EMC TEST REPORT

No.803385-1

Electromagnetic disturbances

EQUIPMENT UNDER TEST

Equipment :	Microwave oven
Type / model :	IBMS 1450
Manufacturer :	WHIRLPOOL SWEDEN AB
Tested by request of :	WHIRLPOOL SWEDEN AB

SUMMARY

Referring to the emission limits and the operating mode during the tests specified in this report the equipment complies with the requirements according to the following standards.

FCC, part 18 (2007): Industrial, Scientific & Medical Equipment

Date of issue: April 11, 2008

Tested by: Thomas Nordlund

Approved by: Hans Kohlén

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1. CLIENT INFORMATION

The EUT has been tested by request of

Company:	WHIRLPOOL SWEDEN AB Box 763 601 17 Norrköping SVERIGE
Name of contact:	Tony Lindström

2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT

Equipment:	Microwave oven
Type/Model:	IBMS 1450
Brand name:	WHIRLPOOL
Serial number:	-
Manufacturer:	WHIRLPOOL SWEDEN AB
Rating:	120 V AC, 60 Hz
Class:	I

2.2 Additional information about the EUT

The EUT was tested in a table top configuration.

The EUT was tested with a three-core mains power cable of 1.2 m

3. TEST SPECIFICATIONS

3.1 Standards

Requirements:
47 CFR, Telecommunication, Chapter I – FCC Part 18 – Industrial, Scientific and Medical equipment (2007)

Test methods:
ANSI C.63.4-2003 American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment
in the Range of 9kHz to 40 MHz

FCC/OST MP-5 (1986): FCC methods of measurements of radio noise emissions from industrial, scientific, and medical equipment

3.2 Additions, deviations and exclusions from standards

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

3.3 Mode of operation during the test

The EUT was supplied with 120 V AC, 60 Hz. The heating level was set at maximum during the tests. The EUT was operating with a non-conductive glass beaker (1 litre) with 700/300 ml water.

3.4 Compliance

Purpose of test: To determine whether the Equipment Under Test (EUT) fulfils the EMC requirements of FCC part 18, subpart C.

Conducted emission:

Frequency range	Quasi-Peak	Average
(MHz)	(dBµV)	(dBµV)
0.009-0.050	110	-
0.05-0.15	90-80	-
0.15-0.50	66-56	56-46
0.50-5.00	56	46
5.00-30.0	60	50

Radiated emission:

P=675 W, see clause 6.1

Limit= $25 * \sqrt{\frac{p}{500}} \approx 29.1 \mu V / m \approx 29.2 dB\mu V / m$

Frequency range	300 m distance	300 m distance	3 m distance
	Quasi-Peak	Quasi-Peak	Quasi-Peak
(MHz)	(µV/m)	(dBµV/m)	(dBµV/m)
30-1000	29.1	29.2	69.2

In the frequency range of 30-1000 MHz the values for 300 m distance are calculated by adding 40 dB to the limit.

Calculation of radiated emission limit in the frequency range of 1-26.5 GHz:

E_{300m} (µV/m) =K*E_{3m} (µV/m)

Where K is:

1000-1830 MHz→0.0046

1830-2745 MHz→ $K = \frac{f_{MHz} - 76.25}{381250}$

2745 MHz→0.0070

2745-3660 MHz→ $K = \frac{f_{MHz} - 457.5}{457500}$

3660 MHz→0.0090

3660-4575 MHz→ $K = \frac{f_{MHz} - 4575}{915000}$

4575-26500 MHz→0.0100

To transform dBµV/m→µV/m: $10^{\frac{E_{3m}}{20}}$

To transform µV/m→dBµV/m: 20logE_{300m}

4. TEST SUMMARY

The test has been carried out at the Intertek Semko AB premises in Kista, Sweden.
The results in this report apply only to sample tested:

Basic standard	Description	Result
Emission		
FCC part 18 (2007)	**AC power port continuous disturbance voltage in the frequency range 0.15 MHz to 30 MHz** The EUT complies with Class B limits. The margin to the quasi-peak limit was at least 2.7 dB, found at 0.019 MHz. The margin to the limit is within the measurement uncertainty interval. The margin to the average limit was at least 19.9 dB, found at 0.640 MHz. See diagram 1-2 and table 1-2.	**PASS**
FCC part 18 (2007)	**Radiated electromagnetic field in the frequency range 30 MHz to 1000 MHz** The EUT complies with the limits. The margin to the quasi-peak limit was at least 38.1 dB found at 81.099 MHz. See diagram 3 and table 3.	**PASS**
FCC part 18 (2007)	**Radiated electromagnetic field in the frequency range 1 GHz to 24.5 GHz** The EUT complies with the limits. The margin to the average limit was at least 15.5 dB found at 9926.00 MHz See diagram 4, 6-7 and table 4-6.	**PASS**
FCC part 18 (2007)	**Fundamental frequency 2450 (±50) MHz** The fundamental frequency complies within the frequency limits. See diagram 5	**PASS**
FCC part 18 (2007)	**Radiation leakage, 2.45 GHz** The radiation leakage complies with the limits See table 7.	**PASS**
FCC part 18 (2007)	**Power output (microwave power)**	**PASS**

