Intertek ETL SEMKO

RADIO TEST REPORT

No. 611601R1-2

EQUIPMENT UNDER TEST

Equipment:	RFID Reader
Type / model:	S1566/00 Heavy Duty
Manufacturer:	TagMaster AB
Tested by request of:	TagMaster AB

SUMMARY

All selected test cases specified in this report complies with the requirements of the following standards:

FCC, Part 15, Subpart B (2005) and Subpart C (2005);

Date of issue: September 25, 2006

Tested by: Martin Karlsson

Approved by: Lars-Olov Johansson

Intertek Semko AB
Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden
Telephone +46 8 750 00 00, Fax +46 8 750 60 30, www.sweden.intertek-etlsemko.com
Registered in Sweden: No SE556024059901, Registered office: As address

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1 CLIENT INFORMATION

The EUT has been tested by request of

Company:	TagMaster AB ELECTRUM 410 SE-164 40 Kista Sweden
Name of contact:	Mikael Willgert

2 EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT according to the manufacturer/client declaration

Equipment:	RFID Reader
Type/Model:	S1566/00 Heavy Duty
Brand name:	TagMaster AB
Serial number:	EMC REF #2
Manufacturer:	TagMaster AB
Rating/Supplying voltage:	10 – 30 V DC
Rating RF output power:	10 mW or 500 mW e.i.r.p.
Antenna gain:	7 dBi
External antenna connector:	No
Operating temperature range:	-40 to +70 °C
Frequency range:	2400 - 2483,5 MHz (FHSS) 2435 – 2465 MHz (CW)
Number of channels:	400 (FHSS) 93 (CW)
Channel separation:	200 kHz (FHSS) 300 kHz (CW)
Modulation characteristics:	CW / FHSS
Stand by mode supported:	No

3 TEST SPECIFICATIONS

3.1 Standards

FCC 47 CFR part 15 (2005) Subpart B – Unintentional radiators
FCC 47 CFR part 15 (2005) Subpart C – Intentional Radiators; §15.247 Operation within the bands 902-928 MHz, 2400 – 2483.5 MHz and 5725 – 5850 MHz.

Measurements methods according to ANSI C63.4-2003

3.2 Additions, deviations and exclusions from standards

Only radiated spurious emissions test and conducted emission at AC port has been performed for 500 mW output power level.

No other additions, deviations or exclusions have been made from standards.

3.3 Test set-up

Measurement set-up is described in corresponding section.

The EUT was supplied with 120 V AC (60 Hz) during the tests.

3.4 Operating environment

If not additionally specified, the tests were performed under the following environmental conditions:

Air temperature:	22 – 23	°C
Relative humidity:	45	%

4 TEST SUMMARY

The results in this report apply only to the sample tested.

FCC reference	Test	Result	Note
15.247(b)	Peak output power	NT	
15.247(a)	20 dB Bandwidth	NT	
15.247(a)	Carrier frequency separation	NT	
15.247(a)	Number of hopping frequencies (channels)	NT	
15.247(a)	Time of occupancy (dwell time)	NT	
15.247	Band edge compliance	NT	
15.247(d)	Out of band spurious emissions, radiated	Pass	
15.247(d)	Out of band spurious emissions, conducted	NA	
15B	Out of band spurious emissions, radiated	NA	
15B	Conducted emission at AC port	Pass	

NT = Not Tested
NA = Not Applicable

5 RADIATED SPURIOUS EMISSIONS

5.1 Measurement uncertainty

Radiated disturbance electric field intensity, 30 – 1000 MHz: ± 4.6 dB
Radiated disturbance electric field intensity, 1000 – 26000 MHz: ± 6.0 dB

The measurement uncertainty describes the overall uncertainty of the given measured value during operation of the EUT.

Measurement uncertainty is calculated in accordance with EA-4/02-1997.
The measurement uncertainty is given with a confidence of 95%.

