



NVLAP LAB CODE 200707-0



# FCC PART 18 EMI MEASUREMENT AND TEST REPORT

For

Midea Microwave and Electrical Appliances  
Manufacturing Co., Ltd.

Beijiao, Shunde, Foshan City, Guangdong, P.R of China.

**FCC ID: RSFEAC032CYY**

<b>This Report Concerns:</b> <input checked="" type="checkbox"/> Original report	<b>Equipment Type:</b> Microwave Oven
<b>Test Engineer:</b> Robert Li <i>Robert Li</i>	
<b>Report Number:</b> RSZ07061151	
<b>Test Date:</b> 2007-06-19	
<b>Report Date:</b> 2007-6-21	
<b>Reviewed By:</b> EMC Manager: Boni Baniqued <i>Boni</i>	
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## TABLE OF CONTENTS

<b>GENERAL INFORMATION.....</b>	<b>3</b>
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) .....	3
OBJECTIVE .....	3
RELATED SUBMITTAL(S)/GRANT(S).....	3
TEST METHODOLOGY .....	3
TEST FACILITY .....	3
EXTERNAL CABLE LIST AND DETAILS .....	4
<b>OPERATING CONDITION/TEST CONFIGURATION.....</b>	<b>5</b>
JUSTIFICATION .....	5
EQUIPMENT MODIFICATIONS .....	5
CONFIGURATION OF TEST SETUP .....	5
BLOCK DIAGRAM OF TEST SETUP .....	5
<b>CONDUCTED EMISSIONS .....</b>	<b>6</b>
MEASUREMENT UNCERTAINTY .....	6
EUT SETUP .....	6
EMI TEST RECEIVER SETUP .....	7
TEST EQUIPMENT LIST AND DETAILS .....	7
TEST PROCEDURE .....	7
TEST RESULTS SUMMARY .....	7
TEST DATA .....	8
PLOT(S) OF TEST DATA .....	8
<b>RADIATION HAZARD MEASUREMENT .....</b>	<b>11</b>
ENVIRONMENTAL CONDITIONS .....	11
RADIATION HAZARD MEASUREMENT .....	11
INPUT POWER.....	11
LOAD FOR MICROWAVE OVENS .....	12
RF OUTPUT POWER MEASUREMENT .....	12
OPERATING FREQUENCY MEASUREMENT .....	14
<b>RADIATED EMISSIONS.....</b>	<b>18</b>
MEASUREMENT UNCERTAINTY .....	18
EUT SETUP .....	18
EMI TEST RECEIVER SETUP AND SPECTRUM ANALYZER SETUP.....	19
TEST EQUIPMENT LIST AND DETAILS.....	19
TEST PROCEDURE .....	19
CORRECTED AMPLITUDE & MARGIN CALCULATION .....	20
TEST RESULTS SUMMARY .....	20
TEST DATA AND PLOTS.....	21

## GENERAL INFORMATION

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### Product Description for Equipment under Test (EUT)

The *Midea Microwave and Electrical Appliances Manufacturing Co., Ltd.*'s model: *EAC032CYY(Y=0-9 or A-Z)* or the "EUT" as referred to in this report is a *Microwave Oven* which measures approximately 50.0 cm L x 36 cm W x 30 cm H, rated input voltage: AC 120 V/60 Hz.

\* *The test data gathered are from production sample, serial number: 0706001, provided by the manufacturer, we received the EUT on 2007-06-11*

### Objective

The following test report is prepared on behalf of *Midea Microwave and Electrical Appliances Manufacturing Co., Ltd.* in accordance with Part 2, Subpart J, and Part 18, Subparts A, B and C of the Federal Communication Commissions rules and regulations.

The objective of the manufacturer is to determine compliance with FCC Part 18 limits.

### Related Submittal(s)/Grant(s)

No related submittal(s).

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

### Test Facility

The Test site used by Bay Area Compliance Laboratory Corp. (Shenzhen) to collect test data is located in the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratory Corp. (Shenzhen). has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on November 04, 2004. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratory Corp. (Shenzhen). is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200707-0). The current scope of accreditations can be found at <http://ts.nist.gov/ts/htdocs/210/214/scopes/2007070.htm>

**External Cable List and Details**

<b>Cable Description</b>	<b>Length (M)</b>	<b>From/Port</b>	<b>To</b>
Unshielded Undetachable AC Cable	0.8	EUT	AC Power

## OPERATING CONDITION/TEST CONFIGURATION

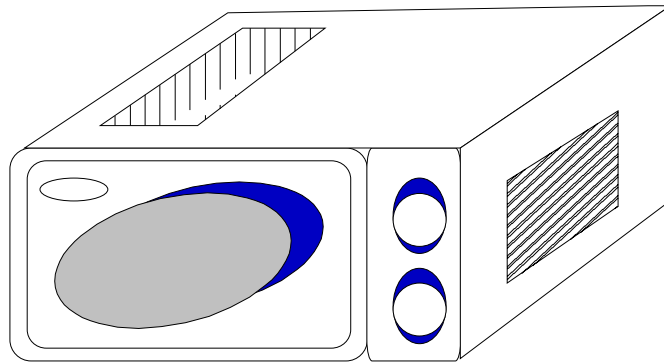
### Justification

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.

