48	-37.01		
0.429724	46.81	36.27	57.31	-21.04	12.00	47.31	-35.31		
24.998512	49.43	48.61	60.00	-11.39	43.16	50.00	-6.84		
0.200689	58.32	54.73	63.63	-8.90	31.64	53.63	-21.99	L2	Pass
0.205442	58.48	53.47	63.44	-9.97	31.46	53.44	-21.98		
0.206280	58.71	48.31	63.41	-15.10	30.14	53.41	-23.27		
0.209527	59.15	54.27	63.29	-9.02	32.44	53.29	-20.85		
0.412772	51.28	46.02	57.63	-11.61	20.39	47.63	-27.24		
24.998750	46.97	46.22	60.00	-13.78	40.51	50.00	-9.49		

*- Margin = Measured emission - specification limit.

Test specification:	**Section 15.207(a), Conducted emission**		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	5/8/2005 4:16:45 PM		
Temperature: 24 ºC	**Air Pressure:** 1017 hPa	**Relative Humidity:** 52 %	**Power Supply:** 120 VAC
Remarks:			

Table 7.2.3 Conducted emission test results at PC power lines

LINE:	AC mains of PC
EUT OPERATING MODE:	Transmit
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*		
0.154580	60.06	52.96	65.78	-12.82	42.00	55.78	-13.78	L1	Pass
0.222873	51.68	49.11	62.77	-13.66	43.74	52.77	-9.03		
0.313764	46.74	41.97	59.89	-17.92	30.09	49.89	-19.80		
0.392796	44.18	40.62	58.00	-17.38	24.94	48.00	-23.06		
0.684901	39.26	34.14	56.00	-21.86	21.50	46.00	-24.50		
16.785194	43.80	37.37	60.00	-22.63	26.84	50.00	-23.16		
24.997901	45.06	42.81	60.00	-17.19	42.10	50.00	-7.90		
0.163561	53.91	46.69	65.34	-18.65	36.29	55.34	-19.05	L2	Pass
0.228390	51.42	49.13	62.56	-13.43	40.18	52.56	-12.38		
0.312643	47.15	42.72	59.91	-17.19	31.44	49.91	-18.47		
0.379810	44.41	41.01	58.31	-17.30	26.12	48.31	-22.19		
0.387032	44.87	42.25	58.14	-15.89	27.62	48.14	-20.52		
24.999251	43.98	42.65	60.00	-17.35	42.34	50.00	-7.66		

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

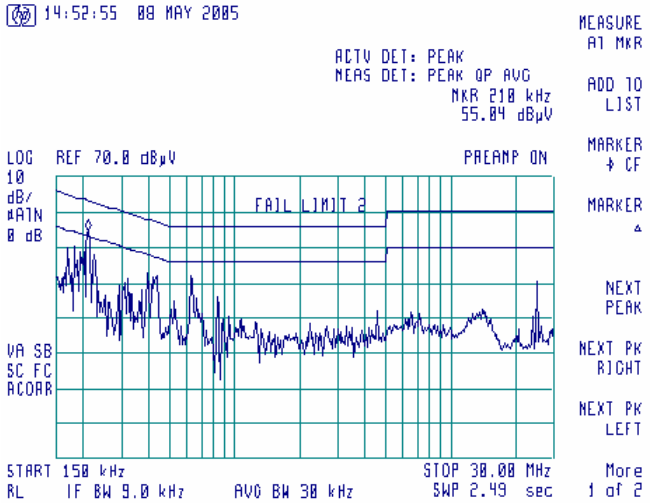
HL 0163	HL 0447	HL 0466	HL 0521	HL 1204	HL 1512	HL 2404	

Full description is given in Appendix A.

