

# RADIO TEST REPORT

No. 611601R2-2

## EQUIPMENT UNDER TEST

Equipment: RFID Reader  
Type / model: S154600 LR-6  
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

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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: S154600 LR-6  
Brand name: TagMaster AB  
Serial number: EMC REF #1  
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



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### 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 for the out-of-band spurious emissions test is described in corresponding section.

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

#### 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 %



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**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



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**5 RADIATED SPURIOUS EMISSIONS**

**5.1 Measurement uncertainty**

Radiated disturbance electric field intensity, 30 – 1000 MHz:  $\pm 4.6$  dB  
Radiated disturbance electric field intensity, 1000 – 26000 MHz:  $\pm 6.0$  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%.



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## 5.2 Measurement set-up

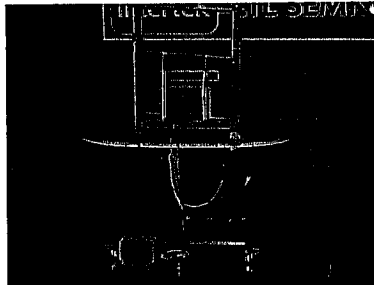
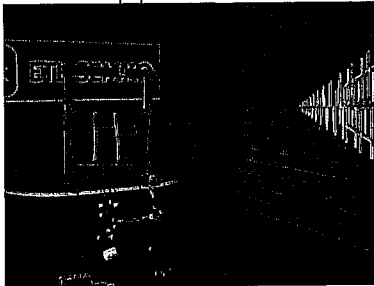
### Test site: Semi-anechoic shielded chamber (30 – 1000 MHz)

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:



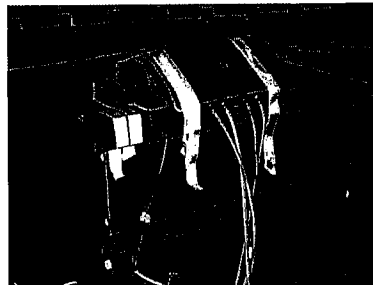
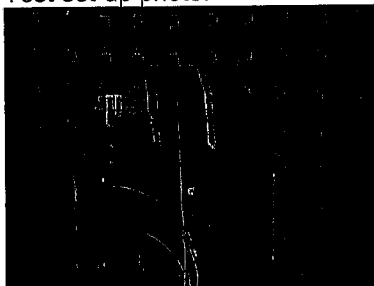
### Test site: Bluetooth anechoic shielded chamber (1 – 26 GHz)

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:



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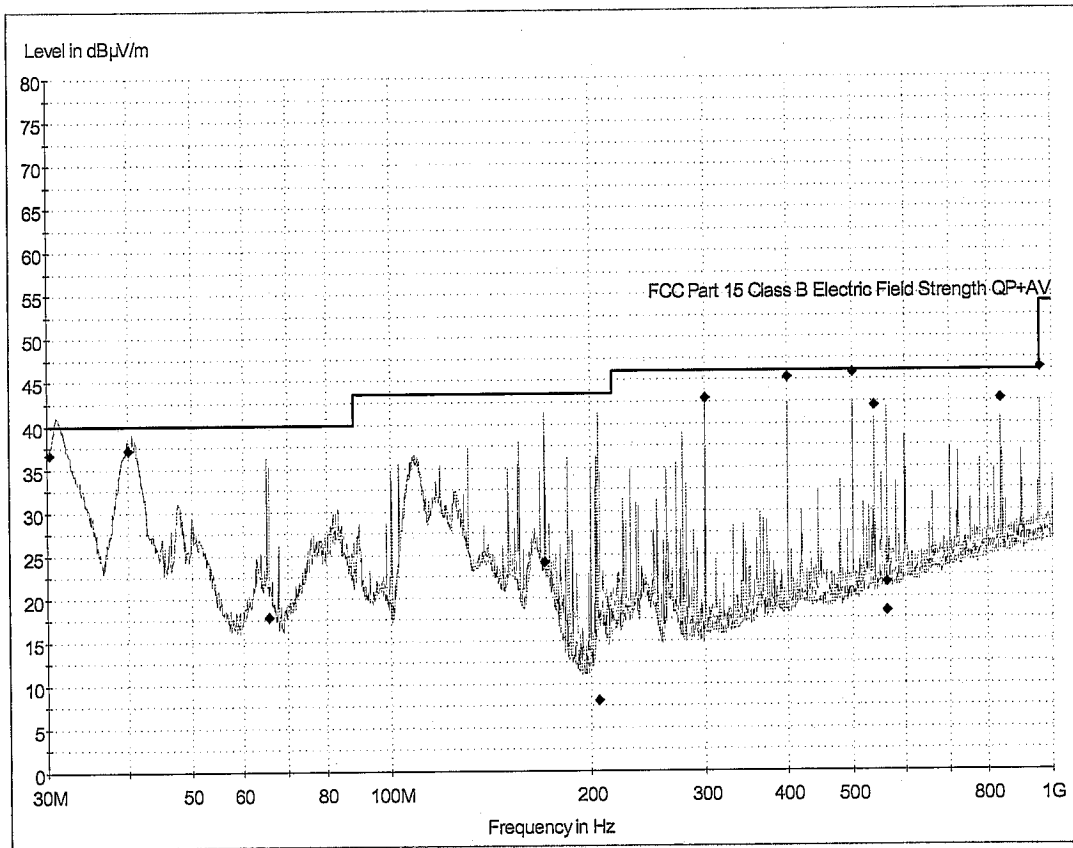
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**5.3 Test protocol**