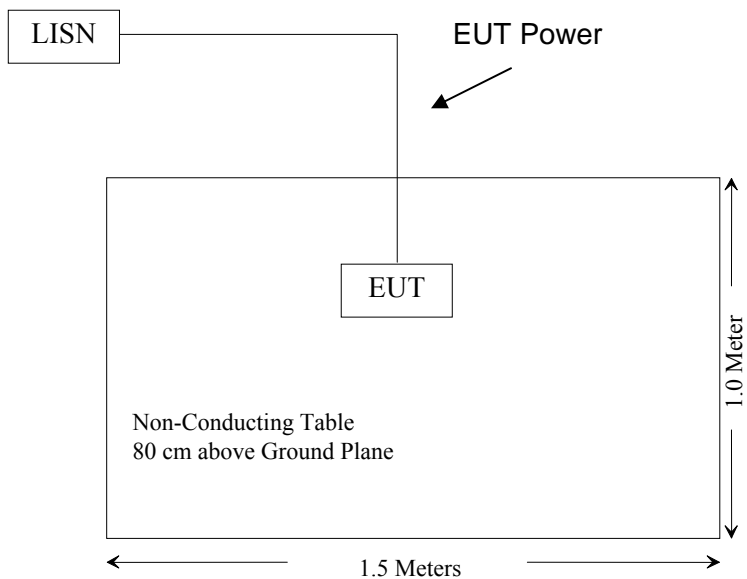
### Equipment Modifications

Bay Area Compliance Laboratory Corp. (Shenzhen). has not done any modification on the EUT.

### Configuration of Test Setup



### Block Diagram of Test Setup



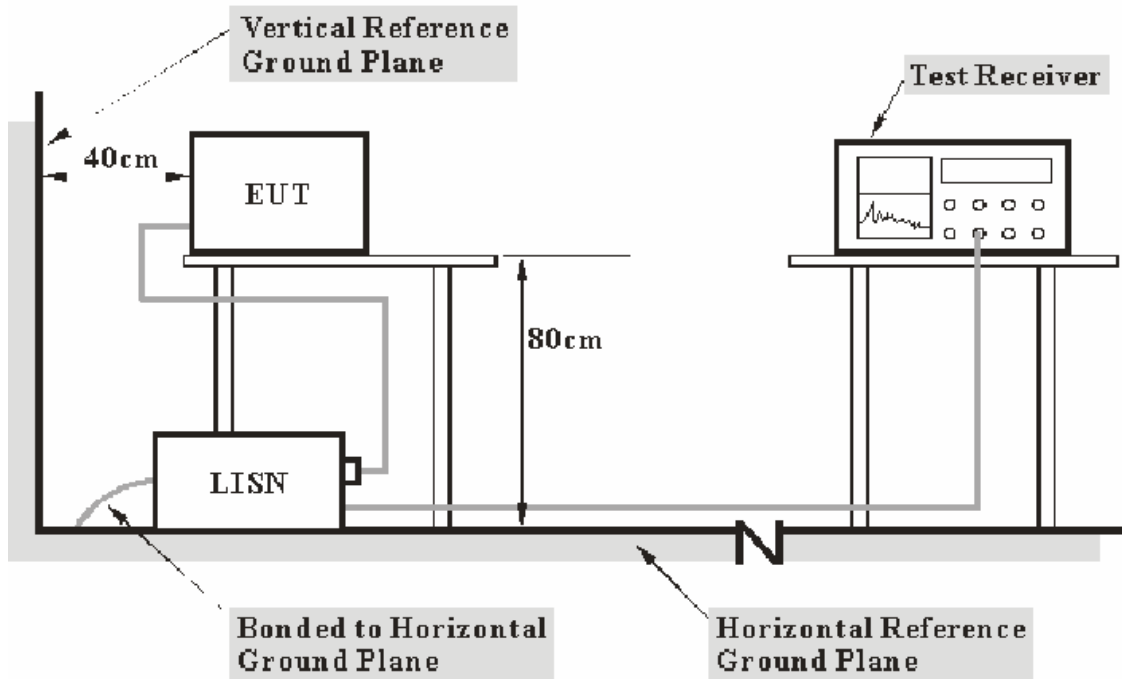
## CONDUCTED EMISSIONS

### 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 Bay Area Compliance Laboratory Corp. (Shenzhen). is  $\pm 2.4$  dB.

### EUT Setup



- Note: 1. Support units were connected to second LISN.  
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

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

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

## EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

<i>Frequency Range</i>	<i>IF B/W</i>
150 kHz – 30 MHz	9 kHz

## Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS30	830245/006	2007-03-26	2008-03-26
Rohde & Schwarz	L.I.S.N.	ESH2-Z5	892107/021	2007-03-26	2008-03-26

\* Com-Power's LISN were used as the supporting equipment.

