FCC PART 18 ID
EMI MEASUREMENT AND TEST REPORT

For

Guangdong MD Microwave Oven Manufacturing Co., Ltd

Penglai Road, Beijiao, Shunde, Foshan, Guangdong Province, People's Republic of China

FCC ID: RSFE9025X-Y

February 14, 2004

This Report Concerns:	**Equipment Type:**
☒ Original Report	Microwave Oven

Test Engineer:	Lisa zhu
Report Number:	RSZ 03122302
Test Date:	Feb 10-12,2004
Reviewed By:	
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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

The *Guangdong MD Microwave Oven Manufacturing Co., Ltd*'s model, E9025X-Y *or* the "EUT" as referred to in this report is a microwave oven which measures approximately 51cmL x 35.8cmW x 28.2cmH, rated input voltage: 120V/60Hz

* *The test data gathered are from production sample, serial number: 120147, provided by the manufacturer*

1.2 Objective

The following test report is prepared on behalf of *Guangdong MD Microwave Oven Manufacturing 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 determine compliance with FCC Part 18 limits

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 Bay Area Compliance Laboratory Corporation. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.5 Test Facility

The Open Area Test site used by Bay Area Compliance Laboratory Corporation to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA

Test site at Bay Area Compliance Laboratory 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 No.: C-1298 and R-1234.

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.

Additionally, Bay Area Compliance Laboratory Corporation is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (NVLAP). The scope of the accreditation covers the FCC Method - 47 CFR Part 15 - Digital Devices, IEC/CISPR 11: 1998, and AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment test methods under NVLAP Lab Code 200167-0.

1.6 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R/S	Spectrum Analyzer	FSEM	849720/019	08/05/2003	1 year
HP	Amplifier	8447D	2944A09795	08/05/2003	1 year
ETS	Log Periodic Antenna	3146	9603-4421	09/05/2003	1 year
ETS	Biconical Antenna	3110B	3360	08/05/2003	1 year
Solar Electronics	LISN	TYPE 8012-50-R-24-BNC	21162	09/05/2003	1 year
Solar Electronics	LISN	TYPE 8012-50-R-25-BNC	21163	10/05/2003	1 year
COM Power	LISN	LI-200	12208	10/30/2003	1 year
COM Power	LISN	LI-200	12005	10/30/2003	1 year
HP	Spectrum Analyzer	8568B	2517A01610	10/30/2003	1 year
HP	Spectrum Analyzer Display Unit	8568B	2517A10039	10/30/2003	1 year
HP	Quasi-Peak Adapter	8565A	3107A01572	10/30/2003	1 year
FCC	Absorbing Clamp	F-201-23mm	90	10/30/2003	1 year
FLUKE	True RMS Multimeter	187	78540402	03/24/2003	1 year

*** Statement of Traceability**: Bay Area Compliance Laboratory Corp. certifies that all calibration has Been performed using suitable standards traceable to the NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

1.7 External Cabling List and Details

Cable Description	Length (M)	From/Port	To
Unshielded AC Cable	1.1	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.

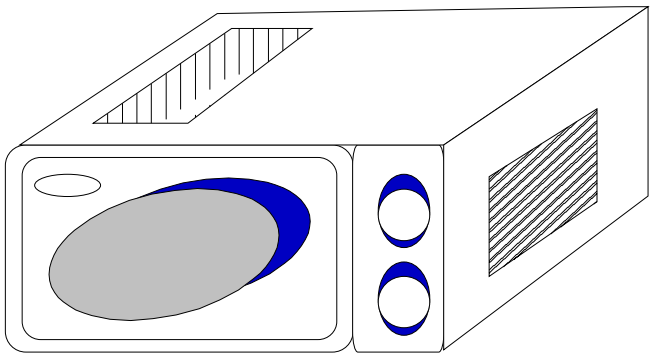
2.2 Schematics / Block Diagram

Appendix D contains a copy of the EUT's block diagram as reference.