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



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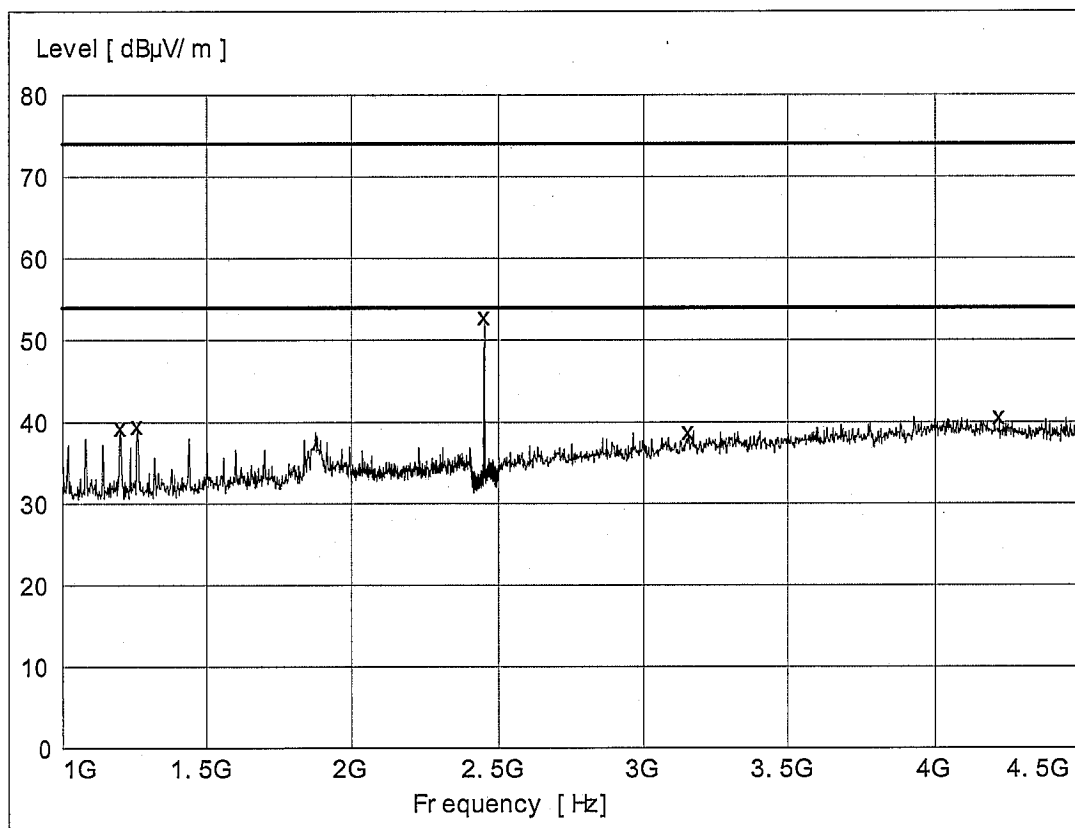
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Bluetooth anechoic shielded chamber