Test specification:	Section 15.207(a), Conducted emission		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/8/2005 4:16:45 PM		
Temperature: 24 °C	Air Pressure: 1017 hPa	Relative Humidity: 52 %	Power Supply: 120 VAC
Remarks:			

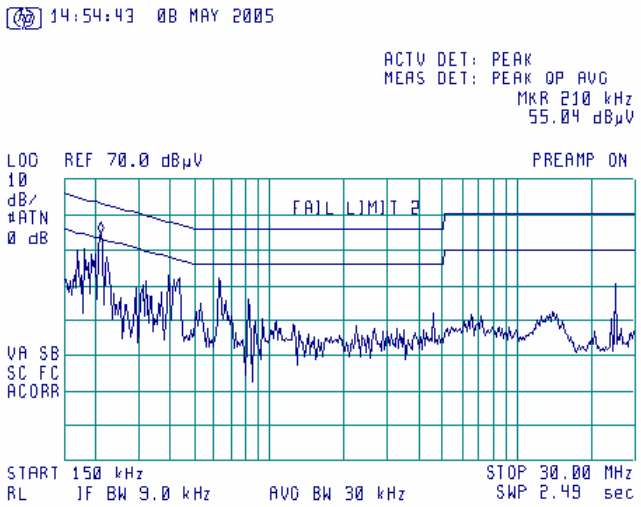
Plot 7.2.1 Conducted emission measurements at EUT power lines

LINE: L1
EUT OPERATING MODE: Transmit
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 7.2.2 Conducted emission measurements at EUT power lines

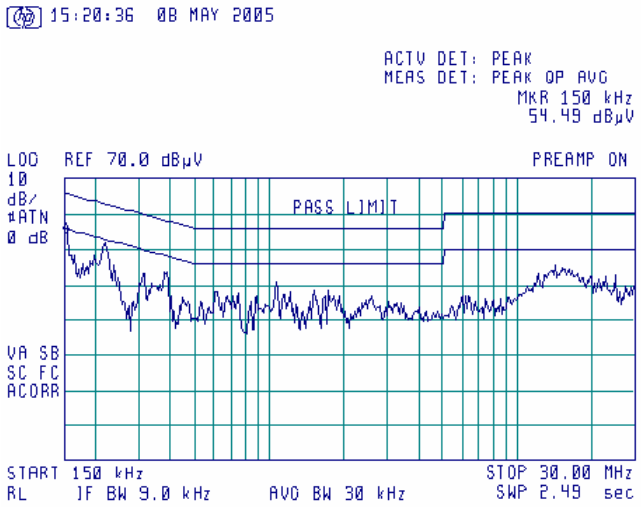
LINE: L2
EUT OPERATING MODE: Transmit
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification:	Section 15.207(a), Conducted emission		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/8/2005 4:16:45 PM		
Temperature: 24 °C	Air Pressure: 1017 hPa	Relative Humidity: 52 %	Power Supply: 120 VAC
Remarks:			

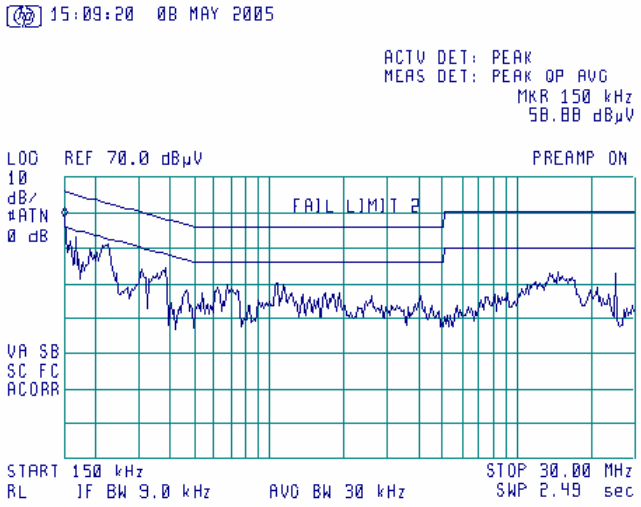
Plot 7.2.3 Conducted emission measurements at PC power lines

LINE: L1
EUT OPERATING MODE: Transmit
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 7.2.4 Conducted emission measurements at PC power lines

LINE: L2
EUT OPERATING MODE: Transmit
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification:	Section 15.107, Conducted emission at AC power port		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/8/2005 4:09:11 PM		
Temperature: 24 ºC	Air Pressure: 1017 hPa	Relative Humidity: 52 %	Power Supply: 120 VAC
Remarks:			

8 Emission tests according to 47CFR part 15 subpart B requirements

8.1 Conducted emissions

8.1.1 General

This test was performed to measure common mode conducted emissions at the mains power port.
Specification test limits are given in Table 8.1.1. The worst test results (the lowest margins) were recorded in Table 8.1.2 and shown in the associated plots.

Table 8.1.1 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.