5.2 Measurement set-up

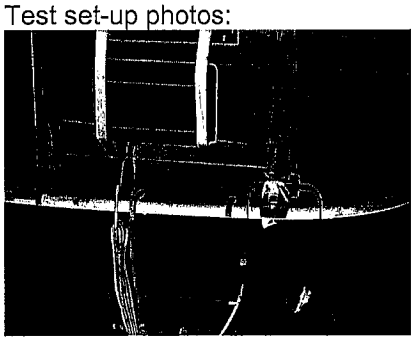
Test site: Semi-anechoic shielded chamber (30 – 1000 MHz)

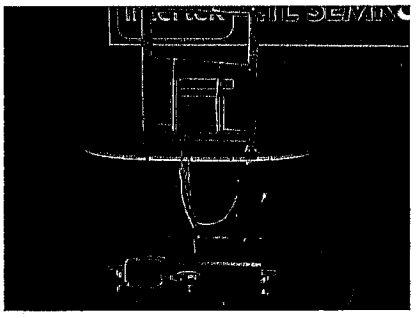
The radiated disturbance electric field intensity was measured in a semi-anechoic chamber at a distance of 3 m and the EUT was placed on a non-metallic table, 0.8 m above the reference ground plane. Test set-up photos are given below.

An overview sweep with peak detection of the electric field intensity was performed with the measurement receiver in max-hold and with the antenna placed 1.5 m, 2.5 m and 3.5 m above the floor. The polarisation was horizontal and vertical. The measurements were repeated with the EUT rotated in 90-degree steps.

At the frequencies where high disturbance levels were found a search for max disturbance level was performed. With the EUT and antenna in the worst-case configuration new measurements with quasi-peak detector were carried out.

Test set-up photos:





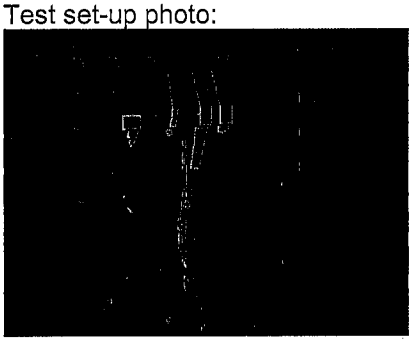
Test site: Bluetooth anechoic shielded chamber (1 – 26 GHz)

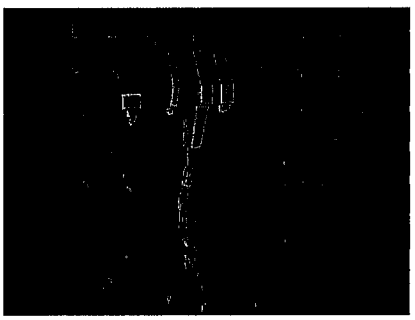
In the Bluetooth anechoic chamber the EUT was placed on a non-metallic table, 1.4 m above the floor. The radiated disturbance electric field intensity was measured at a distance of 3 m.

An overview sweep with peak detection of the electric field intensity was performed with the spectrum analyser in max-hold and with the antenna placed 1.4 m above the floor. The polarisation was horizontal and vertical. The measurements were repeated with the EUT rotated in 90-degree steps.

At the frequencies where high disturbance levels were found a search for max disturbance level was performed. With the EUT and antenna in the worst-case configuration new measurements with peak and average detectors were carried out.

Test set-up photo:



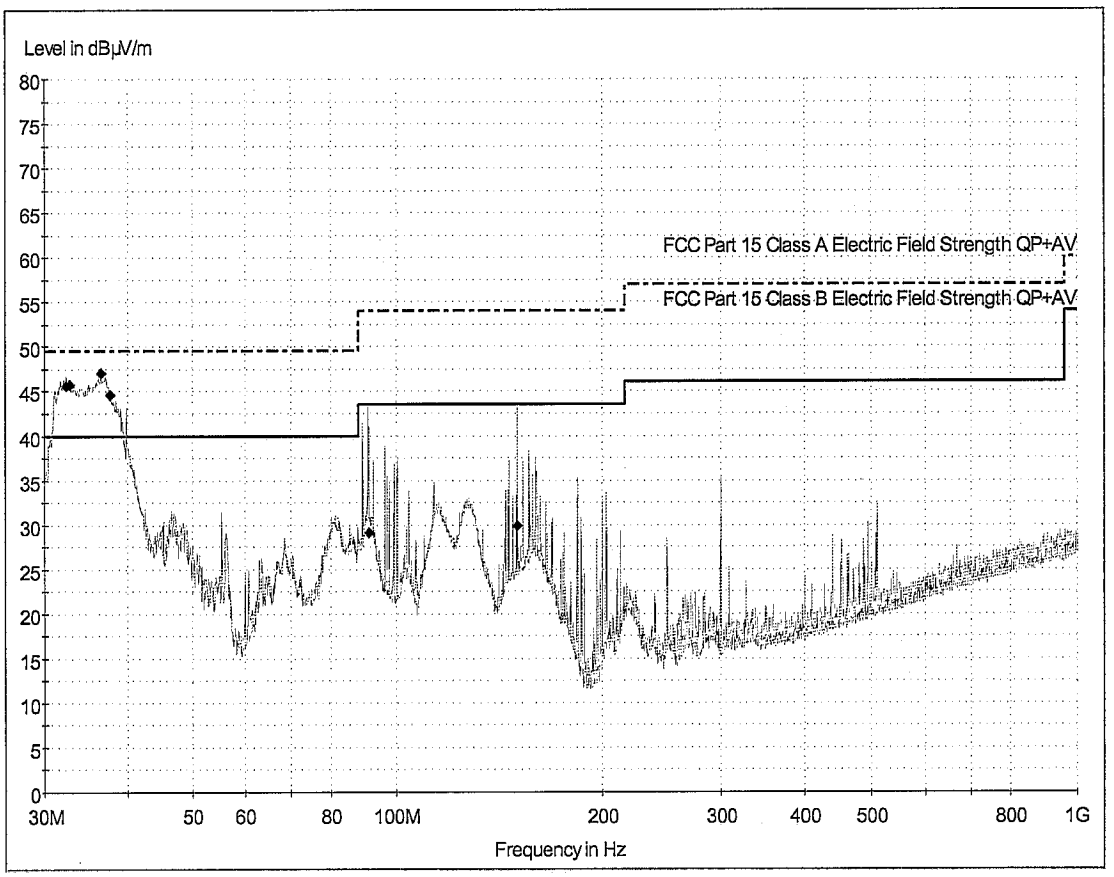


5.3 Test protocol

Semi-anechoic shielded chamber

Date of test: September 15, 2006

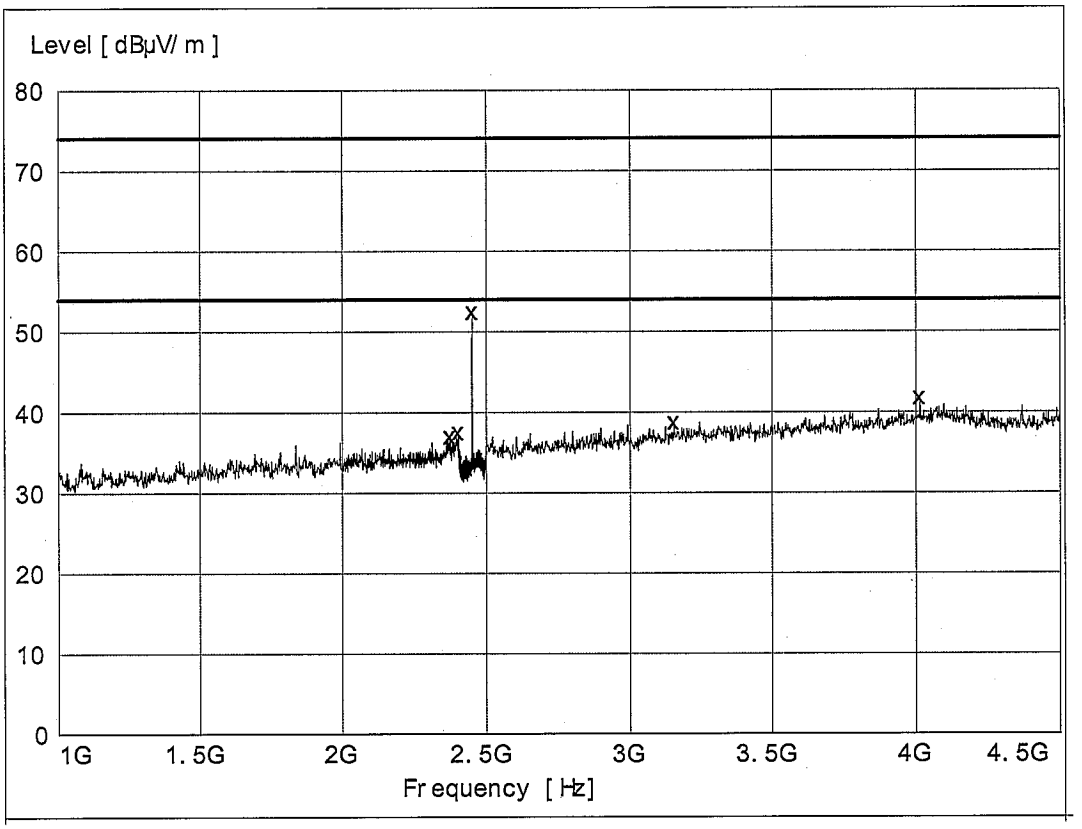
30 – 1000 MHz, max peak at a distance of 3 m on the middle TX channel