5. TABLES AND DIAGRAMS

Diagram 1, Conducted emission, AC power port Line N, Peak overview sweep

Intertek SEMKO
FCC 18, Conducted

31. Mar 08 14:05

EUT: IBMS 1450
Manuf: WHIRLPOOL
Op Cond: 120 V AC. 60 Hz
Operator: THN
Test Spec: Mains terminals. Peak measurements.

Scan Settings (2 Ranges)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
9k	150k	200Hz	10k	PK+AV	20ms	AUTO	LN OFF	60dB
150k	30M	7k	10k	PK+AV	20ms	AUTO	LN OFF	60dB

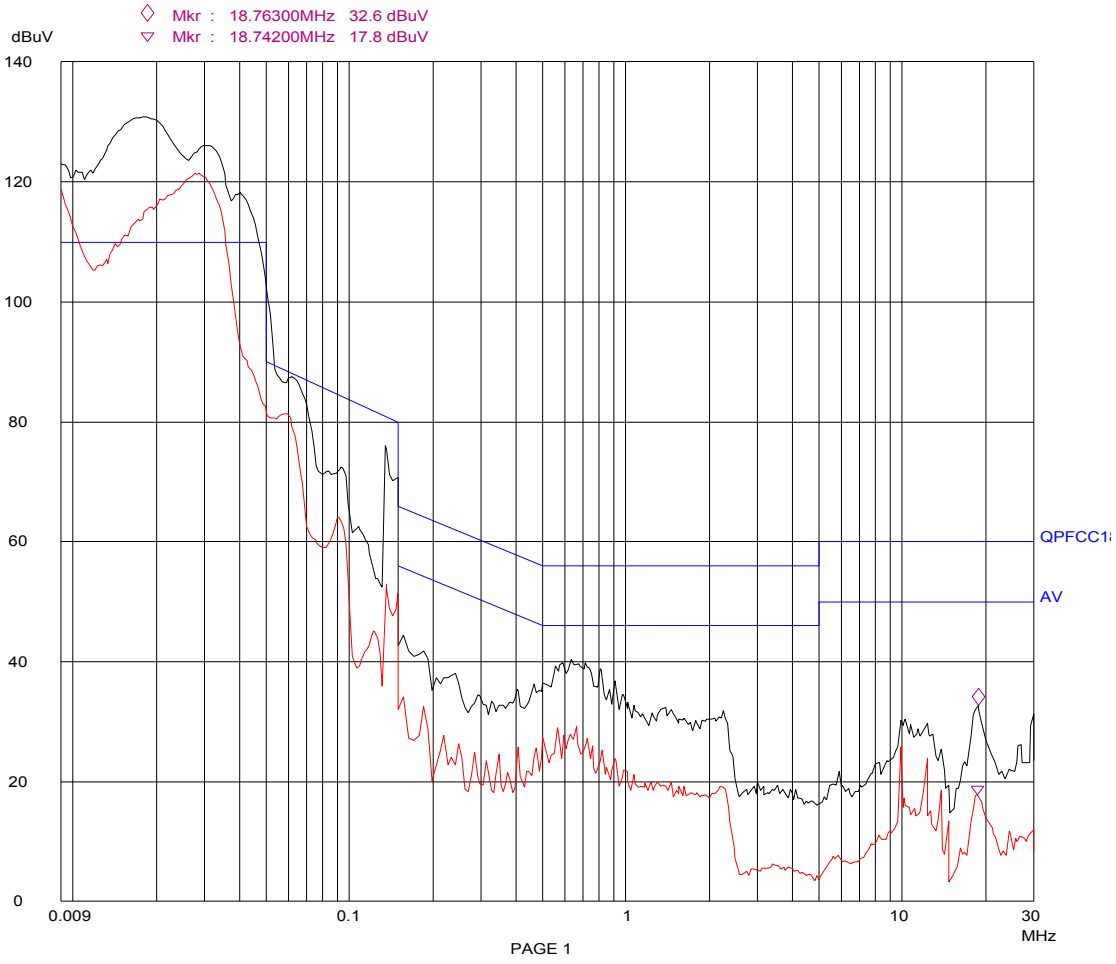


Table 1, Conducted emission, AC power port Line N, Measurement results

Frequency [MHz]	Quasi-Peak Disturbance level [dBµV]	Limit [dBµV]	Margin [dB]
0.009	84.2	110	25.8
0.018	101.6	110	8.4
0.034	65.3	110	44.7
0.062	66.1	88.8	22.7
0.076	45.3	87.4	42.1
0.093	48.7	85.7	37.0
0.150	40.5	80	39.5
0.633	35.8	56	20.2
2.257	28.6	56	27.4
18.763	26.6	60	33.4

Frequency [MHz]	Average Disturbance Level [dBµV]	Limit [dBµV]	Margin [dB]
0.150	31.2	56	24.8
0.633	25.6	46	20.4
2.257	19.6	46	26.4
18.763	17.4	50	32.6

Diagram 2, Conducted emission, AC power port Line L1, Peak overview sweep

Intertek SEMKO

FCC 18, Conducted

31. Mar 08 15:18

EUT: IBMS 1450
Manuf: WHIRLPOOL
Op Cond: 120 V AC. 60 Hz
Operator: THN
Test Spec: Mains terminals. Peak measurements.

Scan Settings (2 Ranges)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
9k	150k	200Hz	10k	PK+AV	20ms	AUTO	LN OFF	60dB
150k	30M	7k	10k	PK+AV	20ms	AUTO	LN OFF	60dB

