FCC PART 18
EMI MEASUREMENT AND TEST REPORT

For

Qing Dao Haier Microwave Production Co., Ltd.

Haier Garden, Qianwangang Road, Economic Development Zone,
Qingdao, P. R. China

FCC ID: PKAUA0770MPA167

2004-11-22

This Report Concerns:	**Equipment Type:**
☒ Original Report	Microwave Oven – Consumer ISM Equipment

Test Engineer:	Peter Zhang
Report Number:	RSC0410223
Test Date:	2004-10-10
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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

The *QING DAO HAIER MICROWAVE PRODUCTION CO., LTD.*'s models, **UA-0770M, MWQ747RW, MWQ747RB, MWQ747RPG, MWW747RW, MWW747RB, MWW747RPG, MWK747RW, MWK747RB, MWK747RPG, MWT747RW, MWT747RB, MWT747RPG (HAIER); MWHQ747RW, MWHQ747RB, MWHQ747RPG (HEC);** or the "EUT" as referred to in this report is a mechanical Control microwave oven， it has a Panasonic's magnetron 2M167B. Which measures approximately 11.4 inch H x 19.1inch W x 15.4inch D. rated input voltage: 120V/60Hz

Note: *The test data was only good for the test sample. It may have deviation for other sample.*

1.2 Objective

The following test report is prepared on behalf of *QINGDAO HAIER MICROWAVE PRODUCTION CO., LTD.,* in accordance with Part 2, Subpart J, and Part 18, Subparts A, B and C of the Federal Communication Commissions rules.

The objective of the manufacturer is to demonstrate compliance with FCC Part 18 limits for Industrial, Scientific and Medical Equipment.

1.3 Related Submittal(s)/Grant(s)

No related submittal(s).

1.4 Test Methodology

All measurements contained in this report were conducted with MP-5, FCC Methods of Measurements of Radio Noise Emissions from ISM Equipment, February 1986. All measurement was performed at Haier Corporation. The radiated testing was performed at an antenna-to-EUT
distance of 3 meters.

1.5 Test Facility

The anechoic room used by Haier Corporation to collect radiated electromagnetic disturbance and disturbance voltage measurement data is located Haier Garden, Qianwangang Road, Economic Development Zone, Qingdao, P. R. China.

Test anechoic room at Haier Corporation has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4–2001.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration. The test sites has been listed with the FCC and approved by the VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

1.6 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Due Date
R/S	Receiver	FSEM	849720/019	08/05/2005
R/S	Receiver	ESCS30	828304/014	09/05/2005
R/S	CLAMP	MDS-21	SB2601	08/05/2005
HP	Amplifier	8447D	2944A09795	08/05/2005
ETS	Log Periodic Antenna	3146	9603-4421	09/05/2005
ETS	Biconical Antenna	3110B	3360	08/05/2005
A.H. System	Horn Antenna	SAS0200/571	261	08/05/2005
VALHALLA SCIENTIFIC	Digital Power Analyzer	2101	20314	08/05/2005
SCHAFFNER	LISN	MN20500	1412	10/05/2005

1.7 External Cabling List and Details

Cable Description	Length (M)	From/Port	To
Unshielded Undetachable Power Cord	1.4	AC Mains	EUT