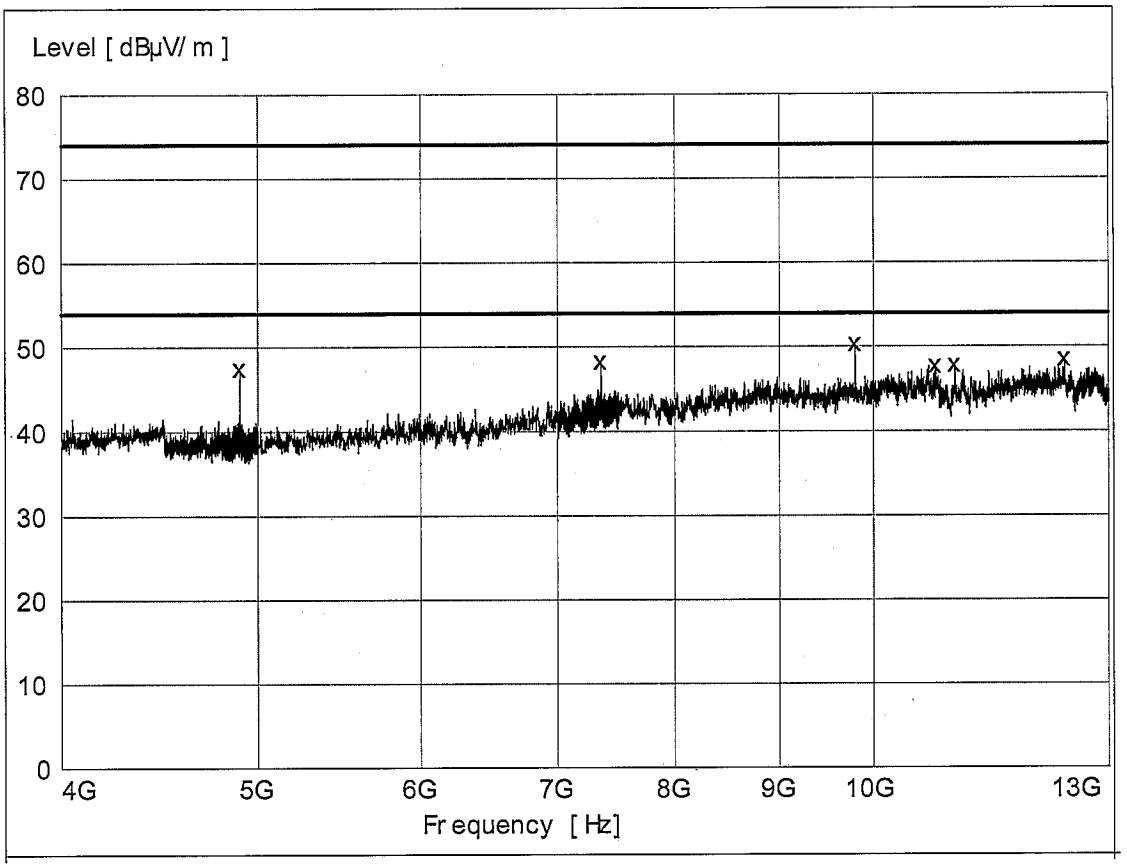
Bluetooth anechoic shielded chamber

Date of test: September 13, 2006

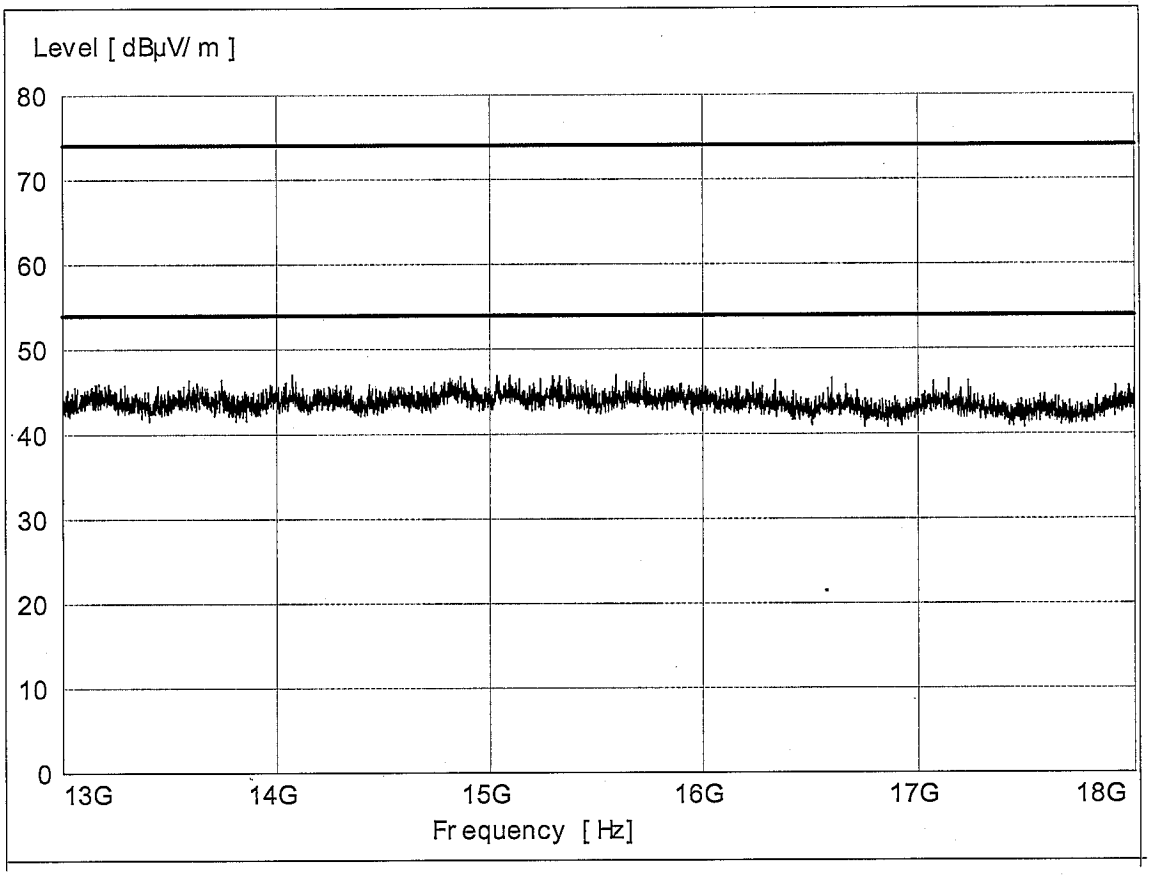
1000 – 4500 MHz, max peak at a distance of 3 m on the middle TX channel.
Carrier is attenuated by a band rejection filter, K&L 6N45-2450/T 100-0/0