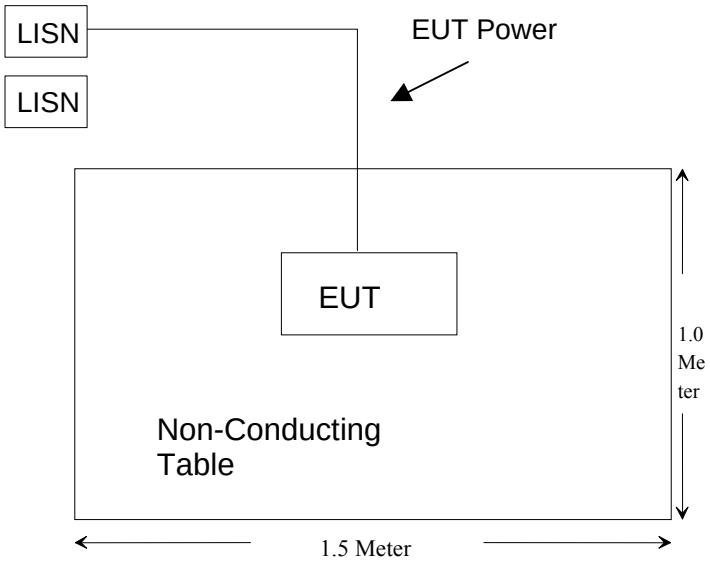
2.3 Equipment Modifications

The EUT tested was not modified by BACL.

2.4 Configuration of Test System



2.5 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 spectrum analyzer, 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 BACL 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.

3.4Spectrum Analyzer Setup

According to FCC Rules, 47 CFR 15.33 (a) (1), the system was tested to 25GHz.

During the radiated emission test, the spectrum analyzer 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 dBμV of specification limits). Quasi-peak readings are distinguished with a "**Qp**" or **"AV"**.

3.6 Conducted Emissions Test Data

Date of Test	:	Feb 12,2004	Temperature:	25℃
EUT	:	Microwave oven	Humidity:	70%
M/N	:	E9025X-Y	Operating Mode:	Max power
S/N	:	120147	Test Engineer:	Jandy Su

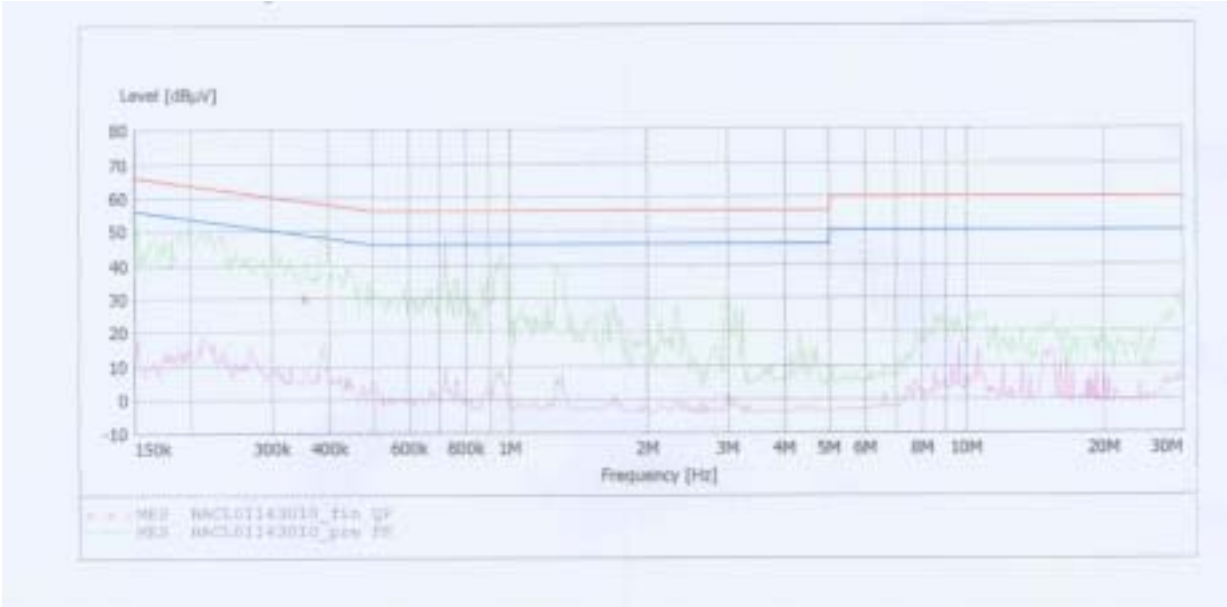
LINE CONDUCTED EMISSIONS				FCC PART 18	
Frequency MHz	Amplitude dBμV	Detector QP/AV/Peak	Phase Line/Neutral	Limit dBμV	Margin dB
11.76	40.1	AV	Line	50	-9.9
11.76	49.3	QP	Line	60	-10.7
0.15	45.3	AV	Line	56	-10.7
0.23	41.6	AV	Line	52.41	-10.8
0.23	50.8	QP	Line	62.41	-11.6
0.15	53.7	QP	Line	66	-12.3
2.24	31.9	AV	Neutral	46	-14.1
0.15	39.2	AV	Neutral	56	-16.8
2.24	38.7	QP	Neutral	56	-17.3
0.15	48.3	QP	Neutral	66	-17.7
5.17	30.6	AV	Neutral	50	-19.4
5.17	35.8	QP	Neutral	60	-24.2