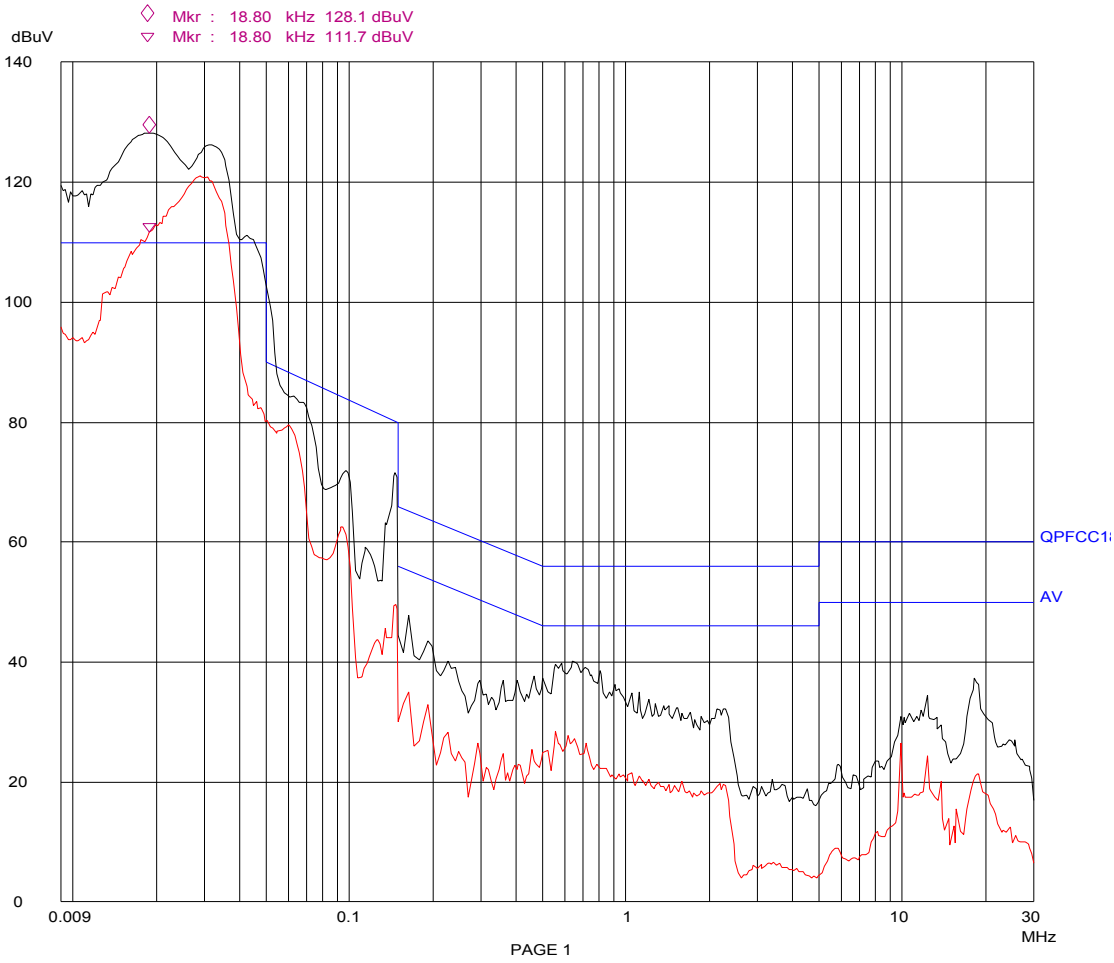


Table 2, Conducted emission, AC power port Line L1, Measurement results

Frequency [MHz]	Quasi-Peak Disturbance level [dBµV]	Limit [dBµV]	Margin [dB]
0.019	**107.3***	110	**2.7***
0.031	105.6	110	4.4
0.042	79.6	110	30.4
0.059	64.2	89.1	24.9
0.060	63.6	89.0	25.4
0.146	34.1	80.4	46.3
0.640	37.8	56	18.2
18.203	29.7	60	30.3
18.826	29.3	60	30.7

*****The measured result is below the limit by a margin less than the measurement 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.

Frequency [MHz]	Average Disturbance Level [dBµV]	Limit [dBµV]	Margin [dB]
0.640	26.1	46	19.9
18.203	20.5	50	29.5
18.826	20.8	50	29.2

Diagram 3, Radiated emission 30-1000 MHz at 3 m, Peak overview sweep