2 – OPERATING CONDITION/TEST CONFIGURATION

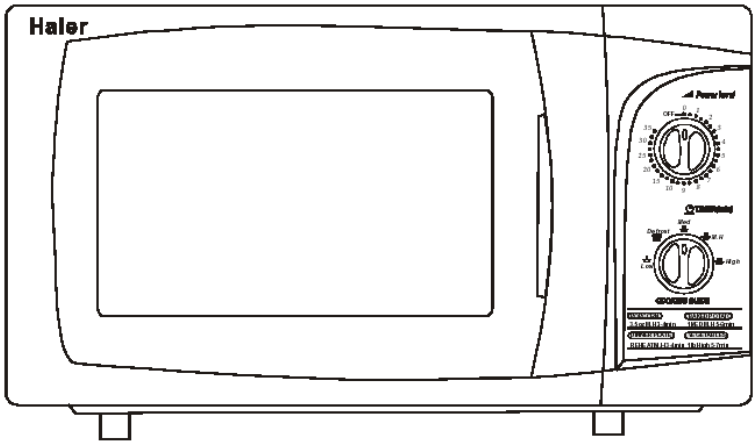
2.1 Justification

The EUT was provided for tests as a stand-alone device. It was prepared for testing in accordance with the manufacturer's instructions. The EUT was operated at maximum (continuous) RF output power. The loads consisted of water in a glass beaker in the amounts specified in the test procedure.

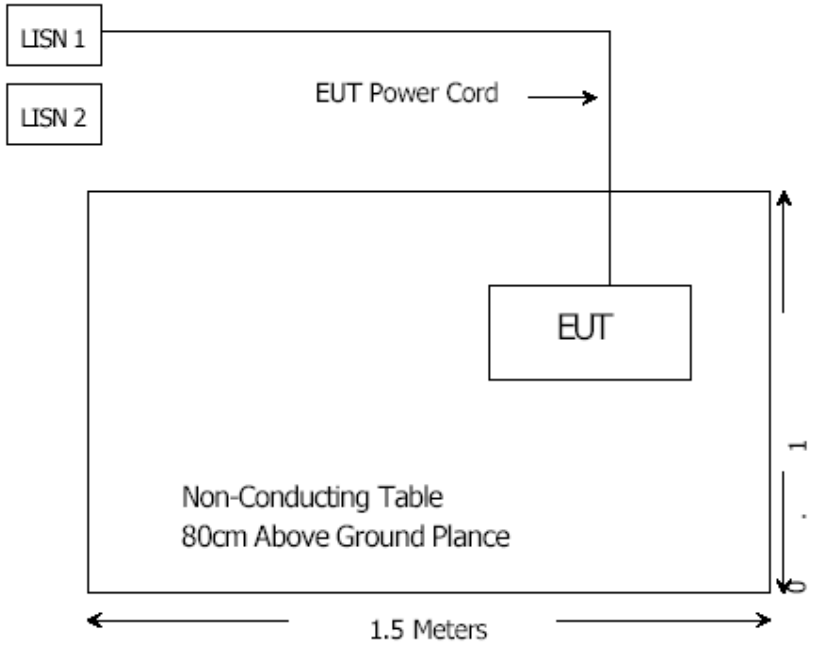
2.2 Equipment Modifications

No modification to the EUT was made by BACL Corp to make sure the EUT comply with applicable limits.

2.3 Configuration of Test System



2.4 Test Setup Block Diagram



3 - CONDUCTED EMISSIONS TEST DATA

3.1 Environmental Conditions

Temperature:	**27°C**
Relative Humidity:	**63%**
ATM Pressure:	**1089mbar**

3.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are Receiver, cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at Haier is +2.4 dB.

3.3 EUT Setup

The setup of EUT is according with per MP-5: 1986 measurement procedure. Specification used was with the FCC Part 18 Consumer Product limits.

The EUT was placed on the center of the back edge on the test table.

The EUT was connected to a 120 VAC/ 60Hz power source.

3.4 Receiver Setup

According to FCC Rules, 47 CFR 18.307, the system was tested to 30 MHz.

During the radiated emission test, the Receiver was set with the following configurations:

Frequency Range	***RBW***	***Video B/W***
150K-30MHz	10KHz	10KHz
30 – 1000MHz	100KHz	100KHz
Above 1000MHz	1MHz	1MHz

3.5 Test Procedure

During the conducted emission test, the EUT power cord was connected to the outlet of the LISN.

Maximizing procedure was performed on the highest emissions to ensure EUT compliance using all installation combination.

All data was recorded in the peak detection mode. Quasi-peak readings were only performed when an emission was found to be marginal (within -4 dBμ V of specification limits). Quasi-peak readings are distinguished with a "**Qp**" or **"AV"**.