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.


Level [dBµV]
80
70
60
50
40
30
20
10
0
-10
150k
300k
400k
600k
800k
1M
2M
3M
4M
5M
6M
8M
10M
20M
30M
Frequency [Hz]


Level [dBµV]
80
70
60
50
40
30
20
10
0
-10
150k
300k
400k
600k
800k
1M
2M
3M
4M
5M
6M
8M
10M
20M
30M
Frequency [Hz]

4 – RADIATION HAZARD MEASUREMENT

4.1 Environmental Conditions

Temperature:	25°C
Relative Humidity:	60%
ATM Pressure:	1175mbar

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 2600ml 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 0.55mWfcm^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 2600ml water load was placed in the center of the oven and the oven was operated at maximum output power. A 2600ml 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	11.75	1410W	1450W

☒ 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 1400 watts

Load used for power output measurement = 1050 milliliters of water

Load used for frequency measurement = 1050 milliliters of water
Load used for harmonic measurement = 735 & 315 milliliters of water
Load used for other measurement = 735 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)
2600	21	37.14	200

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

Power = 4.2 joules/calorie x 2600 x (37.14-21) / 200

Power = 881.4 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(881.4/500)

LFS ≈ 33.19

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
MD	E9025X-Y	33.19	30.42	70.42

4.5 Operating Frequency Measurement

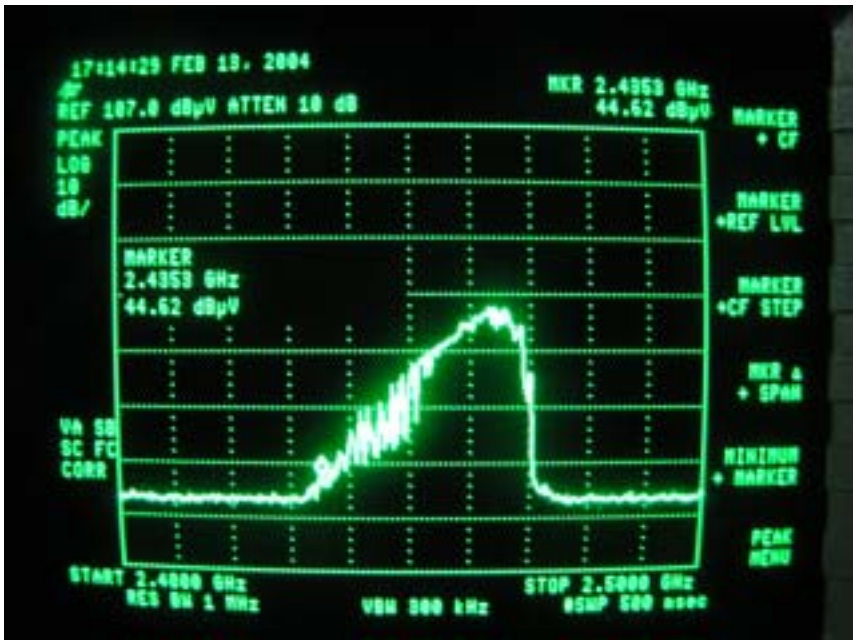
4.5.1 Variation in Operating Frequency with Time