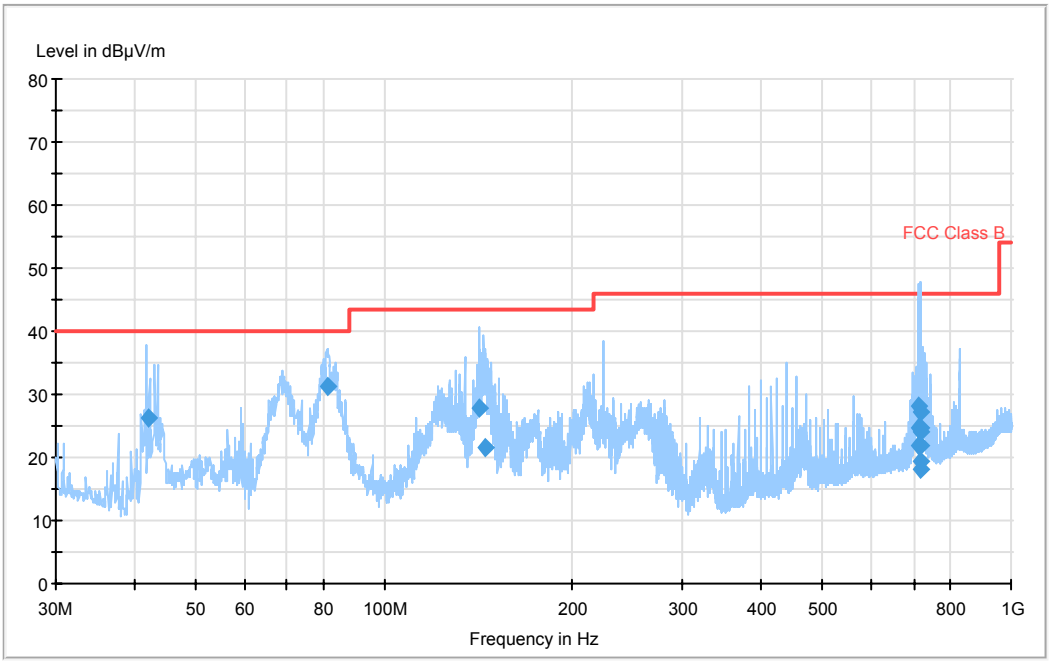


Table 3, Radiated emission, Measurement results

Frequency [MHz]	Quasi-Peak Disturbance level [dBµV/m]	Quasi-Peak Limit [dBµV/m]	Margin dB
42.262	-13.8	29.2	43.0
81.099	-8.9	29.2	38.1
141.801	-12.3	29.2	41.5
145.056	-18.4	29.2	47.6
713.723	-15.3	29.2	44.5
713.832	-11.8	29.2	41.0
714.249	-18.2	29.2	47.4
714.705	-12.8	29.2	42.0
714.926	-22.0	29.2	51.2
715.433	-20.7	29.2	49.9
715.829	-15.2	29.2	44.4
716.450	-18.2	29.2	47.4
717.202	-16.1	29.2	45.3

Limit according to FCC, part 18 (2004)

The measured field strength levels have been recalculated to 300 m measuring distance. The limit has been calculated, using the output power calculated according to clause 6.