3.6 Conducted Emissions Test Data

Date of Test : October 10, 2004 Temperature: 25℃

EUT : Microwave oven Humidity: 70%

M/N : UA-0770M Operating Mode: Max power

S/N : NO Test Engineer: Peter Zhang

LINE CONDUCTED EMISSIONS				FCC PART 18	
Frequency MHz	**Amplitude dBμ V**	**Detector QP/AV/Peak**	**Phase Line/Neutral**	**Limit dBμ V**	**Margin dB**
16.91	49.6	QP	N	60	10.4
17.54	47.9	QP	N	60	12.1
17.26	48.6	QP	N	60	11.4
16.82	52.8	QP	L	60	7.2
17.01	53.1	QP	L	60	6.9
15.44	33.7	AV	N	50	16.3
25.06	20.1	AV	N	50	29.9
17.46	52.3	QP	L	60	7.7
29.6	29.0	AV	N	50	21.0
29.93	31.6	AV	L	50	18.4
15.45	38.1	AV	L	50	11.9
17.21	42.4	AV	L	50	7.6

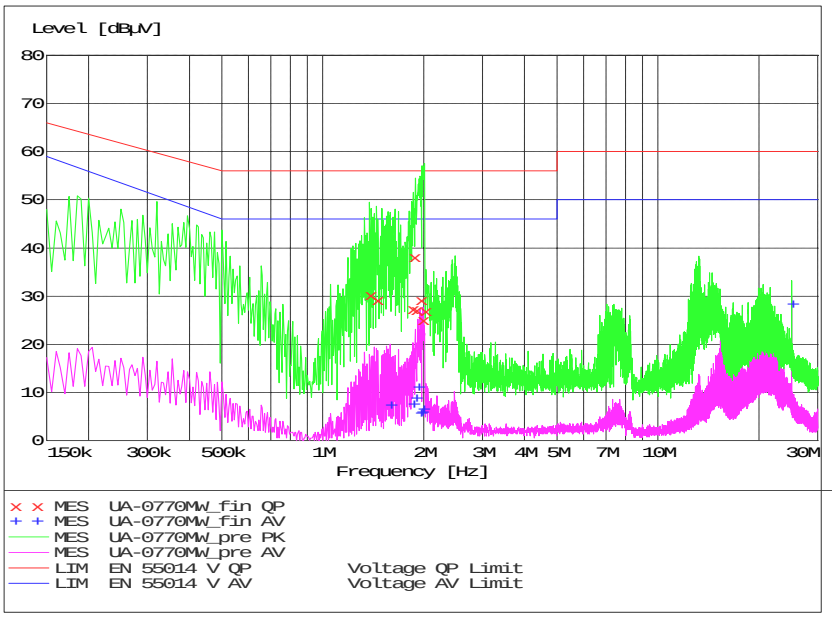
3.7 Test Result

PASS

3.8 Plot(s) of Conducted Emissions Test Data

Plot(s) of Conducted Emissions Test Data is presented hereinafter as reference.

L



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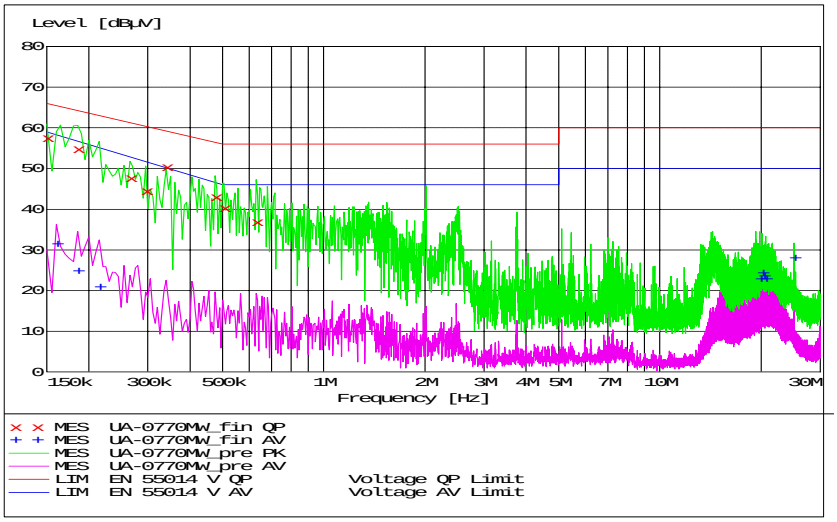