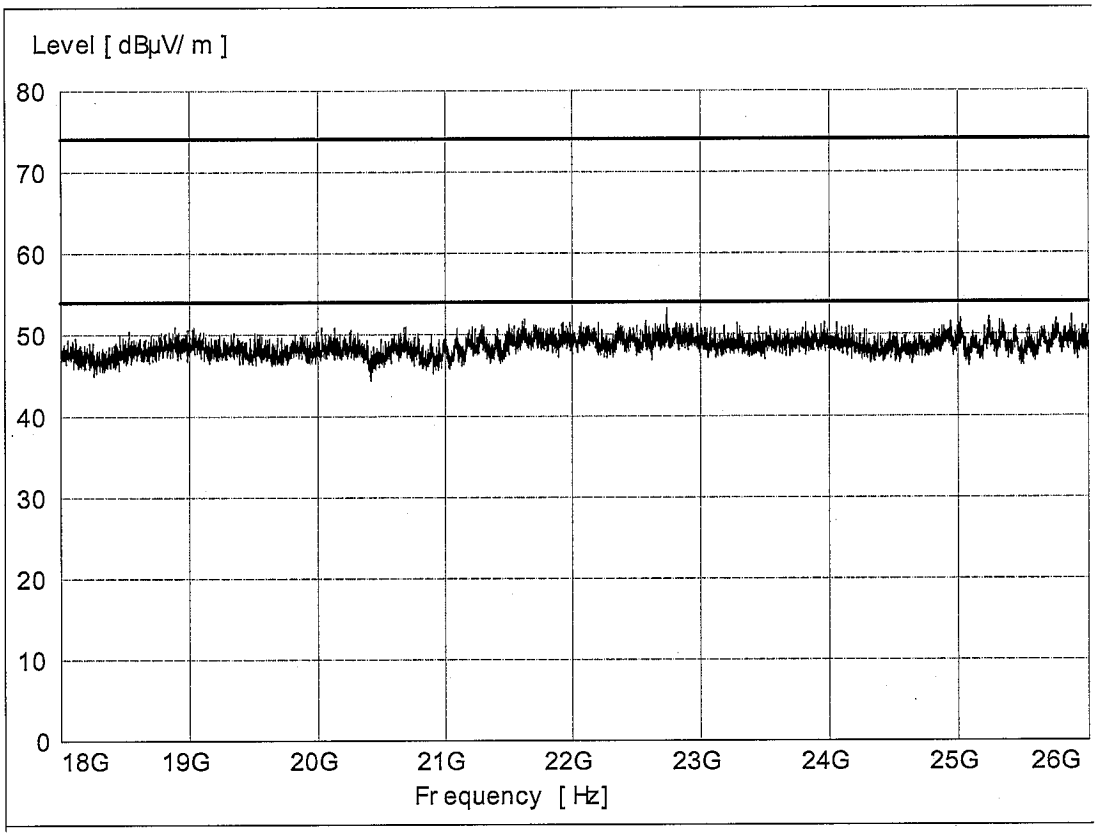
4000 – 13000 MHz, max peak at a distance of 3 m on the middle TX channel.
Emissions below 4000 MHz are attenuated by high-pass filter K&L 4410-X4500/18000-0



13 – 18 GHz, max peak at a distance of 3 m on the middle TX channel
Emissions below 4000 MHz are attenuated by high-pass filter K&L 4410-X4500/18000-0