Diagram 4, Radiated emission 1-2.4 GHz at 3 m, Peak overview sweep

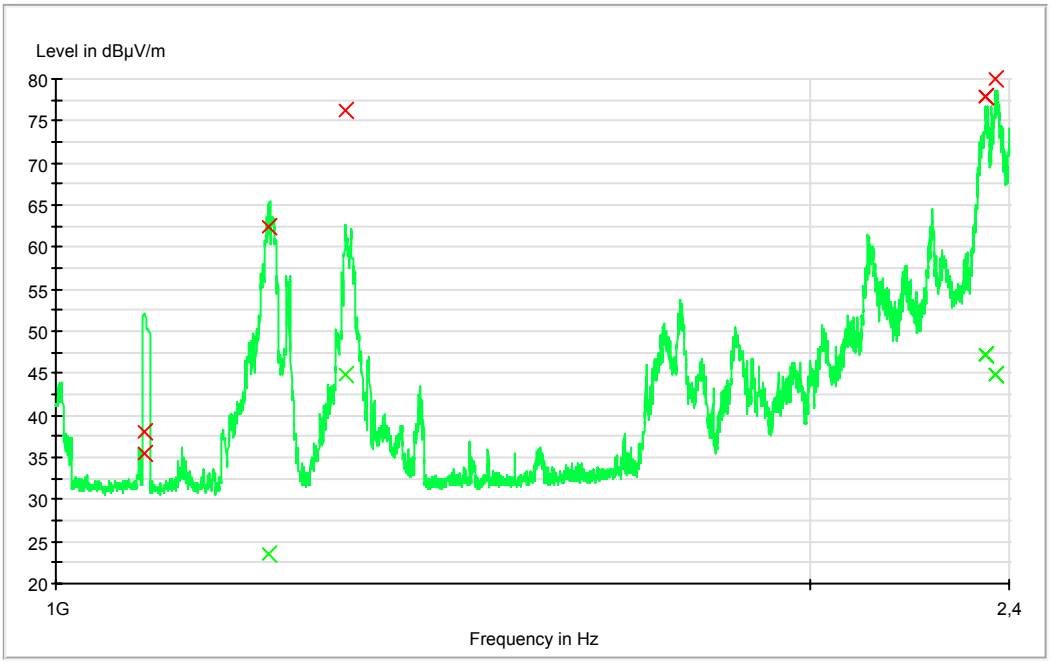


Table 4, Radiated emission, Measurement results

Frequency [MHz]	Average Disturbance [dBµV/m]	Limit [dBµV/m]	Margin [dB]
1084.400	-27.1	29.2	56.3
1215.600	-23.2	29.2	52.4
1304.400	-1.9	29.2	31.1
2350.400	2.7	29.2	26.4
2370.400	0.4	29.2	28.8

The measured field strength levels have been recalculated to 300 m measuring distance by using the formulas described in section 3.4.
The limit has been calculated, using the output power calculated according to clause 6.