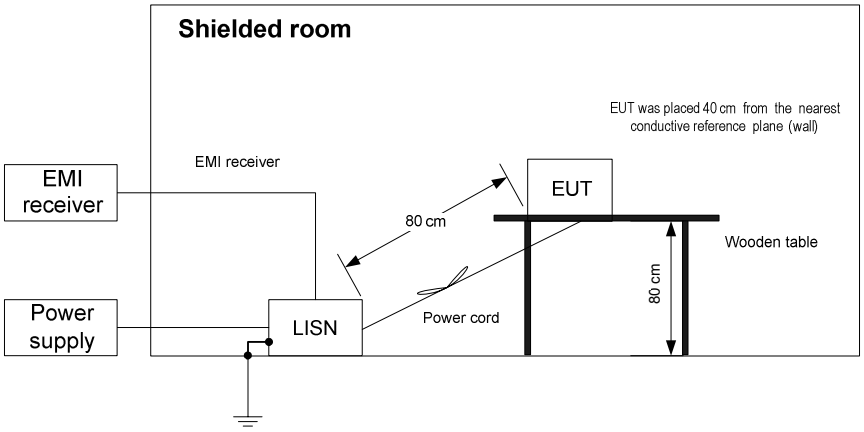
8.1.2 Test procedure

8.1.2.1 The EUT was set up as shown in Figure 8.1.1, energized and the performance check was conducted.

8.1.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer in the frequency range referred to in Table 8.1.1. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and average detectors were used throughout the testing.

8.1.2.3 The position of the device cables was varied to determine maximum emission level.

Figure 8.1.1 Setup for conducted emission measurements, table-top equipment



Test specification:	**Section 15.107, Conducted emission at AC power port**		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	5/8/2005 4:09:11 PM		
Temperature: 24 ºC	**Air Pressure:** 1017 hPa	**Relative Humidity:** 52 %	**Power Supply:** 120 VAC
Remarks:			

Table 8.1.2 Conducted emission test results at EUT power lines

LINE:	AC mains
LIMIT:	Class B
EUT OPERATING MODE:	Receive / Stand-by
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*		
0.156469	50.01	42.61	65.68	-23.07	26.07	55.68	-29.61	L1	Pass
0.199288	52.70	44.19	63.68	-19.49	20.89	53.68	-32.79		
0.215063	56.31	50.49	63.07	-12.58	27.63	53.07	-25.44		
0.420726	45.08	34.33	57.48	-23.15	10.47	47.48	-37.01		
0.429724	46.81	36.27	57.31	-21.04	12.00	47.31	-35.31		
24.998512	49.43	48.61	60.00	-11.39	43.16	50.00	-6.84		
0.200689	58.32	54.73	63.63	-8.90	31.64	53.63	-21.99	L2	Pass
0.205442	58.48	53.47	63.44	-9.97	31.46	53.44	-21.98		
0.206280	58.71	48.31	63.41	-15.10	30.14	53.41	-23.27		
0.209527	59.15	54.27	63.29	-9.02	32.44	53.29	-20.85		
0.412772	51.28	46.02	57.63	-11.61	20.39	47.63	-27.24		
24.998750	46.97	46.22	60.00	-13.78	40.51	50.00	-9.49		

*- Margin = Measured emission - specification limit.

Test specification:	**Section 15.107, Conducted emission at AC power port**		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	5/8/2005 4:09:11 PM		
Temperature: 24 ºC	**Air Pressure:** 1017 hPa	**Relative Humidity:** 52 %	**Power Supply:** 120 VAC
Remarks:			

Table 8.1.3 Conducted emission test results at PC power lines

LINE:	AC mains
EUT OPERATING MODE:	Class B
EUT SET UP:	Receive / Stand-by
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*		
0.154580	60.06	52.96	65.78	-12.82	42.00	55.78	-13.78	L1	Pass
0.222873	51.68	49.11	62.77	-13.66	43.74	52.77	-9.03		
0.313764	46.74	41.97	59.89	-17.92	30.09	49.89	-19.80		
0.392796	44.18	40.62	58.00	-17.38	24.94	48.00	-23.06		
0.684901	39.26	34.14	56.00	-21.86	21.50	46.00	-24.50		
16.785194	43.80	37.37	60.00	-22.63	26.84	50.00	-23.16		
24.997901	45.06	42.81	60.00	-17.19	42.10	50.00	-7.90		
0.163561	53.91	46.69	65.34	-18.65	36.29	55.34	-19.05	L2	Pass
0.228390	51.42	49.13	62.56	-13.43	40.18	52.56	-12.38		
0.312643	47.15	42.72	59.91	-17.19	31.44	49.91	-18.47		
0.379810	44.41	41.01	58.31	-17.30	26.12	48.31	-22.19		
0.387032	44.87	42.25	58.14	-15.89	27.62	48.14	-20.52		
24.999251	43.98	42.65	60.00	-17.35	42.34	50.00	-7.66		