Date of test: September 13, 2006

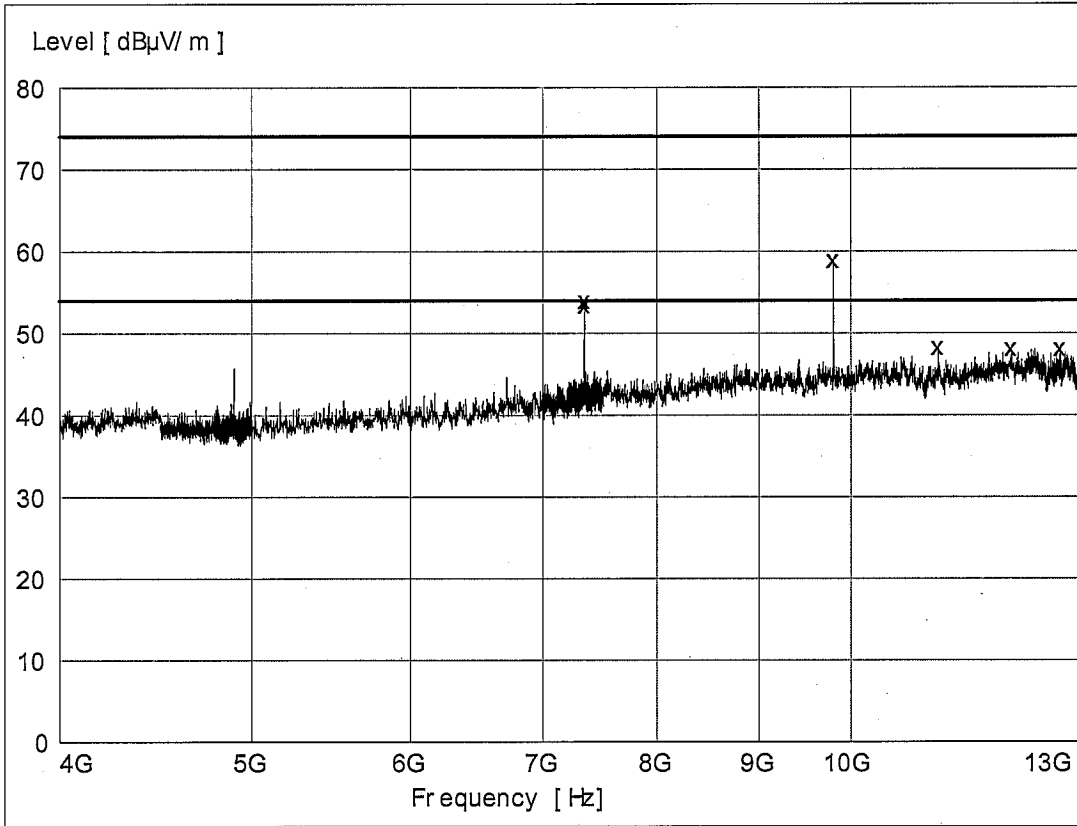
1000 – 4500 MHz, max peak at a distance of 3 m on the middle TX channel.  
Carrier is attenuated by a band rejection filter, K&L 6N45-2450/T 100-0/0