\* **Statement of Traceability:** Bay Area Compliance Laboratory Corp. (Shenzhen). attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

## Test Procedure

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

Maximizing procedure were performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

## Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC PART 18, with the worst margin reading of:

**6.10 dB at 0.340 MHz** in the **Neutral** conductor mode.

**Test Data****Environmental Conditions**

Temperature:	25° C
Relative Humidity:	55%
ATM Pressure:	100.0kPa

Testing was performed by Robert Li on 2007-06-19.

Test mode: MAX Power

LINE CONDUCTED EMISSIONS				FCC PART 18	
Frequency (MHz)	Amplitude (dB $\mu$ V)	Detector (QP/AV)	Phase (Live/Neutral)	Limit (dB $\mu$ V)	Margin (dB)
0.340	53.10	QP	Neutral	59.20	6.10
1.170	41.60	QP	Neutral	56.00	14.40
20.150	43.50	QP	Live	60.00	16.50
19.340	40.80	QP	Neutral	60.00	19.20
0.280	41.50	QP	Live	60.82	19.32
1.125	34.60	QP	Live	56.00	21.40
15.805	38.50	QP	Neutral	60.00	21.50
0.400	35.60	QP	Live	57.85	22.25
2.775	32.70	QP	Neutral	56.00	23.30
20.945	36.60	QP	Neutral	60.00	23.40
1.175	21.50	AV	Neutral	46.00	24.50
11.375	35.40	QP	Live	60.00	24.60
1.125	21.40	AV	Live	46.00	24.60
0.340	22.30	AV	Neutral	49.20	26.90
8.450	31.90	QP	Live	60.00	28.10
0.280	20.70	AV	Live	50.82	30.12
16.000	18.90	AV	Neutral	50.00	31.10
0.400	14.40	AV	Live	47.85	33.45
2.810	7.40	AV	Neutral	46.00	38.60
20.260	10.70	AV	Live	50.00	39.30
11.375	10.00	AV	Live	50.00	40.00
19.585	9.60	AV	Neutral	50.00	40.40
21.055	7.60	AV	Neutral	50.00	42.40
8.580	5.80	AV	Live	50.00	44.20

\* Within measurement uncertainty.