The operating frequency was measured using a spectrum analyzer. Starting with the EUT at room temperature, a 2600ml 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
MD	E9025X-Y	2435.3MHz	2470.3MHz

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


17:14:29 FEB 19, 2004
REF 107.0 dBµV ATTEN 10 dB
MKR 2.4953 GHz
44.62 dBµV
PEAK
LOG
10
dB/
MARKER
2.4953 GHz
44.62 dBµV
MARKER
+ CF
MARKER
+REF LVL
MARKER
+CF STEP
MKR Δ
+ SPAN
MINIMUM
+ MARKER
PEAK
MENU
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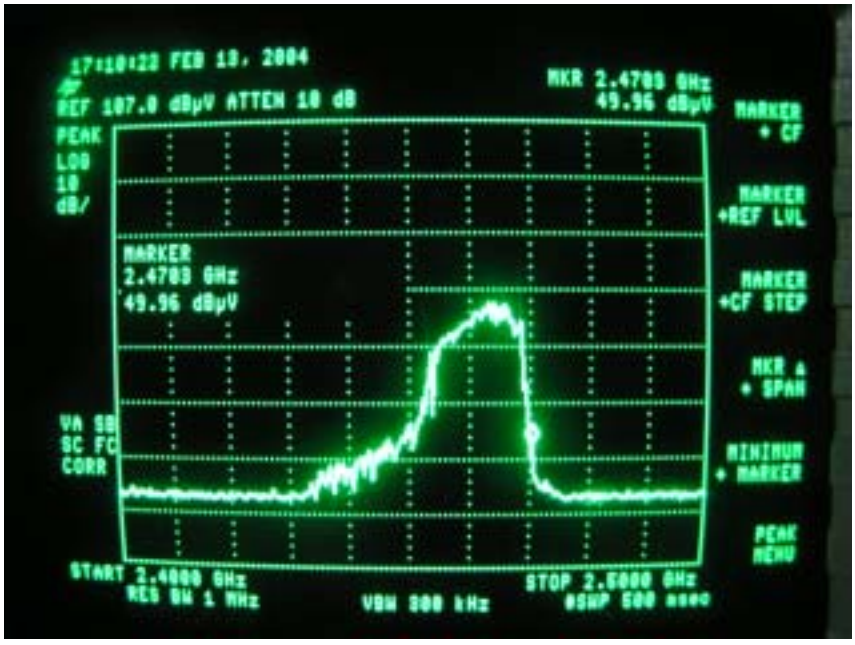
RES BW 1 MHz
VBW 300 kHz
STOP 2.5000 GHz
#SWP 500 msec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REF 107.0 dBµV ATTEN 10 dB
MKR 2.4783 GHz
49.96 dBµV
PEAK
LOG
10
dB/
MARKER
2.4783 GHz
49.96 dBµV
MARKER
+ CF
MARKER
+REF LVL
MARKER
+CF STEP
MKR Δ
+ SPAN
MINIMUM
+ MARKER
PEAK
MENU
START 2.4000 GHz
RES BW 1 MHz
VBW 300 kHz
STOP 2.5000 GHz
#SWP 500 msec