4 – RADIATION HAZARD MEASUREMENT

4.1 Environmental Conditions

Temperature:	**27°C**
Relative Humidity:	**63%**
ATM Pressure:	**1089mbar**

4.2 Radiation Hazard Measurement

Radiation leakage was measured in the as-received condition with the oven door closed using a microwave leakage meter.

A 1000ml water load was placed in the center of the oven and the oven was operated at maximum output power.

☒ There was no microwave leakage exceeding a power level of 0.66mWfcm^2 observed at any point 5cm or more from the external surface of the oven.

A maximum of 1.0mW/cm^2 is allowed in accordance with the applicable Federal Standards. Hence, microwave leakage in the as-received condition with the oven door closed was below the maximum allowed.

4.3 Input Power

Input power and current was measured using a power analyzer. A 1000ml water load was placed in the center of the oven and the oven was operated at maximum output power. A 1000ml water load was chosen for its compatibility with the procedure commonly used by manufacturers to determine their input ratings.

Input Voltage (Vac/Hz)	Input Current (amps)	Measured Input Power (watts)	Rated Input Power (watts)
120/60	9.42	1130.4	1150

☒ Based on the measured input power, the EUT was found to be operating within the intended specifications.

4.4 Load for Microwave Ovens

For all measurements, the energy developed by the oven was absorbed by a dummy load consisting of a quantity of tap water in a beaker. If the oven was provided with a shelf or other utensil support, this support was in its initial normal position. For ovens rated at 1000 watts or less power output, the beaker contained quantities of water as listed in the following subparagraphs. For ovens rated at more than 1000watts output, each quantity was increased by 50% for each 500watts or fraction thereof in excess of 1000watts. Additional beakers were used if necessary.

- Load for power output measurement: 1000 milliliters of water in the beaker located in the center of the oven.
- Load for frequency measurement: 1000 milliliters of water in the beaker located in the center of the oven.

● Load for measurement of radiation on second and third harmonic: Two loads, one of 700 and the other of 300 milliliters, of water are used. Each load is tested both with the beaker located in the center of the oven and with it in the right front corner.

The RF output power is rated at 700 watts

Load used for power output measurement = 1000 milliliters of water

Load used for frequency measurement = 1000 milliliters of water
Load used for second and third harmonic measurement = 700 & 300 milliliters of water
Load used for other measurement = 700 milliliters of water

4.5 RF Output Power Measurement

The Caloric Method was used to determine maximum RF output power. The initial temperature of the water load was measured. The water load was placed in the center of the oven. The oven was operated at maximum output power for 200 seconds, the temperature of the water was re-measured.

Quality of Water (ml)	Starting Temperature (ºC)	Final Temperature (ºC)	Elapsed Time (Seconds)
1000	20	51.57	200

Power = (4.2 joules/calorie)(volume in milliliters)(temperature rise)/(time is seconds)

Power = 4.2 joules/calorie x 1000 x (51.57-20) / 200

Power = 663 watts

☐ The measurement output power was found to be less than 500watts. Therefore, in accordance with Section 18.305 of Subpart-C, the measured out-of-band emissions were compared to the limit of 25μV/meter at a 300-meter measurement distance.