18 – 26 GHz, max peak at a distance of 3 m on the middle TX channel
Emissions below 4000 MHz are attenuated by high-pass filter K&L 4410-X4500/18000-0



Data summary

Field strength of spurious emissions							
Frequency	RBW	Measured level		Polarity	Limit		Note
		Peak	QP/AV		Peak	QP/AV	
[MHz]	[kHz]	[dB(µV/m)]	[dB(µV/m)]		[dB(µV/m)]	[dB(µV/m)]	
32.339	120	-	45.6	V	-	49.5	1, 2
32.662	120	-	45.6	V	-	49.5	1, 2
36.462	120	-	47.0	V	-	49.5	1, 2
37.585	120	-	44.6	V	-	49.5	1
90.924	120	-	29.0	V	-	54.0	1
150.035	120	-	29.8	V		54.0	1
1000 – 4500	1 000	-	-	-	74	54	Noise floor
4899.800	1 000	51,3	44.8	V	74	54	
7350.000	1 000	56.9	51.8	H	74	54	2
9800.611	1 000	56.5	53.3	V	74	54	2
13000 – 18000	1 000	-	-	-	74	54	Noise floor
18000 – 26000	1 000	-	-	-	74	54	Noise floor

1) The limit at 3 m test distance was calculated using an inverse linear extrapolation factor 20 dB/decade.

Example calculation:

Measured level [dBµV/m] = Analyser reading [dBµV] + cable loss [dB] – preamplifier gain [dB] + antenna factor [1/m]

2) The measured result is below the limit by a margin less than the measured uncertainty; it is therefore not possible to state compliance based on the 95 % level of confidence. However, the result indicates that compliance is more probable than non-compliance with the specification limit.

6 CONDUCTED EMISSIONS AT AC PORT

6.1 Measurement uncertainty

Conducted disturbance voltage, quasi peak detection: 2.0 dB

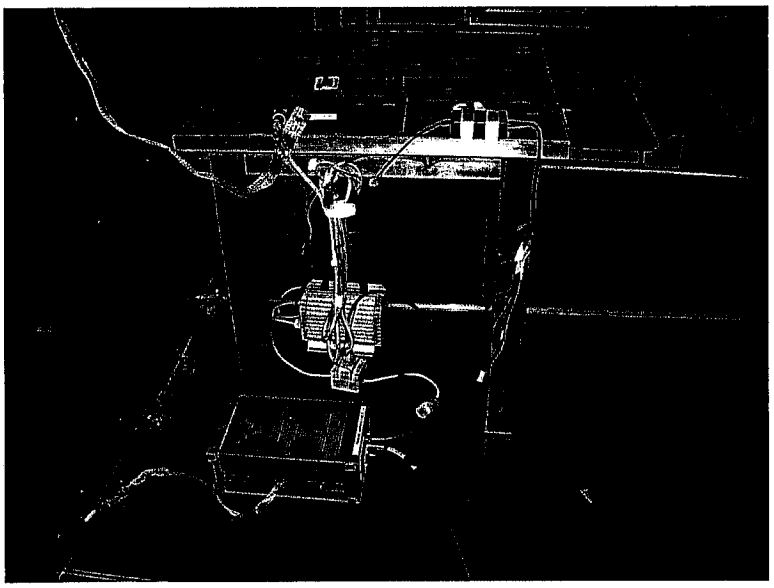
The measurement uncertainty describes the overall uncertainty of the given measured value during operation of the EUT.

Measurement uncertainty is calculated in accordance with EA-4/02-1997
The measurement uncertainty is given with a confidence of 95%

6.2 Measurement set-up

The mains terminal disturbance voltage was measured with the EUT located 0.8 m above the ground plane and 0.4 m from the vertical ground plane. The EUT was connected to an artificial mains network (AMN). The AMN was placed on the ground plane. Amplitude measurements were performed with a quasi-peak detector. The EUT was supplied by 120 VAC (60 Hz) during the test.