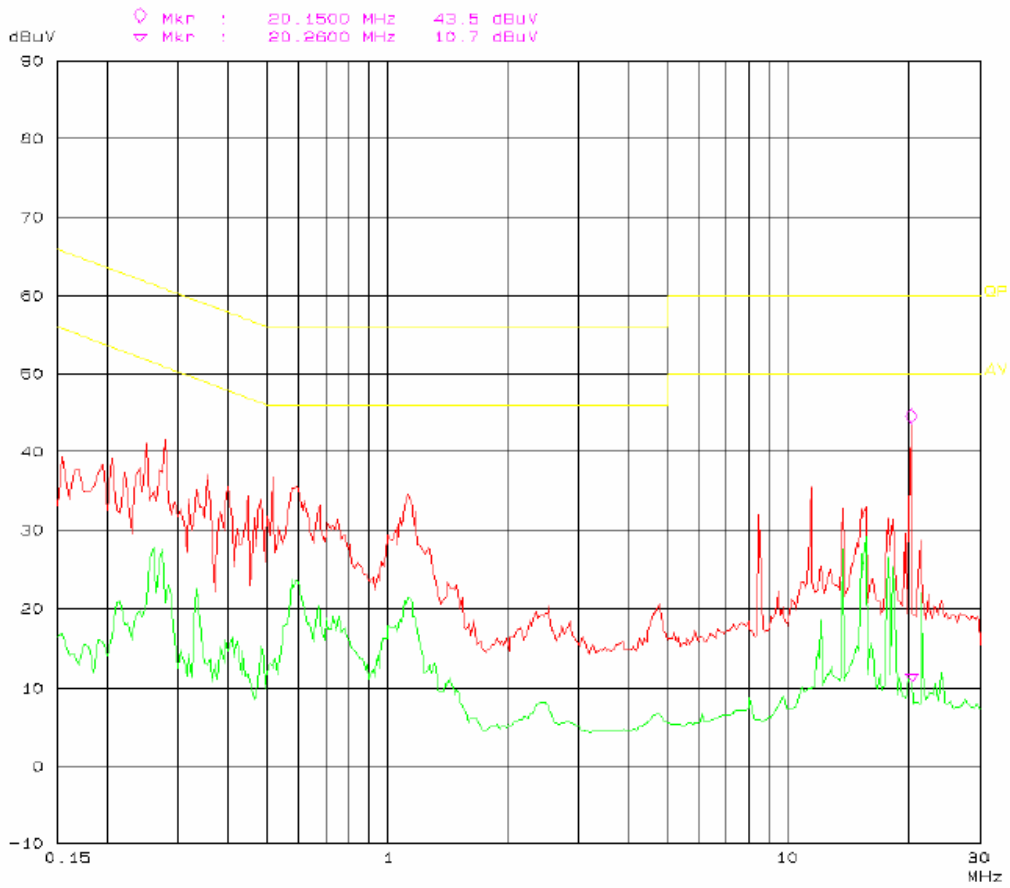
**Plot(s) of Test Data**

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



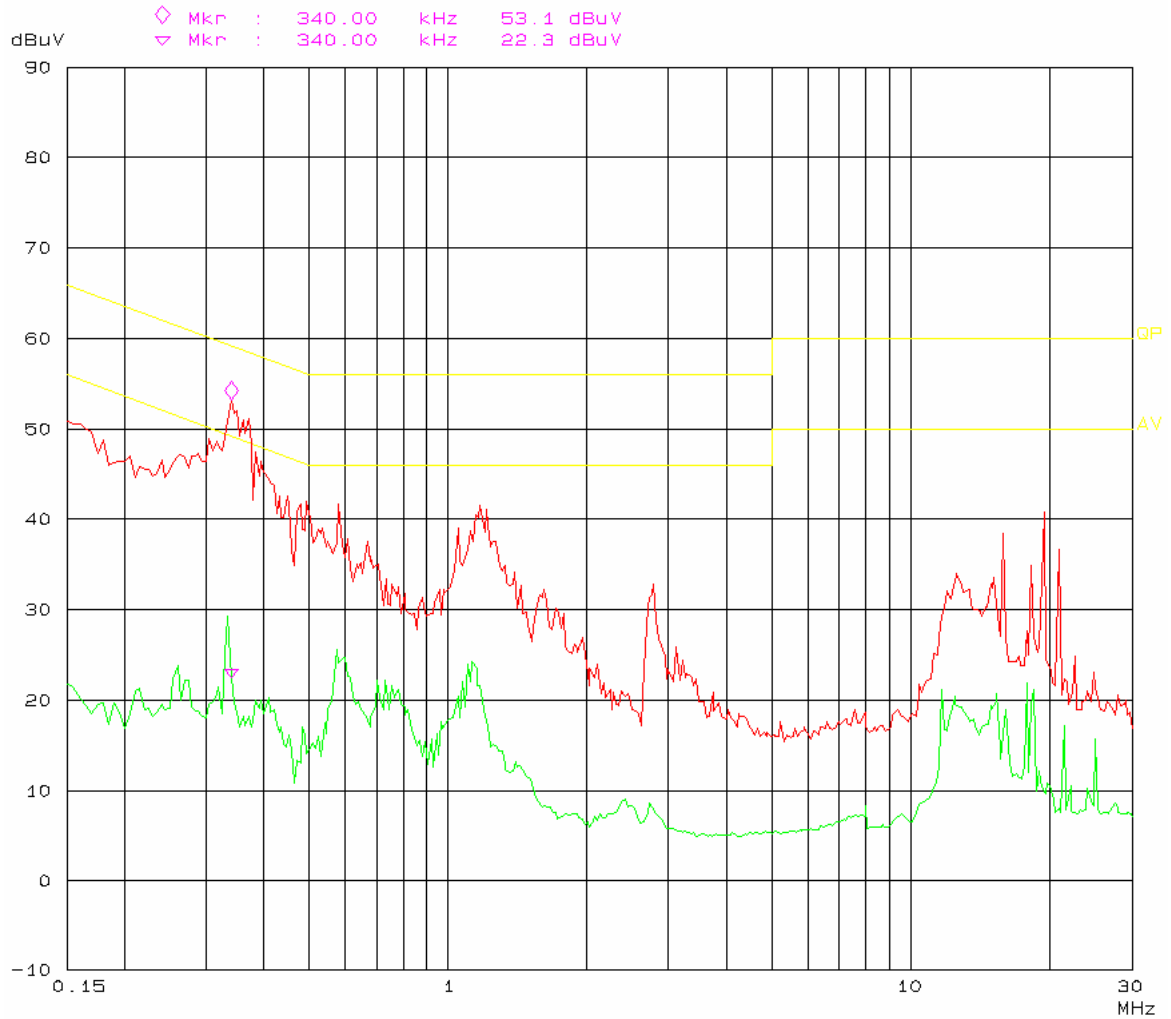
### Conducted Emission Test FCC PART18

EUT: Microwave ( A-Z)  
Manuf: Midea  
Op Cond: Max Power  
Operator: Robert Li  
Test Spec: AC120V/60Hz L  
Comment: Temp: 25 Humi: 58%



### Conducted Emission Test FCC PART18

EUT: Microwave I (A-Z)  
Manuf: Midea  
Op Cond: Max Power  
Operator: Robert Li  
Test Spec: AC120V/60Hz N  
Comment: Temp: 25 Humi: 56%



## RADIATION HAZARD MEASUREMENT

### Environmental Conditions

Temperature:	26°C
Relative Humidity:	55%
ATM Pressure:	94.0kPa

### Radiation Hazard Measurement

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

A 275ml 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  $0.71\text{mW}/\text{cm}^2$  observed at any point 5cm or more from the external surface of the oven.

A maximum of  $1.0\text{mW}/\text{cm}^2$  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.