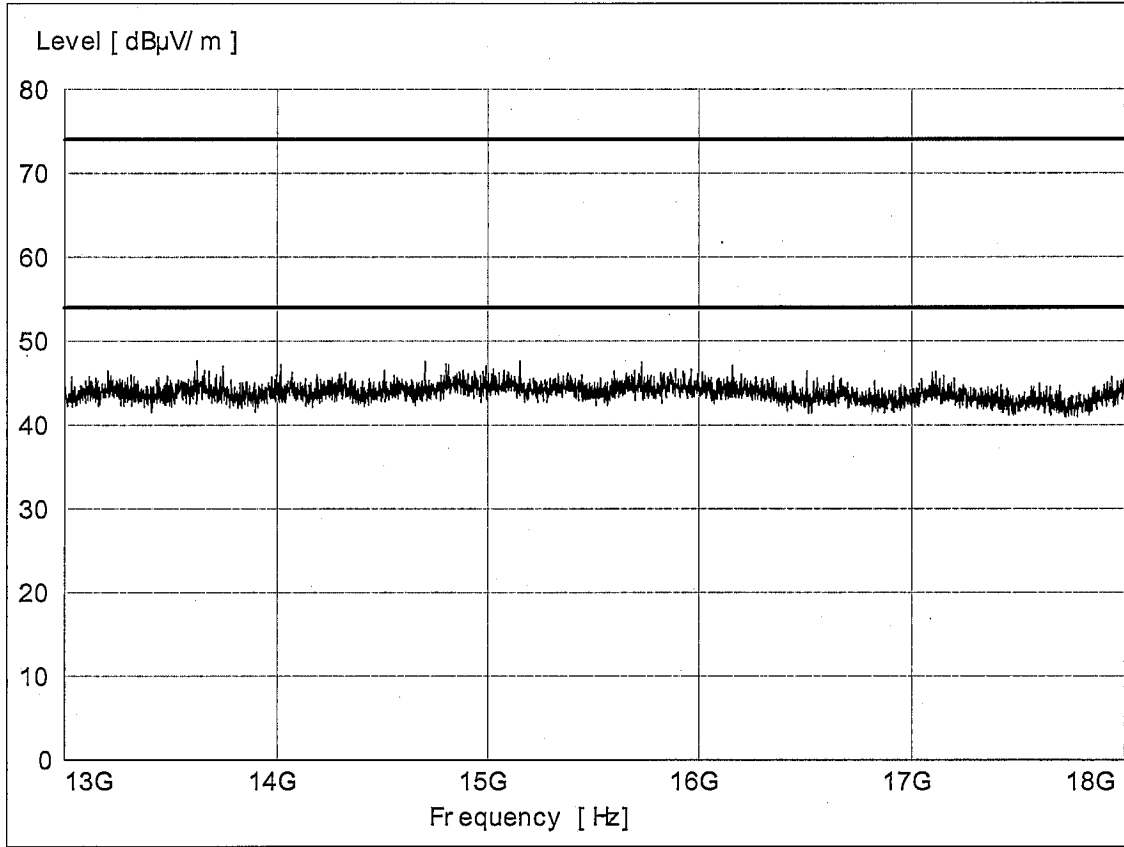
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4000 – 13000 MHz, max peak at a distance of 3 m on the middle TX channel.  
Emissions below 4000 MHz are attenuated by high-pass filter K&L 4410-X4500/18000-0



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



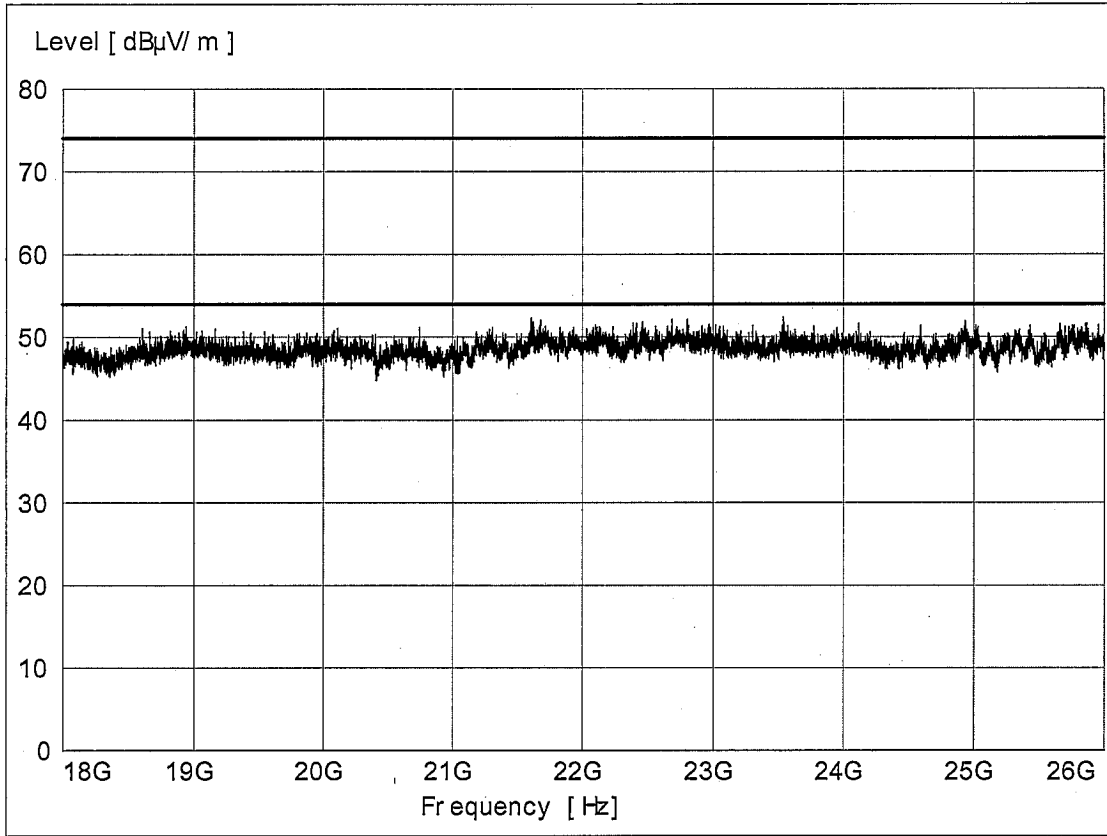
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18 – 26 GHz, max peak at a distance of 3 m on the middle TX channel  
Emissions below 4000 MHz are attenuated by high-pass filter K&L 4410-X4500/18000-0