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

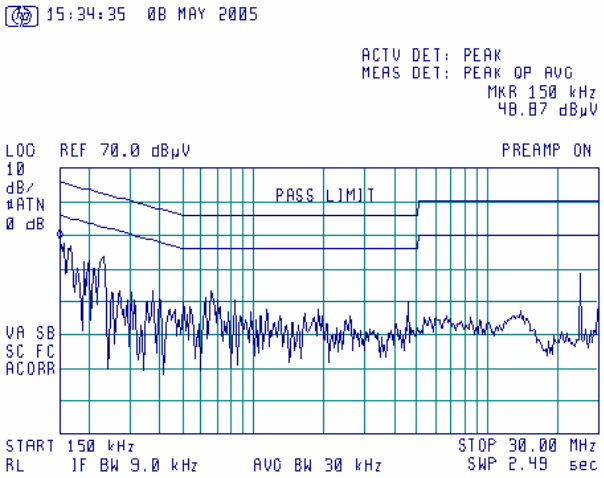
HL 0163	HL 0447	HL 0466	HL 0521	HL 1204	HL 1512	HL 2404	

Full description is given in Appendix A.

Test specification:	Section 15.107, Conducted emission at AC power port		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/8/2005 4:09:11 PM		
Temperature: 24 °C	Air Pressure: 1017 hPa	Relative Humidity: 52 %	Power Supply: 120 VAC
Remarks:			

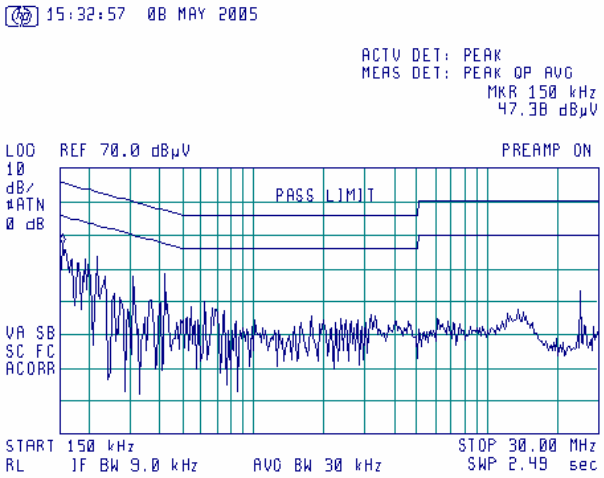
Plot 8.1.1 Conducted emission measurements at EUT power lines

LINE:	L1
LIMIT:	Class B
EUT OPERATING MODE:	Receive / Stand-by
LIMIT:	QUASI-PEAK, AVERAGE
DETECTOR:	PEAK



Plot 8.1.2 Conducted emission measurements at EUT power lines

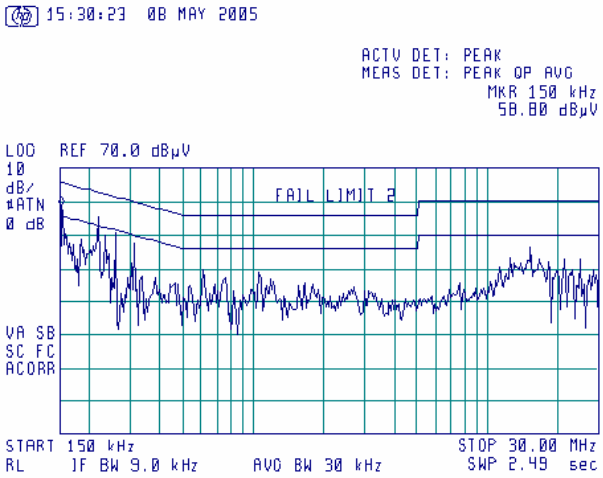
LINE:	L2
LIMIT:	Class B
EUT OPERATING MODE:	Receive / Stand-by
LIMIT:	QUASI-PEAK, AVERAGE
DETECTOR:	PEAK