Diagram 5, Fundamental frequency (2450±50MHz), Peak overview sweep

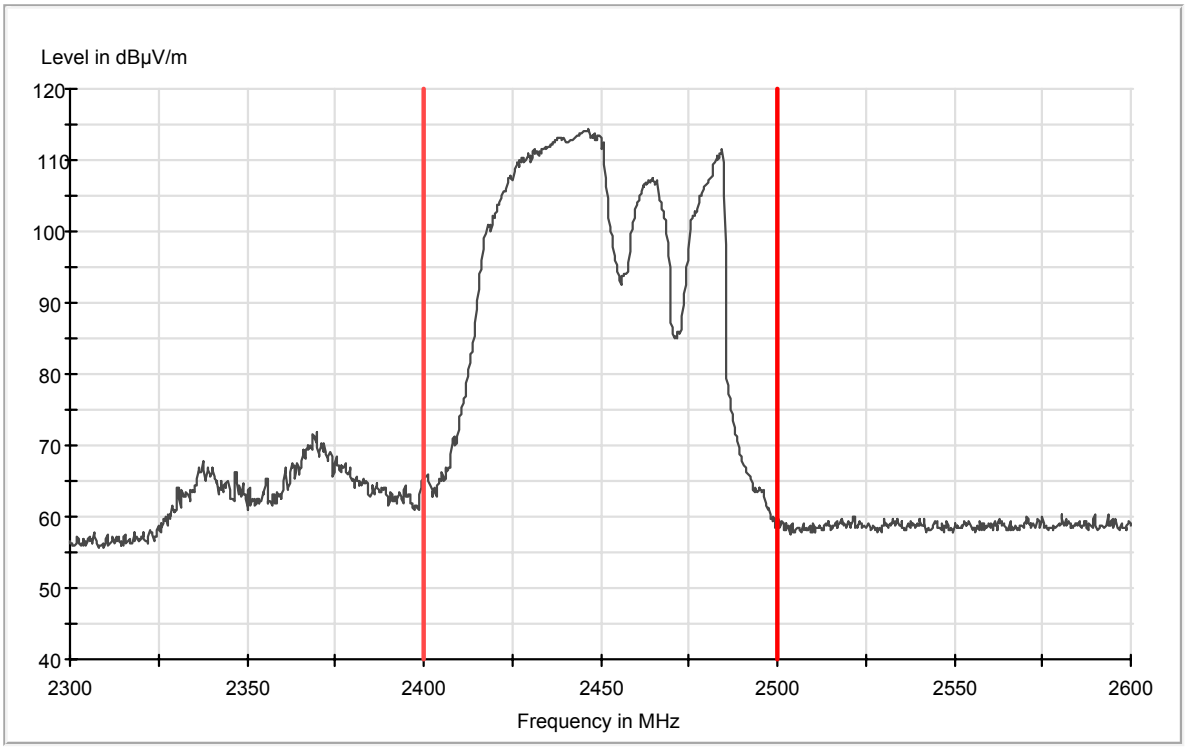


Diagram 6, Radiated emission 2.5-8 GHz at 3 m, Peak/Average overview sweep

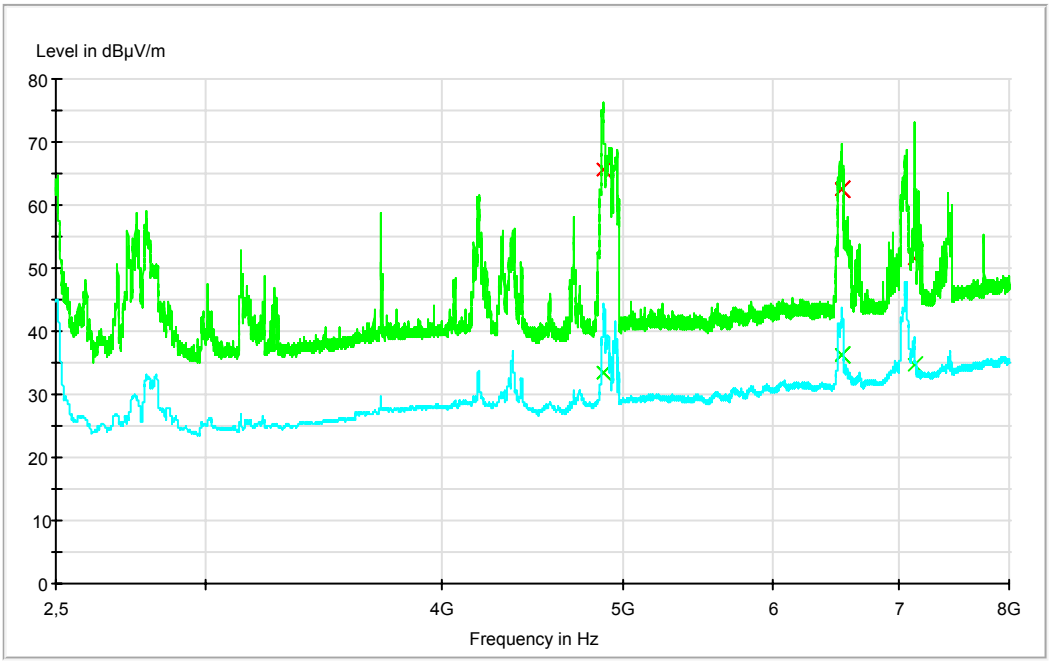


Table 5, Radiated emission, Measurement results

Frequency [MHz]	Average Disturbance level [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4873.600	3.5	29.2	25.7
6521.600	6.3	29.2	22.9
7128.000	4.8	29.2	24.4

The measured field strength levels have been recalculated to 300 m measuring distance by using the formulas described in section 3.4.
The limit has been calculated, using the output power calculated according to clause 6.