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Data summary

Field strength of spurious emissions							
Frequency [MHz]	RBW [kHz]	Measured level		Polarity	Limit		Note
		Peak [dB(μV/m)]	QP/AV [dB(μV/m)]		Peak [dB(μV/m)]	QP/AV [dB(μV/m)]	
30.646	120	-	37.9	V	-	40.0	1, 2
39.690	120	-	39.6	V	-	40.0	1, 2
39.848	120	-	39.7	V	-	40.0	1, 2
82.770	120	-	20.7	H	-	40.0	1
100.011	120	-	40.7	V	-	43.5	1,2
299.989	120	-	44.1	H	-	46.0	1, 2
399.997	120	-	42.5	H	-	46.0	1, 2
500.006	120	-	31.5	H	-	46.0	1
1078.156	1 000	42.3	39.0	H	74	54	
1198.387	1 000	46.6	38.0	V	74	54	
1256.523	1 000	49.8	38.5	V	74	54	
4900.010	1 000	54.2	51.1	V	74	54	2
7350.010	1 000	62.1	52.8	H	74	54	2
9800.601	1 000	59.7	52.0	V	74	54	2
13000-26000	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:

$$\text{Measured level [dB}\mu\text{V/m]} = \text{Analyser reading [dB}\mu\text{V]} + \text{cable loss [dB]} - \text{preamplifier gain [dB]} + \text{antenna factor [1/m]}$$

- 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.



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## 6 CONDUCTED EMISSIONS AT AC PORT

### 6.1 Measurement uncertainty

Conducted disturbance voltage, quasi peak detection: 2.0 dB

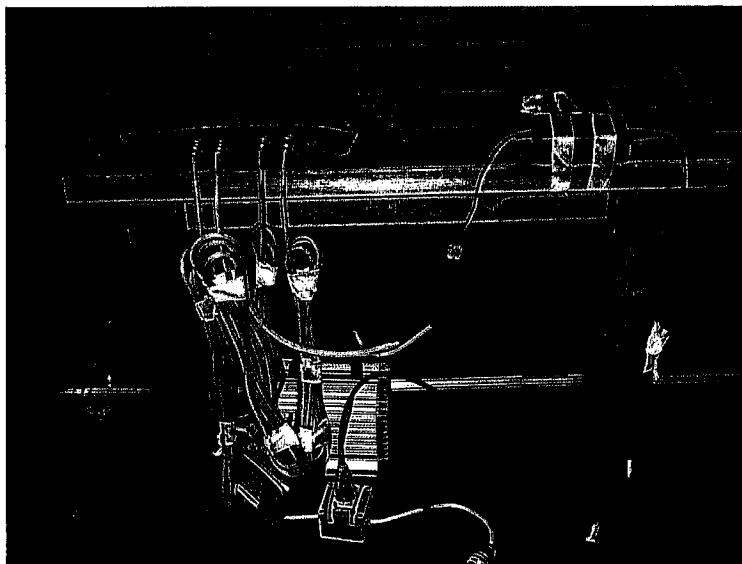
The measurement uncertainty describes the overall uncertainty of the given measured value during operation of the EUT.