4.5.2 Variation in Operating Frequency with Line Voltage

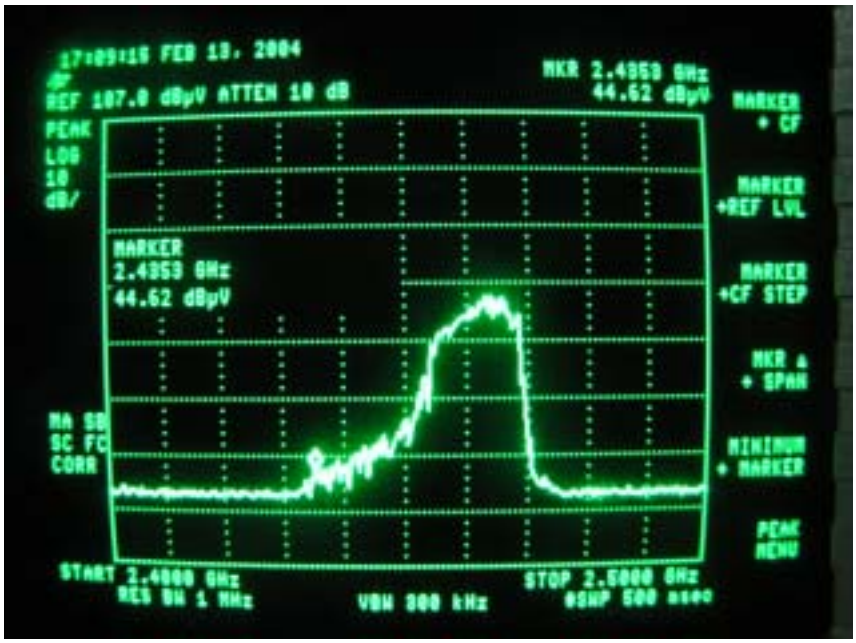
The EUT was operated / warmed by at least 10 minutes of use with a 2600ml water load at room temperature at the beginning of the test. Then the operating frequency was monitored as the input voltage was varied between 80 and 125 percent of the nominal rating.

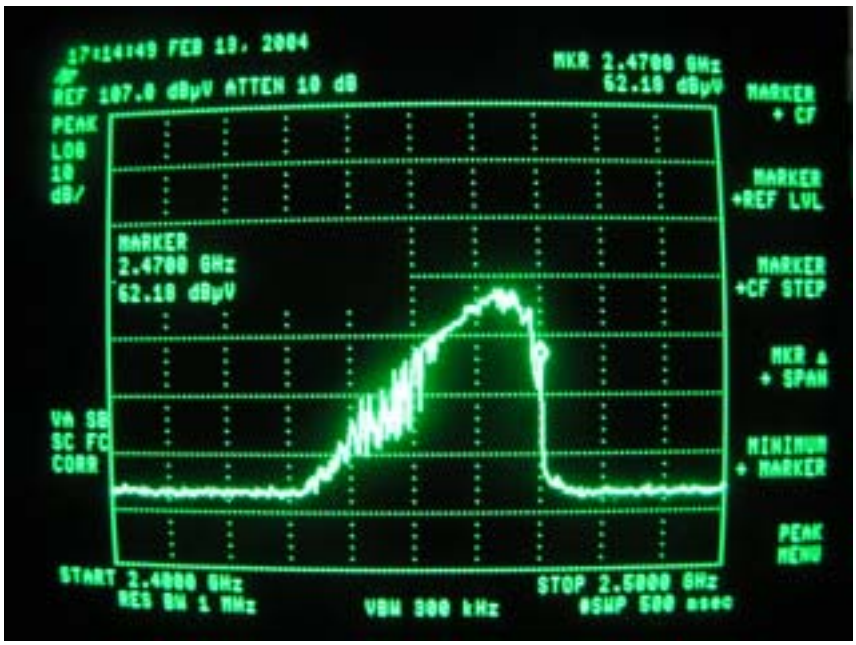
The results of this test are as follows:

Line voltage varied from 96Vac to 150Vac.