Diagram 7, Radiated emission 5-18 GHz at 3 m, Peak overview sweep

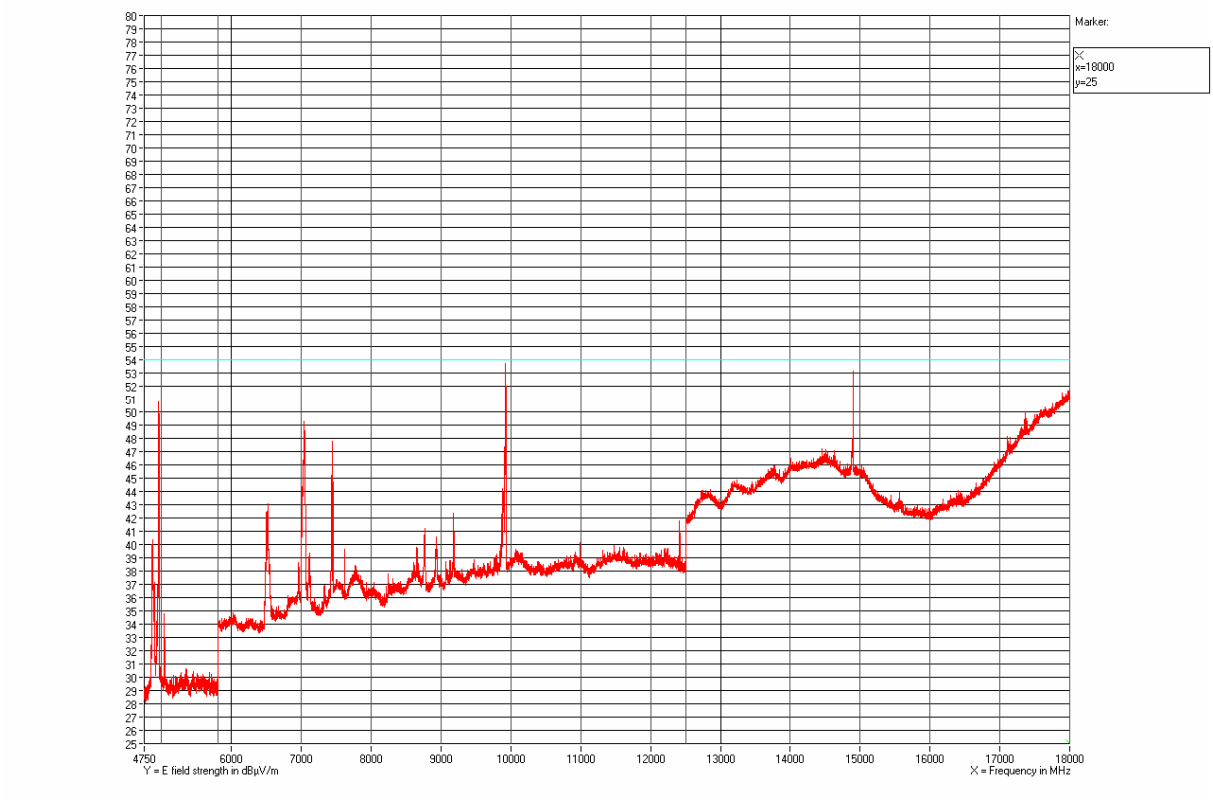


Table 6, Radiated emission, Measurement results

Frequency [MHz]	Average Disturbance Level at 300 m [dBµV/m]	Average Limit at 300 m [dBµV/m]	Margin [dB]
4874.00	0.4	29.2	28.8
4959.25	10.8	29.2	18.4
6520.00	3.1	29.2	26.1
7043.00	9.3	29.2	19.9
7444.00	7.8	29.2	21.4
9926.00	13.7	29.2	15.5
14902.00	13.1	29.2	16.1

The measured field strength levels have been recalculated to 300 m measuring distance by using the formulas described in section 3.4.
The limit has been calculated, using the output power calculated according to clause 6.

