FCC ID PER PART 18
EMI MEASUREMENT AND TEST REPORT

For

Shunde MD Microwave Oven Manufactory Co., Ltd.

Penglai Road, Beijiao, Shunde,
Guangdong, P.R. China

FCC ID: PU7EV1044X-Y

October 01, 2002

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

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Report Number:	R0209188
Test Date:	August 15, 2002
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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

The *Shunde MD Microwave Oven Manufactory Co., Ltd.*'s model, *EV1044X-Y* or the "EUT" as referred to in this report is a microwave oven which measures approximately 18"L x 12"W x 11.5"H.

1.2 Objective

The following test report is prepared on behalf of *Shunde MD Microwave Oven Manufactory 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 Test Methodology

All measurements contained in this report were conducted with MP-5, Methods of Measurements of Radio Noise Emissions from ISM equipment. All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory Corporation. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.4 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 C63.4-2000 and CISPR 11.

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.

1.5 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Last Cal. Data	Cal. Due Data
HP	Spectrum Analyzer	8564E	08303	12/6/01	12/6/02
HP	Spectrum Analyzer	8593B	2919A00242	12/20/01	12/20/02
HP	Amplifier	8349B	2644A02662	12/20/01	12/20/02
HP	Quasi-Peak Adapter	85650A	917059	12/6/01	12/6/02
HP	Amplifier	8447E	1937A01046	12/6/01	12/6/02
A.H. System	Horn Antenna	SAS0200/571	261	12/27/01	12/27/02
Com-Power	Log Periodic Antenna	AL-100	16005	11/2/01	11/2/02
Com-Power	Biconical Antenna	AB-100	14012	11/2/01	11/2/02
Solar Electronics	LISN	8012-50-R-24-BNC	968447	12/28/01	12/28/02
Com-Power	LISN	LI-200	12208	12/20/01	12/20/02
Com-Power	LISN	LI-200	12005	12/20/01	12/20/02
BACL	Data Entry Software	DES1	0001	12/20/01	12/20/02

1.6 Equipment Under Test (EUT)

Manufacturer	Description	Model	Serial Number	FCC ID
Shunde MD Microwave Oven Manufactory Co., Ltd.	Microwave Oven	EV1044X-Y	N/A	PU7EV1044X-Y

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.

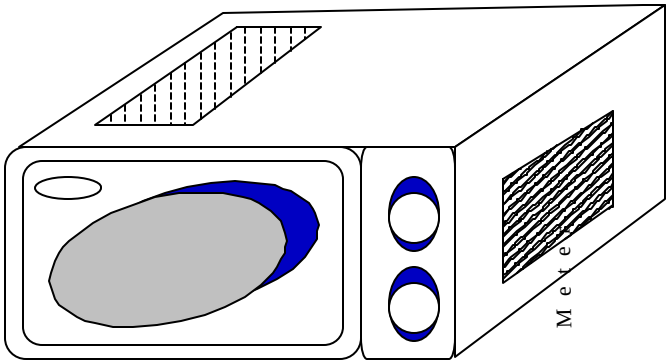
2.2 Schematics / Block Diagram

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

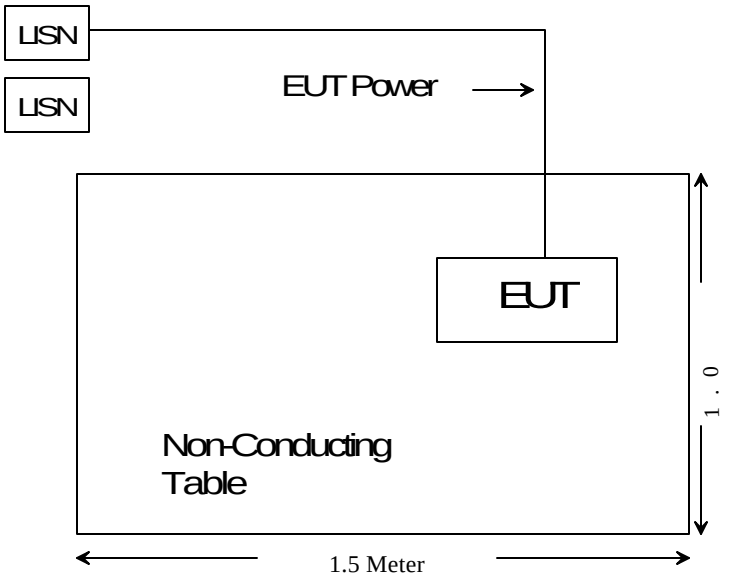
2.3 Equipment Modifications

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

2.4 Configuration of Test System



2.5 Test Setup Block Diagram



3 – RADIATION HAZARD MEASUREMENT

3.1 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 0.5mWfcm^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.