### 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)
120V/60Hz	12.3	1476	1500

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

## 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 1000 watts

Load used for power output measurement = 1000 milliliters of water  
 Load used for frequency measurement = 1000 milliliters of water  
 Load used for harmonic measurement = 700 & 300 milliliters of water  
 Load used for Radiation leakage measurement = 275 milliliters of water

## 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.

Load of Water (ml)	Starting Temperature (°C)	Final Temperature (°C)	Elapsed Time (Seconds)
1000	22.5	66.5	200

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

RF Output Power = 4.2 x 1000 x (66.5-22.5) / 200

RF Output Power = 924.0 Watts

The measurement output power was found to be above 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-meters measurement distance.

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

$$\text{LFS} = 25 * \text{SQRT} (\text{Power Output}/500) (\mu\text{V}/\text{m})$$

$$\text{LFS} = 25 * \text{SQRT} (924.0/500) (\mu\text{V}/\text{m})$$

$$\text{LFS} = 33.98 (\mu\text{V}/\text{m})$$

Where: LFS is the maximum allowable field strength for out-of-band emissions in  $\mu\text{V}/\text{meter}$  at a 300-meters measurement distance. Power Output is the measured output power in watts.

<b>Manufacturer</b>	<b>Model Number</b>	<b>LFS(<math>\mu\text{V}/\text{m}</math>)</b>	<b>dB<math>\mu\text{V}/\text{m}</math> @ 300m</b>	<b>dB<math>\mu\text{V}/\text{m}</math> @ 3m</b>
Midea Microwave and Electrical Appliances Manufacturing Co., Ltd.	EAC032CYY(Y=0-9 or A-Z)	33.98	30.60	70.60

## Operating Frequency Measurement

### Variation in Operating Frequency with Time

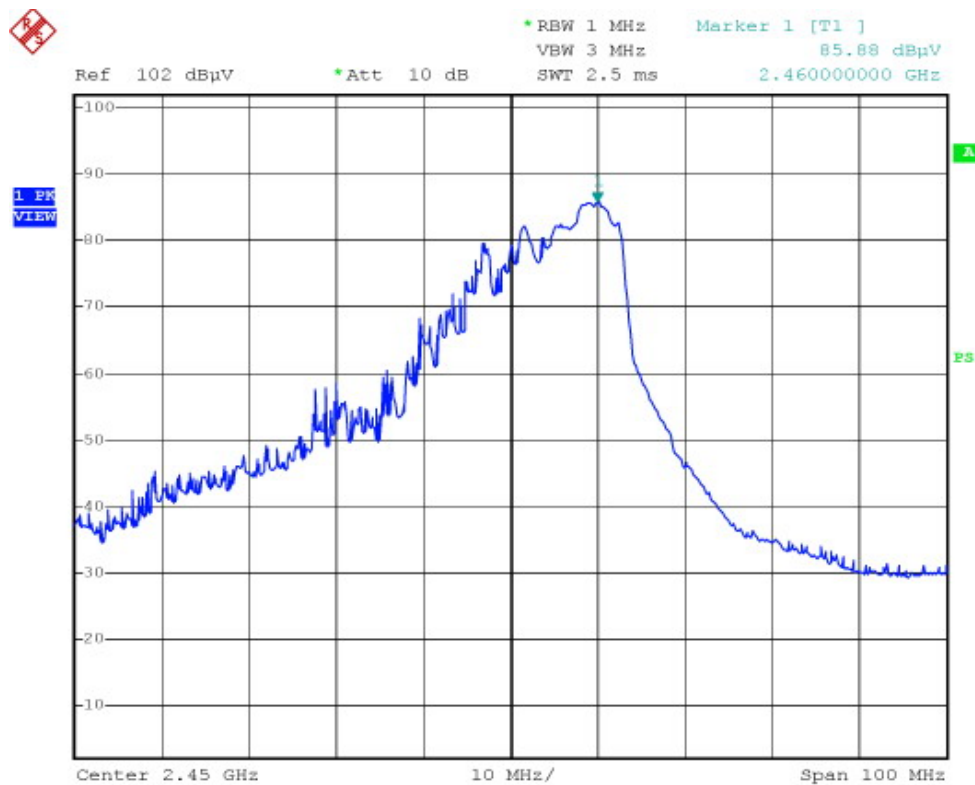
The operating frequency was measured using a spectrum analyzer. Starting with the EUT at room temperature, a 1000ml water load was placed in the center of the oven and the oven was operated at maximum output power. The fundamental operating frequency was monitored until the water load was reduced to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