Test specification:	Section 15.107, Conducted emission at AC power port		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/8/2005 4:09:11 PM		
Temperature: 24 °C	Air Pressure: 1017 hPa	Relative Humidity: 52 %	Power Supply: 120 VAC
Remarks:			

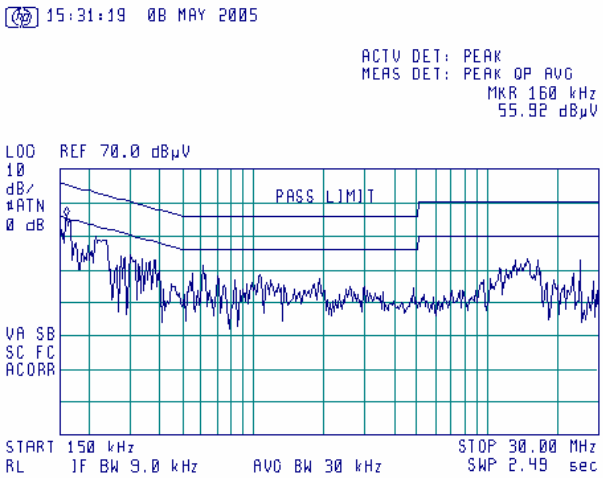
Plot 8.1.3 Conducted emission measurements for PC

LINE: L1
LIMIT: Class B
EUT OPERATING MODE: Receive / Stand-by
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 8.1.4 Conducted emission measurements for PC

LINE: L2
LIMIT: Class B
EUT OPERATING MODE: Receive / Stand-by
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	5/16/2005 3:01:33 PM		
Temperature: 22 ºC	**Air Pressure:** 1009 hPa	**Relative Humidity:** 38%	**Power Supply:** 120 V AC
Remarks:			

8.2 Radiated emission measurements

8.2.1 General

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

Table 8.2.1 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 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 for measurements in semi-anechoic chamber

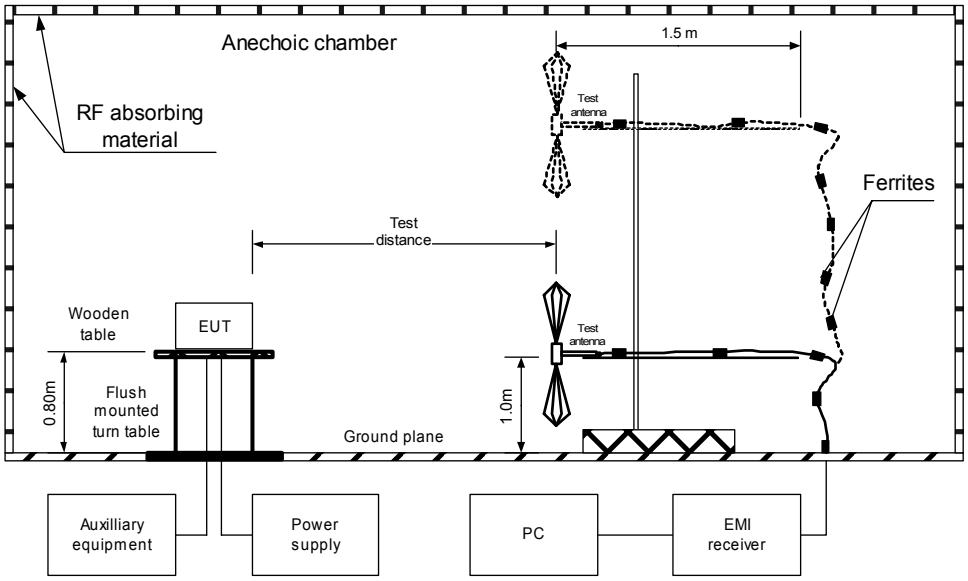
8.2.2.1 The EUT was set up as shown in Figure 8.2.1, energized and the performance check was conducted.

8.2.2.2 The specified frequency range was investigated with biconilog antenna connected to EMI receiver. To find maximum radiation the turntable was rotated 360^0, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal and the EUT cables position was varied.