Manufacturer	Model	Minimum Frequency	Maximum Frequency
MD	E9025X-Y	2435.3MHz	2470.00MHz

Please refer to following pages for details of the variation in operating frequency with line voltage measurement.


17:09:16 FEB 19, 2004
MKR 2.4853 GHz
44.62 dBµV
REF 107.0 dBµV ATTEN 10 dB
PEAK
LOG
10
dB/
MARKER
2.4853 GHz
44.62 dBµV
MARKER
+ CF
MARKER
+REF LVL
MARKER
+CF STEP
MKR Δ
+ SPAN
MINIMUM
+ MARKER
PEAK
MENU
START 2.4000 GHz
RES BW 1 MHz
VBW 300 kHz
STOP 2.5000 GHz
SWP 500 msec


17:14:49 FEB 19, 2004
MKR 2.4700 GHz
62.18 dBµV
REF 107.0 dBµV ATTEN 10 dB
PEAK
LOG
10
dB/
MARKER
2.4700 GHz
62.18 dBµV
MARKER
+ CF
MARKER
+REF LVL
MARKER
+CF STEP
MKR Δ
+ SPAN
MINIMUM
+ MARKER
PEAK
MENU
START 2.4000 GHz
RES BW 1 MHz
VBW 300 kHz
STOP 2.5000 GHz
SWP 500 msec

5 - RADIATED EMISSION DATA

5.1 Environmental Conditions

Temperature:	23°C
Relative Humidity:	59%
ATM Pressure:	1078mbar

5.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, 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 BACL is ±4.0 dB.

5.3 EUT Setup

The radiated emission tests were performed in the open area 3-meter test site, 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 Spectrum Analyzer Setup

According to FCC Rules, 47 CFR 15.33 (a) (1), the system was tested to 25GHz.

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

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

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 six (6) 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 -7dBμV means the emission is 7dBμV below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Class B Limit

5.7 Radiated Emissions Test Data

Final Test Data, 30MHz –24.9GHz, 3 Meters

Date of Test	:	Jan 5,2004	Temperature	:	25℃
EUT	:	Microwave oven	Humidity	:	70%
M/N	:	E9025X-Y	Operating Mode	:	Full Load
S/N	:	120147	Test Engineer	:	Lisa zhu

INDICATED		TABLE	ANTENNA		CORRECTION FACTOR			CORRECTEI AMPLITUDI	FCC PART 18	
Frequency MHz	Ampl. dBμV/m	Angle Degree	Height Meter	Polar H/ V	Antenna dBμV/m	Cable dB	Amp. dB	Corr. Ampl. dBμV/m	Limit dBμV/m	Margin dB
2468.51	104.8	0	1.0	v	28.1	3.7	29.0	107.6		
2468.53	97.14	0	1.2	h	28.1	3.7	29.0	99.94		
4939.30	58.29	0	1.0	v	33.6	5.2	37.2	59.89	70.4	-10.51
4939.34	57.72	0	1.2	h	33.6	5.2	37.2	59.32	70.4	-11.08
7411.52	53.47	0	1.0	h	36.0	6.1	37.1	58.47	70.4	-11.93
7411.51	51.43	0	1.2	v	36.0	6.1	37.1	56.43	70.4	-13.97
9888.37	49.19	0	1.2	v	33.7	7.1	38.4	51.59	70.4	-18.81
9888.36	48.56	0	1.2	h	33.7	7.1	38.4	50.96	70.4	-19.44
224.89	50.92	45	1.2	h	10.1	1.0	25	37.0	70.4	-33.4
224.91	50.22	45	1.2	v	10.1	1.0	25	36.3	70.4	-34.1