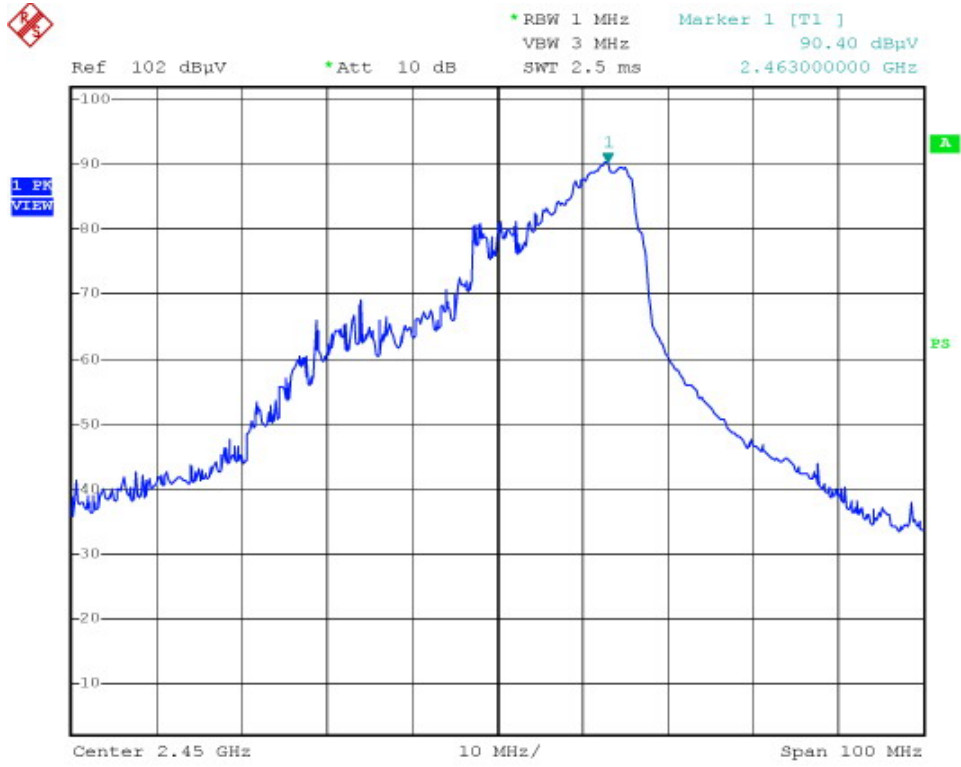
The results of this test are as follows:

Manufacturer	Model	Minimum Frequency (MHz)	Maximum Frequency (MHz)
Midea Microwave and Electrical Appliances Manufacturing Co., Ltd.	EAC032CYY(Y=0-9 or A-Z)	2460.0	2463.0

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

VS Time:





### 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.

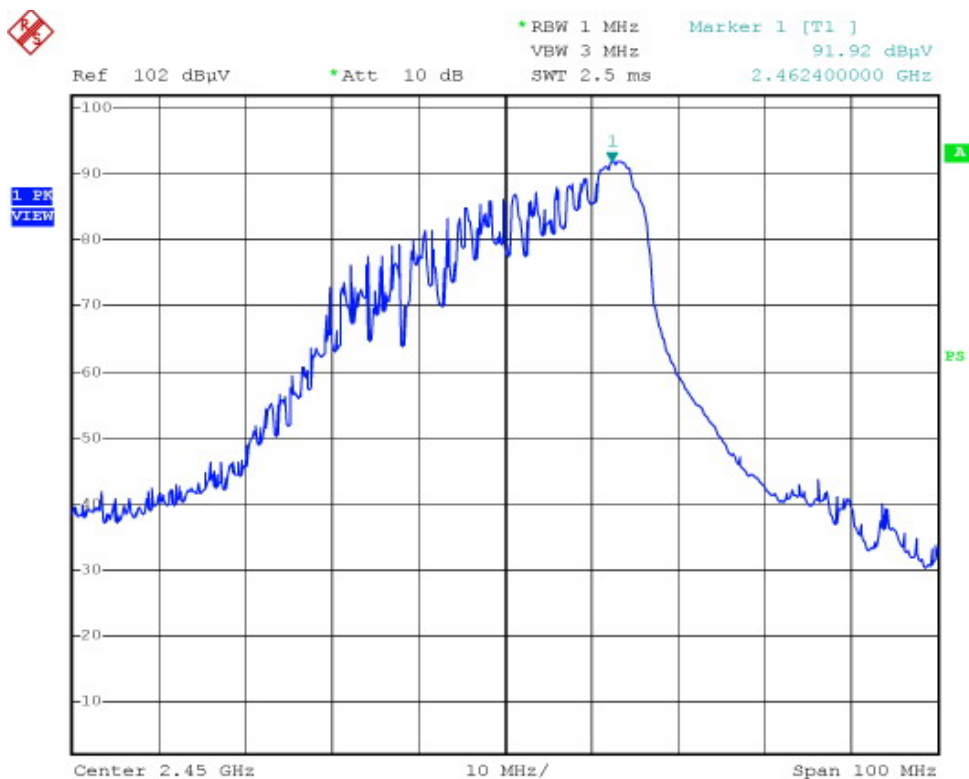
The results of this test are as follows:

Line voltage varied from 96Vac to 150Vac.