☒ The measured output power was found to exceed 500watts. Therefore, in accordance with Section 18.305 of Subpart-C, the measured out-of0band emissions were compared with the limit calculated as following:

LFS = 25*SQRT(Power Output/500)

LFS = 25 * SQRT(663/500)

LFS ≈ 28.8

Where: LFS is the maximum allowable field strength for out-of-band emissions in μV/meter at a 300-meter measurement distance. Power Output is the measured output power in watts.

Manufacturer	Model Number	LFS	dB(μV/M)	dB(μV/M)®3m
Haier	UA-0770M	28.8	29.2	69.2

4.6 Operating Frequency Measurement

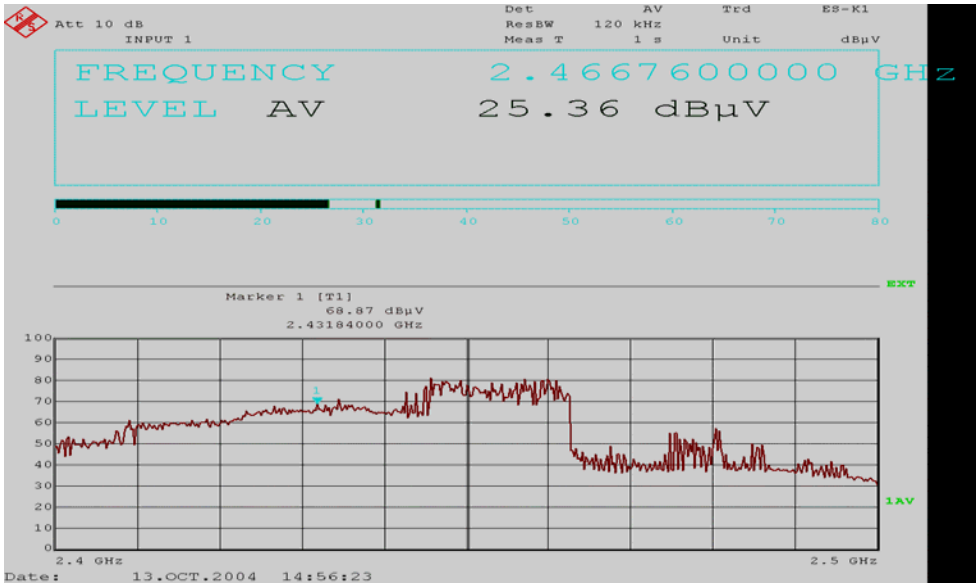
4.6.1 Variation in Operating Frequency with Time

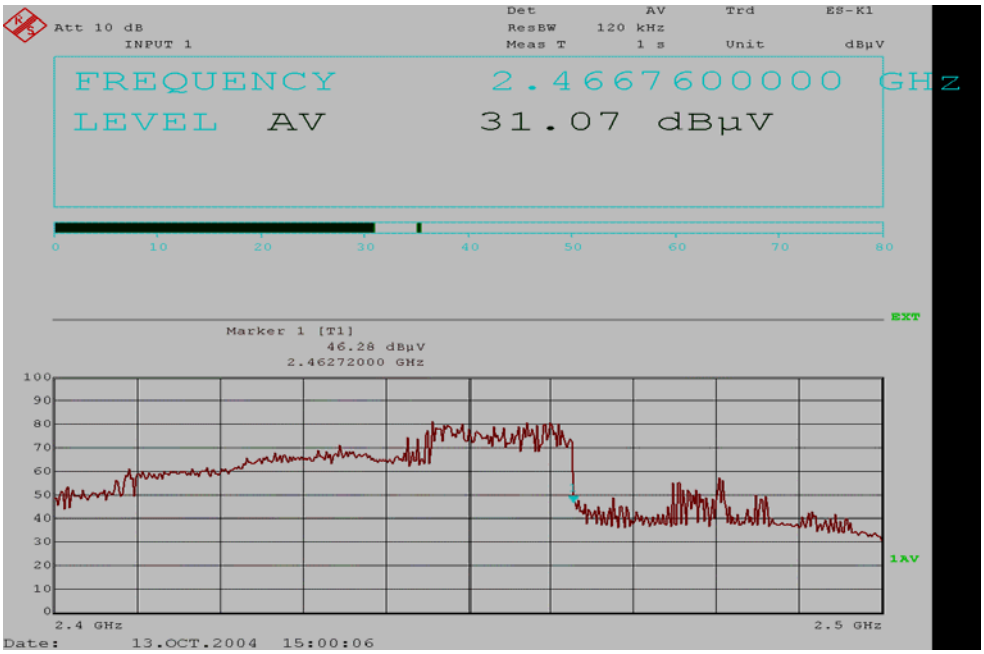
The operating frequency was measured using a Receiver. Starting with the EUT at room temperature, a 1000ml water load was placed in the center of the oven and the oven was operated at maximum output power. The fundamental operating frequency was monitored until the water load was reduced to 20 percent of the original load.