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



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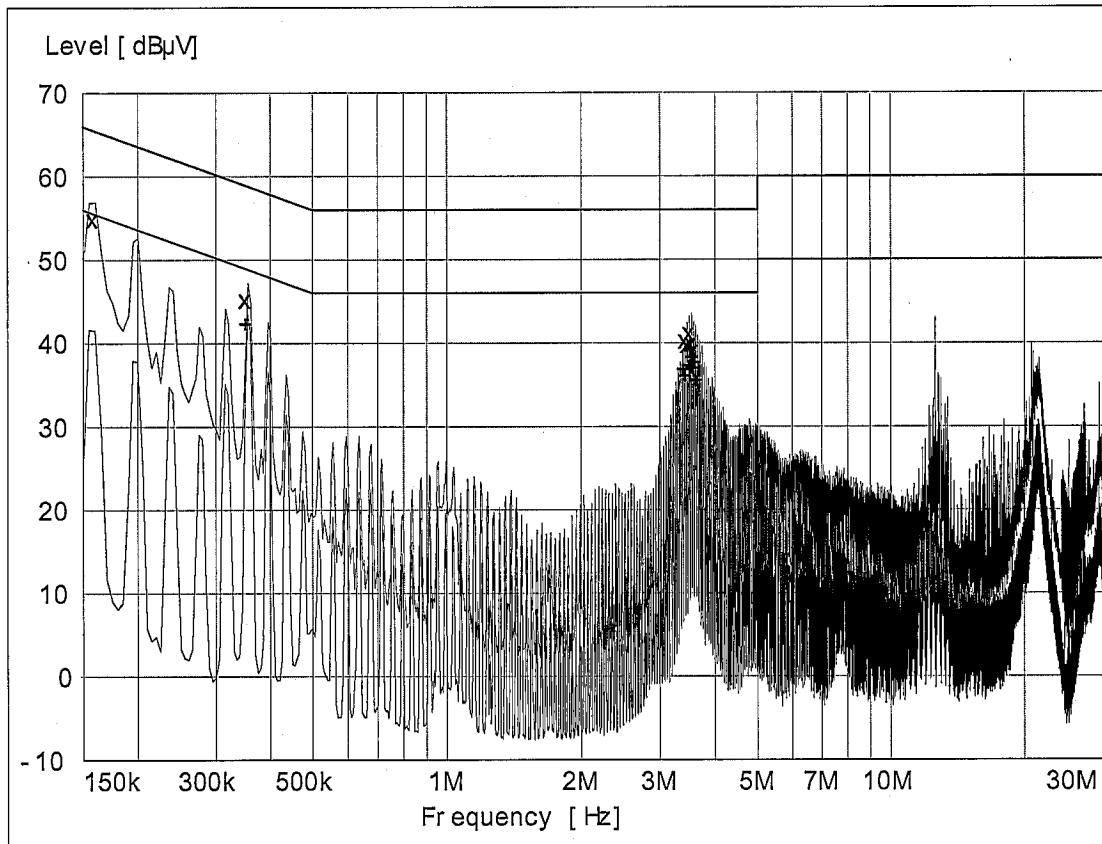
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**6.3 Test protocol**

Date of test: September 13, 2006

Overview sweeps with peak and average detectors



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Data summary

Frequency [MHz]	Quasi-peak	
	Disturbance level [dB $\mu$ V]	Limit [dB $\mu$ V]
0.160	55.0	65.5
0.355	45.3	58.9
3.460	40.4	56.0
3.495	39.9	56.0
3.540	41.3	56.0
3.575	40.0	56.0
3.615	39.2	65.0

Frequency [MHz]	Average	
	Disturbance level [dB $\mu$ V]	Limit [dB $\mu$ V]
0.355	42.3	48.8
3.420	36.9	46.0
3.460	36.1	46.0
3.540	37.3	46.0
3.575	37.0	46.0
3.580	38.3	46.0
3.620	37.7	46.0
3.655	35.5	46.0



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7 APPENDIX I – PHOTOS OF THE EUT