8.2.2.3 The worst test results (the lowest margins) were recorded in Table 8.2.2 and shown in the associated plots.

Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	5/16/2005 3:01:33 PM		
Temperature: 22 ºC	**Air Pressure:** 1009 hPa	**Relative Humidity:** 38%	**Power Supply:** 120 V AC
Remarks:			

Figure 8.2.1 Setup for radiated emission measurements in anechoic chamber, table-top equipment



Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	5/16/2005 3:01:33 PM		
Temperature: 22 ºC	**Air Pressure:** 1009 hPa	**Relative Humidity:** 38%	**Power Supply:** 120 V AC
Remarks:			

Table 8.2.2 Radiated emission test results

EUT SET UP: TABLE-TOP
LIMIT: Class B
EUT OPERATING MODE: Receive / Stand-by
TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m
DETECTORS USED: PEAK / QUASI-PEAK
FREQUENCY RANGE: 30 MHz – 1000 MHz
RESOLUTION BANDWIDTH: 120 kHz

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*				
150.017500	43.23	41.21	43.50	-2.29	V	1	67	Pass
225.010000	41.63	41.12	46.00	-4.88	H	1	20	
250.000000	37.24	35.79	46.00	-10.21	H	1	200	
399.999932	47.74	45.10	46.00	-0.90	V	1	307	
566.746400	41.38	35.45	46.00	-10.55	V	1	228	
599.978900	44.36	42.78	46.00	-3.22	V	1.8	360	

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

Reference numbers of test equipment used

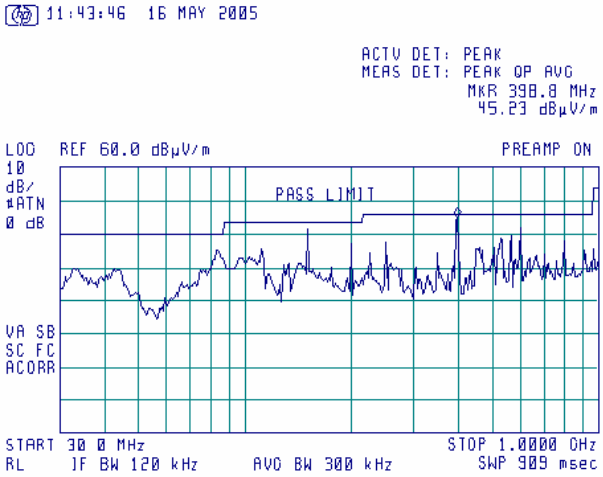
HL 0521	HL 0589	HL 0592	HL 0593	HL 0594	HL 0604	HL 2009	HL 2404

Full description is given in Appendix A.

Test specification:	Section 15.109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	5/16/2005 3:01:33 PM		
Temperature: 22 ºC	Air Pressure: 1009 hPa	Relative Humidity: 38%	Power Supply: 120 V AC
Remarks:			

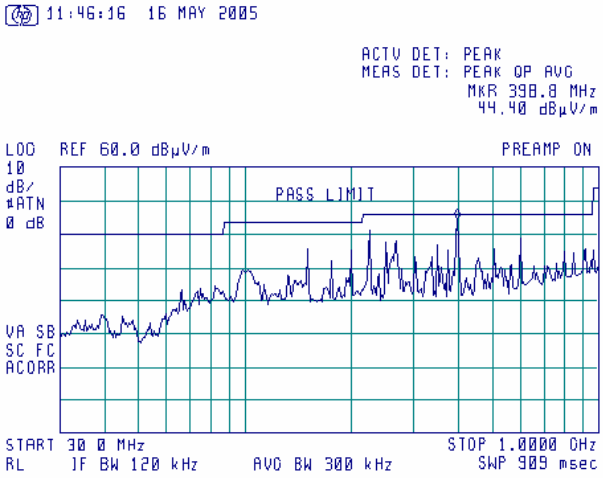
Plot 8.2.1 Radiated emission measurements in 30- 1000 MHz range, vertical antenna polarization

TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Stand-by



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

TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Stand-by



9 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
0163	LISN FCC/VDE/MIL-STD	Electro-Metrics	ANS 25/2	1314	01-Oct-04	01-Oct-05
0446	Antenna, Loop active, 10kHz-30MHz	EMCO	6502	2857	28-Jun-04	28-Jun-05
0447	LISN, 16/2, 300 V RMS	HL	LISN 16 - 1	066	03-Nov-04	03-Nov-05
0465	Anechoic Chamber 9(L) x 6.5(W) x 5.5(H) m	HL	AC - 1	023	03-Nov-04	03-Nov-05
0466	Shielded Room 3(L) x 3(W) x 2,4(H) m	HL	SR - 1	024	03-Nov-04	03-Nov-05
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A002 53	26-Sep-04	26-Sep-05
0589	Cable Coaxial, GORE A2P01POL118, 2.3 m	HL	GORE-3	176	02-Dec-04	02-Dec-05
0592	Position Controller	HL	L2-SR3000 (HL CRL-3)	100	18-May-05	18-May-06
0593	Antenna Mast, 1-4 m Pneumatic	Madgesh	AM-F1	101	03-Feb-05	03-Feb-06
0594	Turn Table FOR ANECHOIC CHAMBER flush mount d=1.2 m Pneumatic	HL	TT-WDC1	102	27-Jan-05	27-Jan-06
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE 26 - 2000 MHz	EMCO	3141	9611-1011	27-Jan-05	27-Jan-06
1204	One phase Voltage regulator, 2 kVA, 0-250V	HL	TDGC-2	99	04-Jun-05	04-Jun-06
1512	Cable RF, 8 m	Belden	M17/167 MIL-C-17	1512	10-Jan-05	10-Jan-06
2009	Cable RF, 8 m	Alpha Wire	RG-214	C-56	02-Dec-04	02-Dec-05
2404	PC Notebook Presario 2100, Cel. 1.8, RAM 256MB, HD 20GB	Compaq	2105EA	CN308285 06	02-Dec-04	02-Dec-05

10 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Conducted emissions with LISN	9 kHz to 150 kHz: ± 3.9 dB 150 kHz to 30 MHz: ± 3.8 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
Conducted emissions at RF antenna connector	9 kHz to 2.9 GHz: ± 2.6 dB 2.9 GHz to 6.46 GHz: ± 3.5 dB 6.46 GHz to 13.2 GHz: ± 4.3 dB 13.2 GHz to 22.0 GHz: ± 5.0 dB 22.0 GHz to 26.8 GHz: ± 5.5 dB 26.8 GHz to 40.0 GHz: ± 4.8 dB

The test equipment has been calibrated according to its recommended procedures and is within the manufacturer's published limit of error. The standards and instruments used in the calibration system conform to the present requirements of ISO/IEC 17025 (or alternately ANSI/NCSL Z540-1).
The laboratory calibrates its measurement standards by a third party (traceable to NIST, USA) on a regular basis according to equipment manufacturer requirements. The Hermon Labs EMC measurements uncertainty is given in the table above.

11 APPENDIX C Test facility 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 2186-1 for OATS and IC 2186-2 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).

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Person for contact: Mr. Alex Usoskin, CEO.

12 APPENDIX D Specification references

47CFR part 15: 2004	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.

13 APPENDIX E Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
BB	broad band
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μV)	decibel referred to one microvolt
dB(μV/m)	decibel referred to one microvolt per meter
dB(μA)	decibel referred to one microampere
dBΩ	decibel referred to one Ohm
DC	direct current
EIRP	equivalent isotropically radiated power
ERP	effective radiated power
EUT	equipment under test
F	frequency
GHz	gigahertz
GND	ground
H	height
HL	Hermon laboratories
Hz	hertz
ITE	information technology equipment
k	kilo
kHz	kilohertz
LISN	line impedance stabilization network
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μs	microsecond
NA	not applicable
NB	narrow band
NT	not tested
OATS	open area test site
Ω	Ohm
PCB	printed circuit board
PM	pulse modulation
PS	power supply
ppm	part per million (10^{-6})
QP	quasi-peak
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
VA	volt-ampere
WB	wideband

14 APPENDIX F Test equipment correction factors

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

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

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

Correction factor
Line impedance stabilization network
Model ANS-25/2
Electro-Metrics