Manufacturer	Model	Minimum Frequency (MHz)	Maximum Frequency (MHz)
Midea Microwave and Electrical Appliances Manufacturing Co., Ltd.	EAC032CYY(Y=0-9 or A-Z)	2462.4	2463.0

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

Voltage:







\*RBW 1 MHz    Marker 1 [T1 ]  
VBW 3 MHz    92.10 dBμV  
SWT 2.5 ms    2.463000000 GHz

Ref 102 dBμV

\*Att 10 dB

1 PK  
VIEW



Center 2.45 GHz

10 MHz/

Span 100 MHz

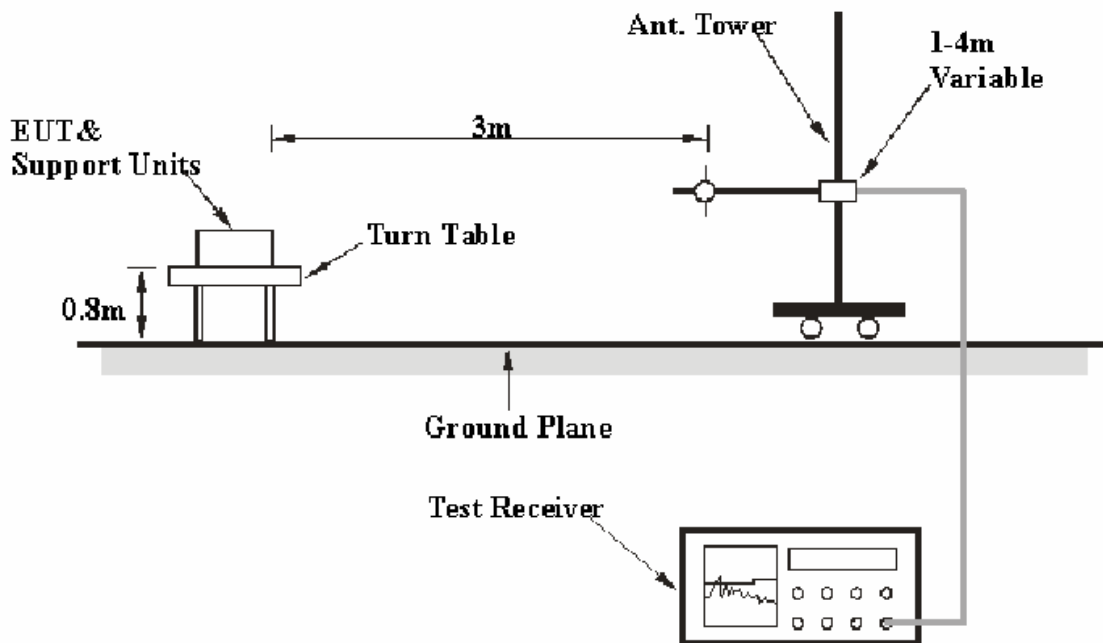
## RADIATED EMISSIONS

### 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 Bay Area Compliance Laboratory Corp. (Shenzhen). is  $\pm 4.0$  dB.

### EUT Setup



The radiated emission tests were performed in the 3 meters chamber B test site, using the setup accordance with the FCC MP - 5. The specification used was the FCC part 18 limits.

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

## EMI Test Receiver Setup and Spectrum Analyzer Setup

The system was investigated from 30 MHz to 1 GHz.

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

<i>Frequency Range</i>	<i>R B/W</i>	<i>Video B/W</i>	<i>IF B/W</i>
30 – 1000 MHz	100 kHz	300 kHz	120 kHz

## Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	8447E	1937A01046	2006-11-15	2007-11-15
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2006-09-29	2007-09-29
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2006-08-14	2007-08-14
Sunol Sciences	System Controller	SC99V	041304-1	N/A	N/A
HP	Amplifier	HP8447D	2944A09795	2006-11-15	2007-11-15
Sunol Sciences	Horn Antenna	DRH-118	A052604	2006-09-25	2007-09-25
Agilent	Spectrum Analyzer	8564E	3943A01781	2006-11-21	2007-11-21

\* **Statement of Traceability:** Bay Area Compliance Laboratory Corp. (Shenzhen). attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

## Test Procedure

For the radiated emissions test, the EUT power cord 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.

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

All data was recorded in the Quasi-peak detection mode from 30 MHz to 1 GHz.

## Corrected Amplitude & Margin Calculation

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

$$\text{Corr. Ampl.} = \text{Meter Reading} + \text{Antenna Loss} + \text{Cable Loss} - \text{Amplifier Gain}$$

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 7dB below the limit; the equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corr. Ampl.}$$

## Test Results Summary

According to the data in the following table, the EUT complied with the FCC Part 18, with the worst margin reading of:

Above 1 GHz: **11.20 dB** at **4925.55 MHz** in the **Vertical** polarization.  
30 MHz to 1GHz: **23.80 dB** at **698.2121230 MHz** in the **Horizontal** polarization.