The results of this test are as follows:

Manufacturer	Model	Minimum Frequency	Maximum Frequency
Haier	UA-0770M	2431.84MHz	2462.72MHz

Refer to data pages for details of the variation in operating frequency with time measurement.


Att 10 dB
INPUT 1
Det AV
ResBW 120 kHz
Meas T 1 s
Trd
Unit dBµV
ES-K1
FREQUENCY 2.466760000 GHz
LEVEL AV 25.36 dBµV
Marker 1 [T1]
68.87 dBµV
2.43184000 GHz
EXT
1AV
2.4 GHz
2.5 GHz
Date: 13.OCT.2004 14:56:23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Det AV
ResBW 120 kHz
Meas T 1 s
Trd
Unit dBµV
ES-K1
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46.28 dBµV
2.46272000 GHz
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1AV
2.4 GHz
2.5 GHz
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4.6.2 Variation in Operating Frequency with Line Voltage

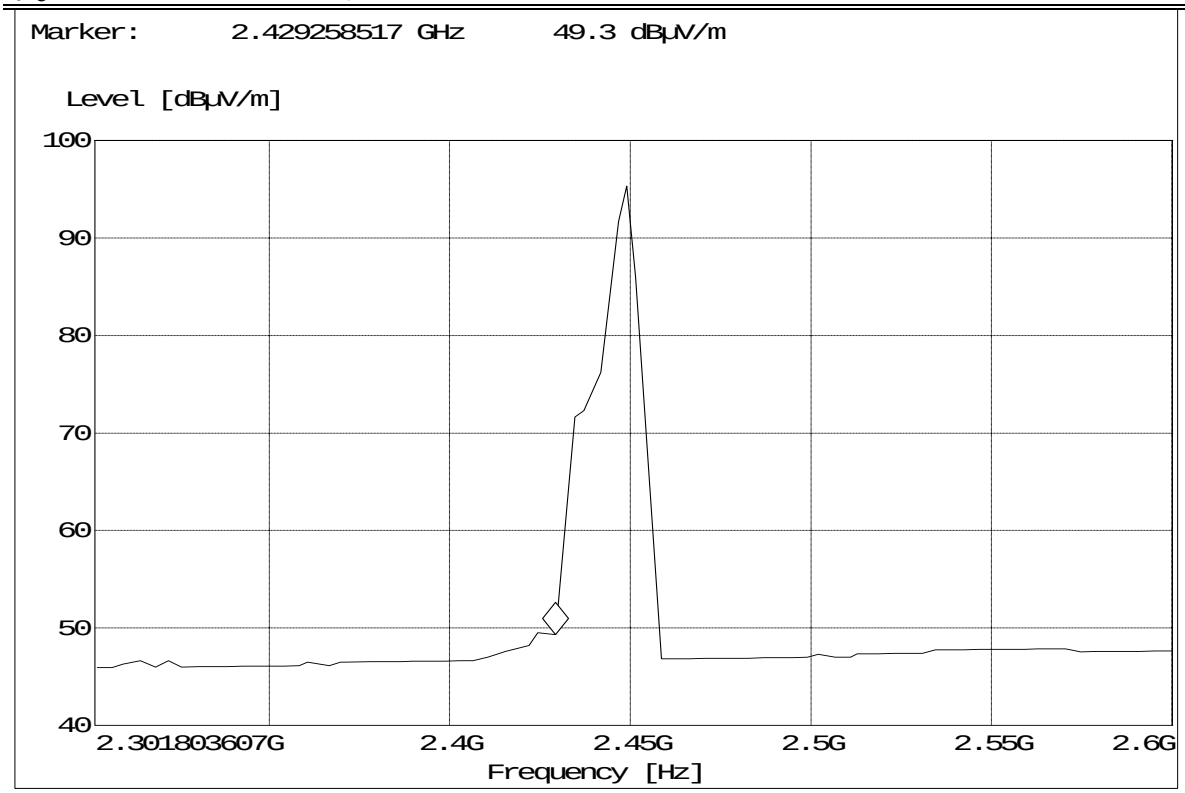
The EUT was operated / warmed by at least 10 minutes of use with a 1000ml water load at room temperature at the beginning of the test. Then the operating frequency was monitored as the input voltage was varied between 80 and 125 percent of the nominal rating.