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

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

Antenna factor
Active loop antenna
Model 6502, S/N 2857, HL 0446

Frequency, MHz	Magnetic antenna factor, dB	Electric antenna factor, dB
0.009	-32.8	18.7
0.010	-33.8	17.7
0.020	-38.3	13.2
0.050	-41.1	10.4
0.075	-41.3	10.2
0.100	-41.6	9.9
0.150	-41.7	9.8
0.250	-41.6	9.9
0.500	-41.8	9.8
0.750	-41.9	9.7
1.000	-41.4	10.1
2.000	-41.5	10.0
3.000	-41.4	10.2
4.000	-41.4	10.1
5.000	-41.5	10.1
10.000	-41.9	9.6
15.000	-41.9	9.6
20.000	-42.2	9.3
25.000	-42.8	8.7
30.000	-44.0	7.5

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 factor

Biconilog antenna EMCO, model 3141, serial number 1011, HL 0604

Frequency, MHz	Antenna factor, dB(1/m)	Frequency, MHz	Antenna factor, dB(1/m)	Frequency, MHz	Antenna factor, dB(1/m)
26	7.8	560	19.8	1300	27.0
28	7.8	580	20.6	1320	27.8
30	7.8	600	21.3	1340	28.3
40	7.2	620	21.5	1360	28.2
60	7.1	640	21.2	1380	27.9
70	8.5	660	21.4	1400	27.9
80	9.4	680	21.9	1420	27.9
90	9.8	700	22.2	1440	27.8
100	9.7	720	22.2	1460	27.8
110	9.3	740	22.1	1480	28.0
120	8.8	760	22.3	1500	28.5
130	8.7	780	22.6	1520	28.9
140	9.2	800	22.7	1540	29.6
150	9.8	820	22.9	1560	29.8
160	10.2	840	23.1	1580	29.6
170	10.4	860	23.4	1600	29.5
180	10.4	880	23.8	1620	29.3
190	10.3	900	24.1	1640	29.2
200	10.6	920	24.1	1660	29.4
220	11.6	940	24.0	1680	29.6
240	12.4	960	24.1	1700	29.8
260	12.8	980	24.5	1720	30.3
280	13.7	1000	24.9	1740	30.8
300	14.7	1020	25.0	1760	31.1
320	15.2	1040	25.2	1780	31.0
340	15.4	1060	25.4	1800	30.9
360	16.1	1080	25.6	1820	30.7
380	16.4	1100	25.7	1840	30.6
400	16.6	1120	26.0	1860	30.6
420	16.7	1140	26.4	1880	30.6
440	17.0	1160	27.0	1900	30.6
460	17.7	1180	27.0	1920	30.7
480	18.1	1200	26.7	1940	30.9
500	18.5	1220	26.5	1960	31.2
520	19.1	1240	26.5	1980	31.6
540	19.5	1260	26.5	2000	32.0
		1280	26.6		

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).

Cable loss
Cable Coaxial, GORE A2P01POL118, 2.3 m, model:GORE-3, HL 0589
+ Cable Coaxial, ANDREW PSWJ4, 6m, model: ANDREW-6, HL 1004

No.	Frequency, MHz	Cable loss, dB	Tolerance (Specification), dB	Measurement uncertainty, dB
1	30	0.33	≤ 6.5	±0.12
2	50	0.40		
3	100	0.57		
4	300	0.97		
5	500	1.25		
6	800	1.59		
7	1000	1.81		
8	1200	1.97		
9	1400	2.15		
10	1600	2.28		
11	1800	2.43		
12	2000	2.61		
13	2200	2.75		
14	2400	2.89		
15	2600	2.97		
16	2800	3.21	≤ 6.5	±0.12
17	3000	3.32		
18	3300	3.47		
19	3600	3.62		
20	3900	3.84		
21	4200	3.92		±0.17
22	4500	4.07		
23	4800	4.36		
24	5100	4.62		
25	5400	4.78		
26	5700	5.16		
27	6000	5.67		
28	6500	5.99		

Cable loss
RF cable 8 m, model RG-214, HL 2009

No.	Frequency, MHz	Cable loss, dB	Tolerance (Specification), dB	Measurement uncertainty, dB
1	1	0.10	NA	±0.12
2	10	0.14		
3	30	0.25		
4	50	0.34		
5	100	0.53		
6	300	0.99		
7	500	1.31		
8	800	1.73		
9	1000	1.98		
10	1100	2.11		
11	1200	2.21		
12	1300	2.35		
13	1400	2.46		
14	1500	2.55		
15	1600	2.68		
16	1700	2.78		
17	1800	2.88		
18	1900	2.98		
19	2000	3.09		