**Test Data and Plots****Environmental Conditions**

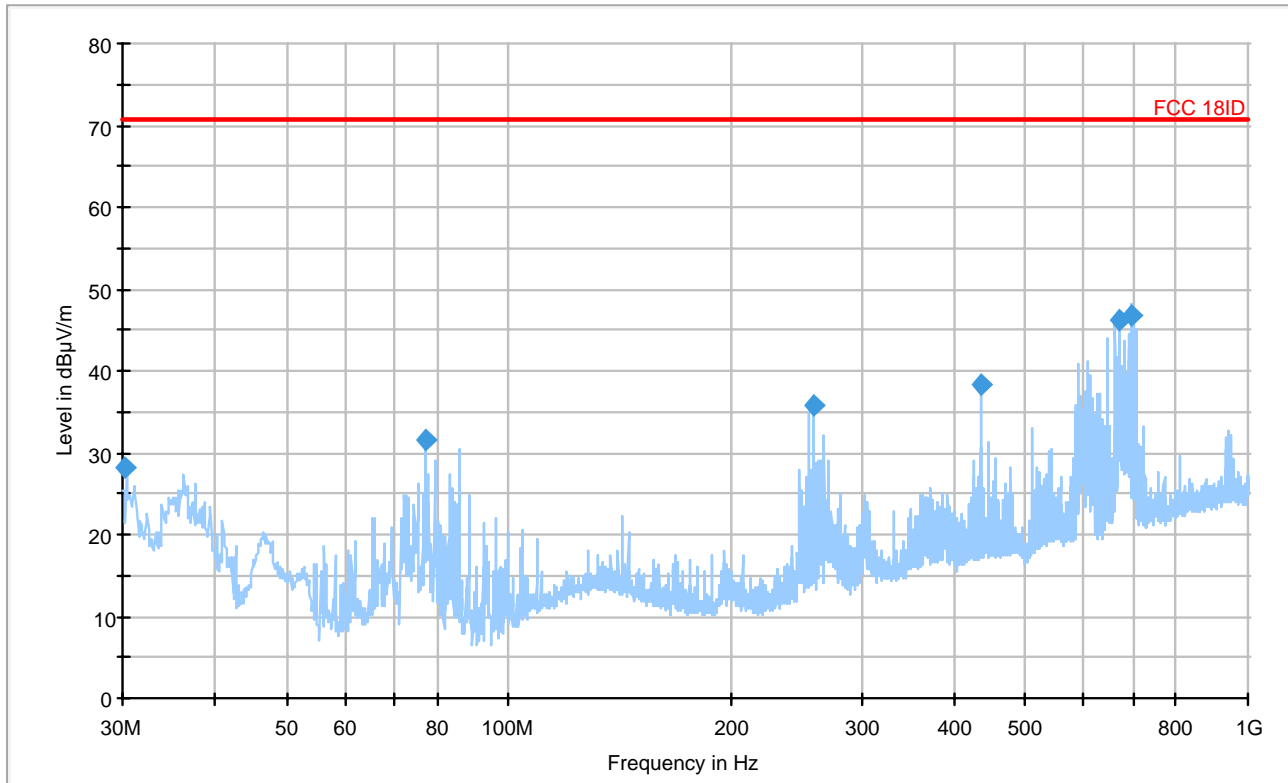
Temperature:	24° C
Relative Humidity:	53%
ATM Pressure:	100.9kPa

Testing was performed by Robert Li on 2007-06-19.

Test mode: MAX Power (Above 1 GHz)

Indicated		Table Angle Degree	Antenna		Correction Factor			Corr. Ampl. (dB $\mu$ V/m)	FCC Part 18	
Frequency (MHz)	Meter Reading (dB $\mu$ V)		Height (m)	Polar (H/ V)	Antenna Factor (dB/m)	Cable Loss (dB)	Amplifier Gain (dB)		Limit (dB $\mu$ V/m)	Margin (dB)
4925.55	56.13	45	1.0	V	32	4.7	33.4	59.4	70.6	11.2
9848.19	46.35	45	1.2	V	38.2	8.1	34.1	58.6	70.6	12.0
4928.75	52.80	60	1.0	H	32	4.7	33.4	56.1	70.6	14.5
9845.79	43.51	60	1.0	H	38.2	8.1	34.1	55.7	70.6	14.9
7383.31	41.40	180	1.2	H	35.3	7.2	33.7	50.2	70.6	20.4
7388.72	37.24	45	1.2	V	35.3	7.2	33.7	46.0	70.6	24.6
2130.26	42.87	45	1.0	V	27.4	3.1	35.0	38.4	70.6	32.2
2130.26	34.54	180	1.2	H	27.4	3.1	35.0	30.0	70.6	40.6

30 to 1000MHz:



Frequency (MHz)	Quasi-Peak (dBµV/m)	Antenna Height (cm)	Polarity	Turntable Position (deg)	Corr. (dB)	Limit (dBµV/m)	Margin (dB)
698.212123	46.8	278.0	H	309.0	-3.5	70.6	23.8
668.214425	46.1	99.0	H	274.0	-3.6	70.6	24.5
434.214665	38.3	115.0	H	286.0	-3.3	70.6	32.3
258.515551	35.8	99.0	H	263.0	-3.8	70.6	34.8
77.284564	31.5	99.0	H	291.0	-3.2	70.6	39.1
30.315615	28.1	159.0	H	169.0	-3.2	70.6	42.5