The results of this test are as follows:

Line voltage varied from 96Vac and 150Vac.

Manufacturer	Model	Minimum Frequency	Maximum Frequency
Haier	UA-0770M	2429.26MHz	2468.34MHz

Please refer to following pages for details of the variation in operating frequency with line voltage measurement.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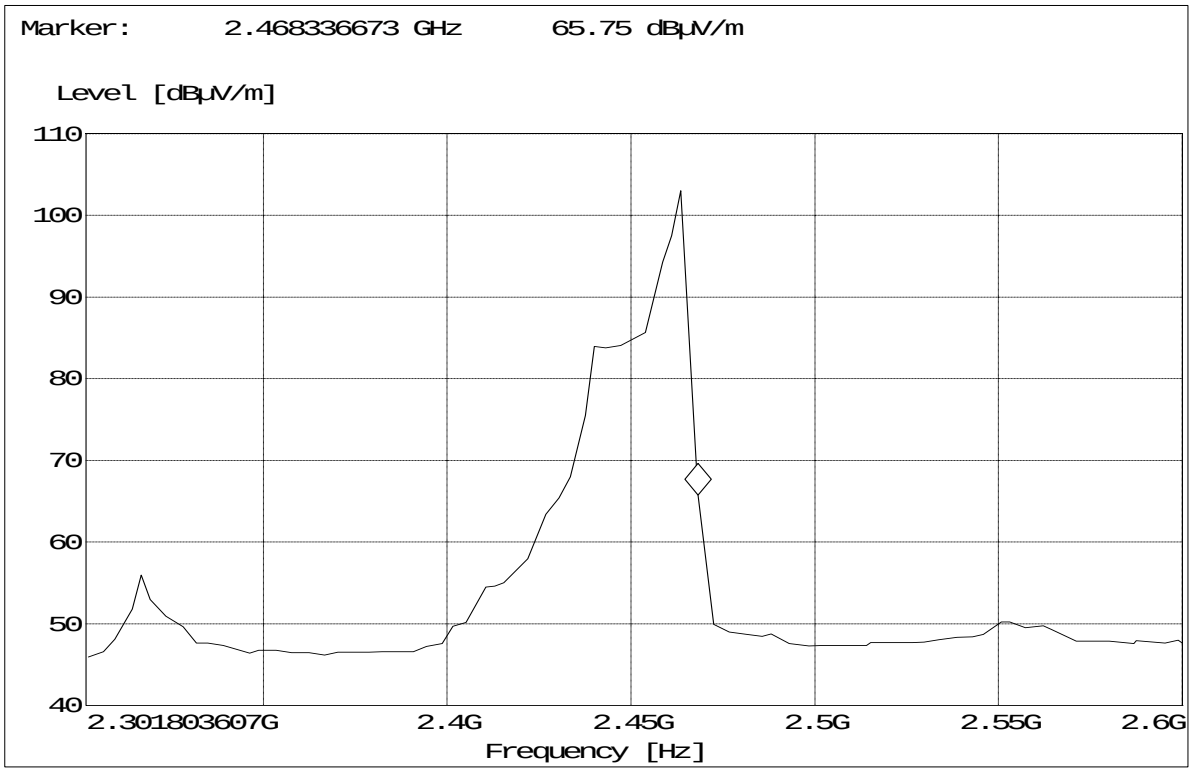
Level [dBµV/m]
100
90
80
70
60
50
40
2.3018036O7G
2.4G
2.45G
2.5G
2.55G
2.6G
Frequency [Hz]