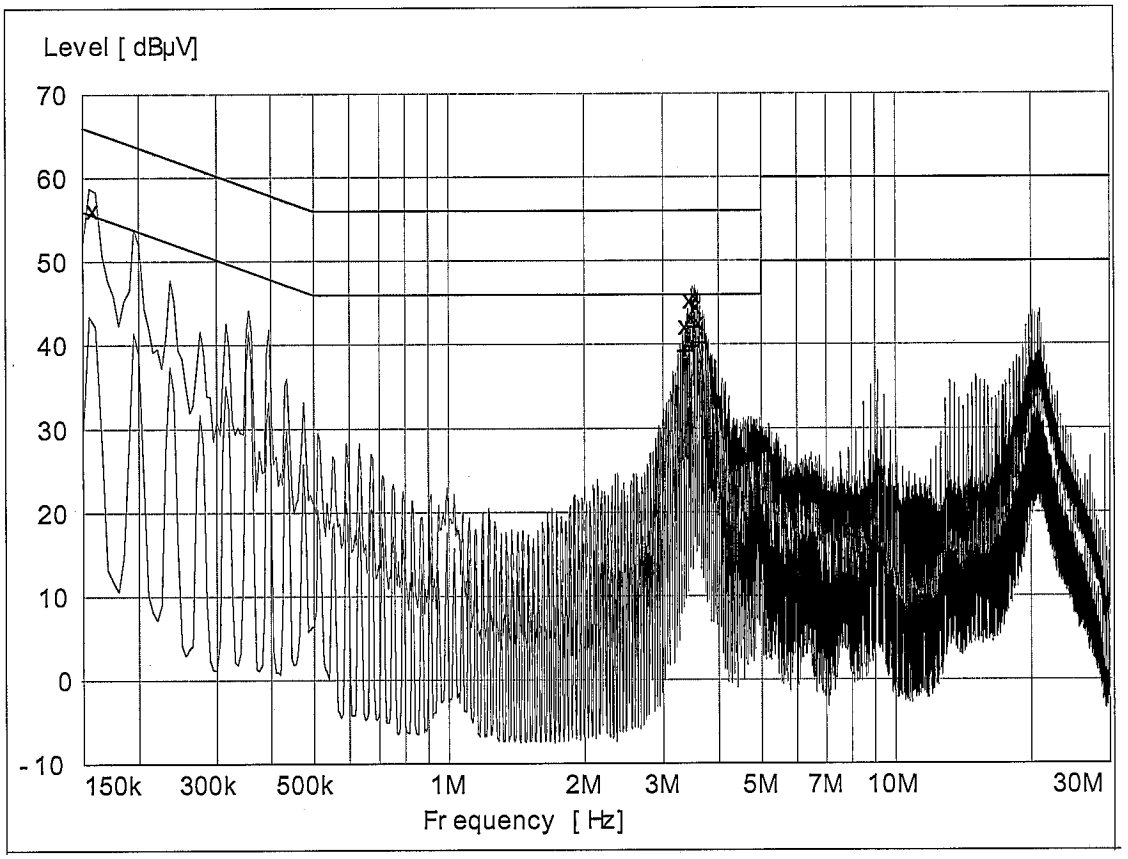
Test set-up photo



6.3 Test protocol

Date of test: September 13, 2006

Overview sweeps with peak and average detectors



Data summary

Frequency [MHz]	Quasi-peak	
	Disturbance level [dBµV]	Limit [dBµV]
0.160	56.3	65.5
3.410	42.3	56.0
3.49	45.4	56.0
3.61	55.7	56.0
3.65	42.8	56.0

Frequency [MHz]	Average	
	Disturbance level [dBµV]	Limit [dBµV]
3.37	39.2	46.0
3.41	39.3	46.0
3.53	39.8	46.0
3.57	42.1	46.0
3.65	40.3	46.0

7 APPENDIX I – PHOTOS OF THE EUT