Table 7, Radiation leakage, 2.45 GHz, Measurement results

Disturbance level [mW/cm^2]	Limit [mW/cm^2]
< 0.2	1.0

6. POWER OUTPUT, MICROWAVE POWER

6.1 Calorimetric method

$$P = \frac{4.187 * M_{\mathrm{w}}(T_2 - T_1) + 0.55 * M_c(T_2 - T_0)}{t}$$

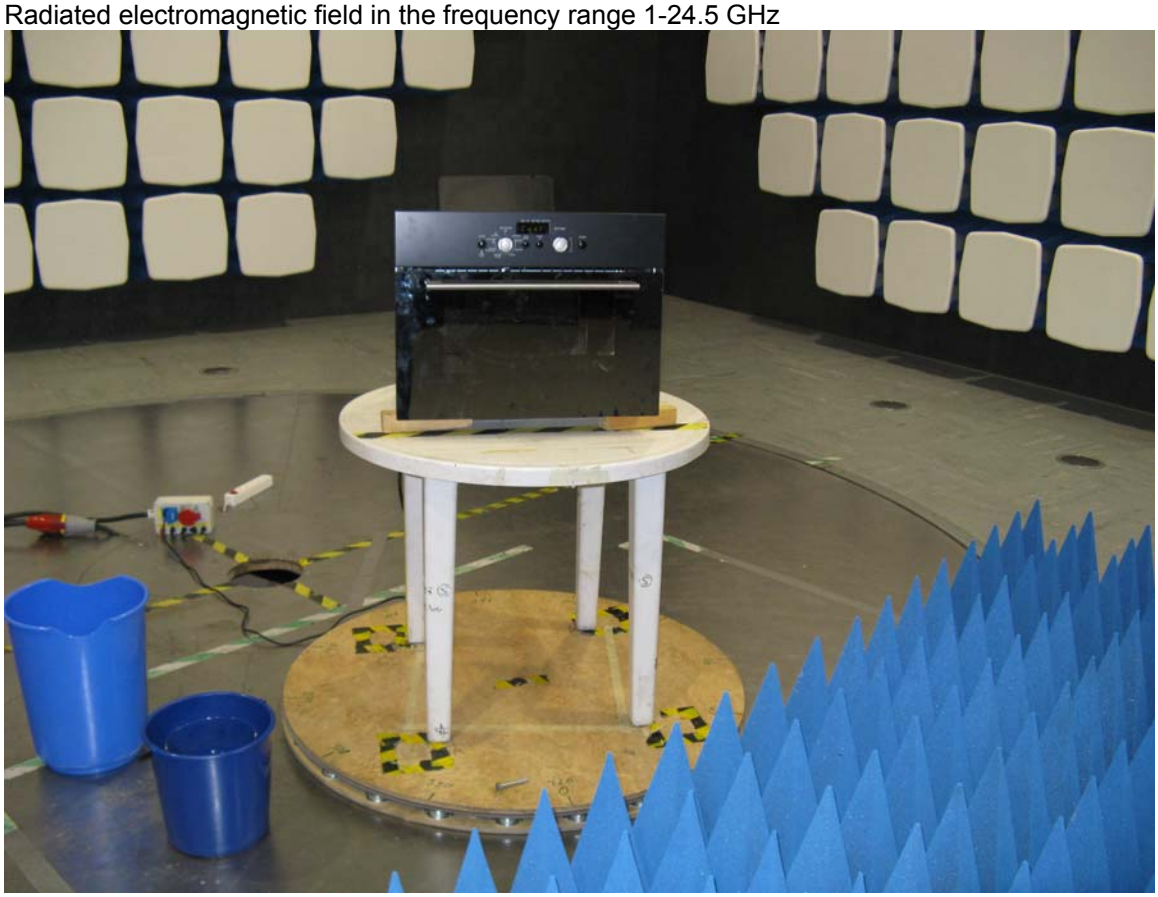
$$P = \frac{4.187 * 1000(29.2 - 8.4) + 0.55 * 392(29.2 - 22.9)}{131} W \approx 675W$$

7. PHOTOS

AC power port continuous disturbance voltage

Radiated electromagnetic field in the frequency range 30-1000 MHz

Radiated electromagnetic field in the frequency range 1-24.5 GHz



8. INTERTEK SEMKO EMC CENTER MEASUREMENT UNCERTAINTIES

All uncertainties are given with a level of confidence of approximately 95% (k=2) and are the maximum values within the complete range. Measurement uncertainties are calculated in accordance with EA-4/02:1997.

Continuous conducted disturbances with AMN in the frequency range 9 kHz to 30 MHz	± 3.6 dB
Measurement uncertainty for radiated disturbance	
Uncertainty for the frequency range 30 to 1000 MHz at 1 m	± 6.2 dB
Uncertainty for the frequency range 30 to 1000 MHz at 3 m	± 4.8 dB
Uncertainty for the frequency range 30 to 1000 MHz at 10 m	± 4.6 dB
Uncertainty for the frequency range 1.0 to 2.75 GHz at 3 m	± 5.6 dB
Uncertainty for the frequency range 2.75 to 6.0 GHz at 3 m	± 5.8 dB
Uncertainty for the frequency range 6.0 to 12.8 GHz at 3 m	± 6.2 dB
Uncertainty for the frequency range 12.8 to 18 GHz at 3 m	± 6.7 dB
Measurement uncertainty for radiated power above 1 GHz	± 4.1 dB