Marker: 2.468336673 GHz 65.75 dBµV/m
Level [dBµV/m]
110
100
90
80
70
60
50
40
2.3018036O7G
2.4G
2.45G
2.5G
2.55G
2.6G
Frequency [Hz]

5 - RADIATED EMISSION DATA

5.1 Environmental Conditions

Temperature:	**27°C**
Relative Humidity:	**63%**
ATM Pressure:	**1089mbar**

5.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are Receiver, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Haier is $\pm$4.0 dB.

5.3 EUT Setup

The radiated emission tests were performed in the 3-meter anechoic room, using the setup accordance with the FCC MP - 5. The specification used was the FCC part 18 Subpart C limits.

The EUT was placed on the edge of the test table.

The EUT was connected to 120VAc/60Hz power source.

5.4 Receiver Setup

According to FCC rules, 47 CFR 18.309(a), the EUT was tested to 10th harmonic (25GHz).

During the radiated emission test, the Receiver was set with the following configurations:

Start Frequency ..... 30 MHz
Stop Frequency ..... 25 GHz
Sweep Speed ..... Auto
IF Bandwidth ..... 1 MHz
Video Bandwidth ..... 1 MHz
Quasi-Peak Adapter Bandwidth ..... 120 KHz
Quasi-Peak Adapter Mode ..... Normal
Resolution Bandwidth ..... 1 MHz

5.5 Test Procedure

For the radiated emissions test, the power cord of the EUT was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dBμV of specified limitations), and are distinguished with a "**Qp**" in the data table.

The EUT was in the normal (naïve) operating mode during the final qualification test to represent the worst results.

5.6 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dBμV/m below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Class B Limit

5.7 Summary of Test Results

According to the data in section 5.8, the EUT complied with the FCC Part 18 Subpart C, and had the worst margin of:

-4.66 dB at **7371 MHz** in the **Horizontal** polarization, **30MHz to 25GHz 3 Meters**

5.8 Radiated Emissions Test Result Data

Final Test Data, 30MHz –25GHz, 3 Meters

Date of Test : October 10, 2004 Temperature: 25℃

EUT : Microwave oven Humidity: 70%

M/N : UA-0770M Operating Mode: Max power

S/N : NO Test Engineer: Peter Zhang

INDICATED		TABLE	ANTENNA		FCC PART 18	
Frequency	Ampl.	Angle	Height	Polar	Limit	Margin
MHz	dBμV/m	Degree	Meter	H/ V	dBμV/m	dB
2425	83.17	0	1.2	V		
2196	45.88	0	1.1	H		
7371	64.54	0	1.5	H	69.2	-4.66
4913	59.89	180	1.7	H	69.2	-9.31
9837	55.21	0	2.0	H	69.2	-13.99
7025	52.29	45	1.1	H	69.2	-16.91
645.09	45.63	0	1.0	H	69.2	-23.57
838.26	30.21	0	1.3	V	69.2	-38.99
49.86	28.04	180	1.1	V	69.2	-41.16
329.34	18.83	45	1.3	H	69.2	-50.37
260.94	18.65	0	1.4	H	69.2	-50.55
77.10	17.5	0	1.1	V	69.2	-51.7