3.2 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	11.47	1376	1400

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

3.3 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 evens 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 = 1500 milliliters of water

Load used for frequency measurement = 1500 milliliters of water
Load used for harmonic measurement = 735 & 315 milliliters of water
Load used for other measurement = 735 milliliters of water

3.4 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	26	43	200

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

Power = 4.2 joules/calorie x 2600 x (43-26) / 200

Power = 928.2 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 25ìV/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(928.2/500)

LFS ≈ 46.41

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

Manufacturer	Model Number	LFS	dB(mV/M)	dB(mV/M)®3m	dB(mV/M)®1m
Midea	EV1044X-Y	46.41	30.1	70.1	79.64

3.5 Operating Frequency Measurement

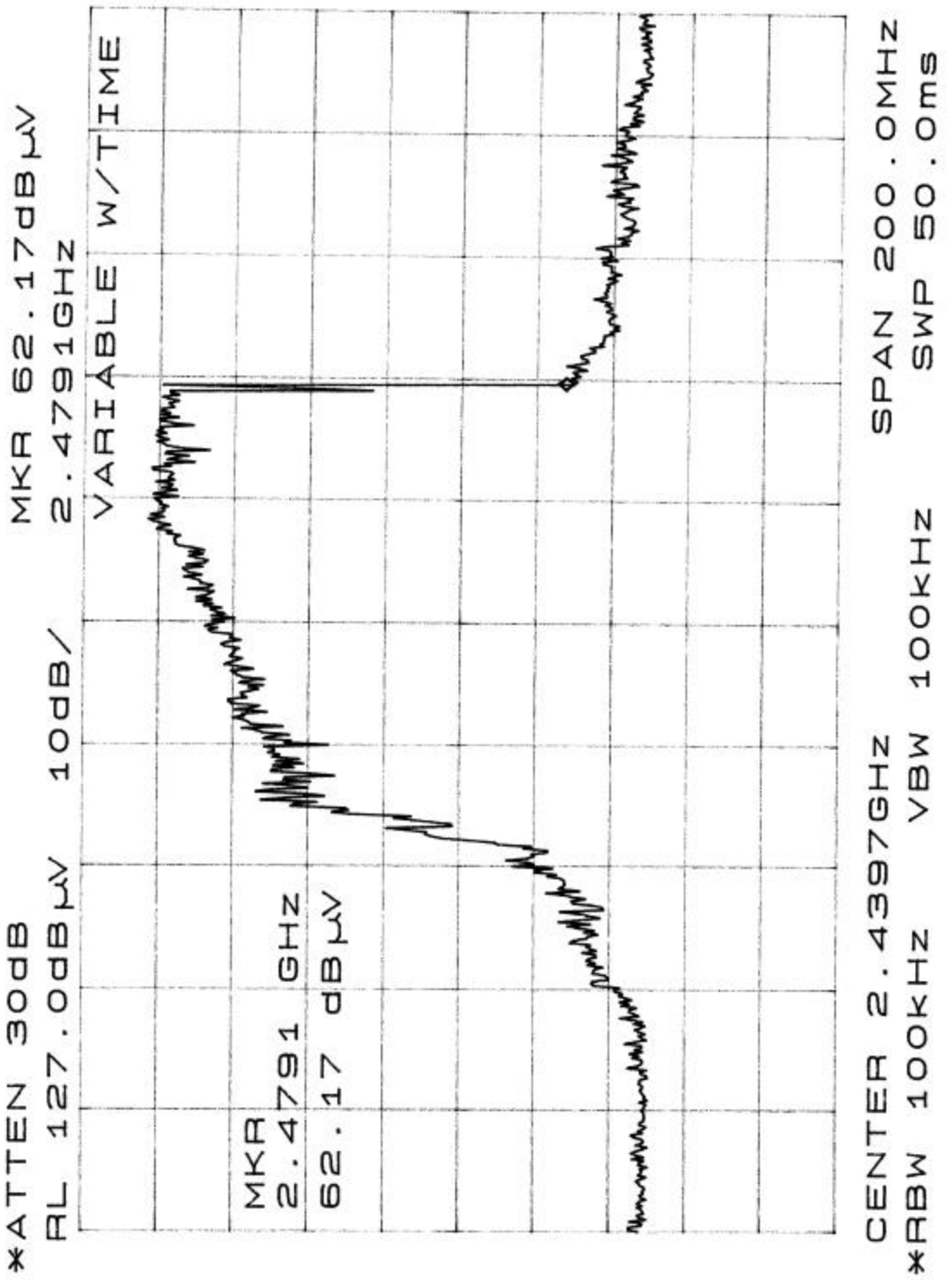
3.5.1 Variation in Operating Frequency with Time

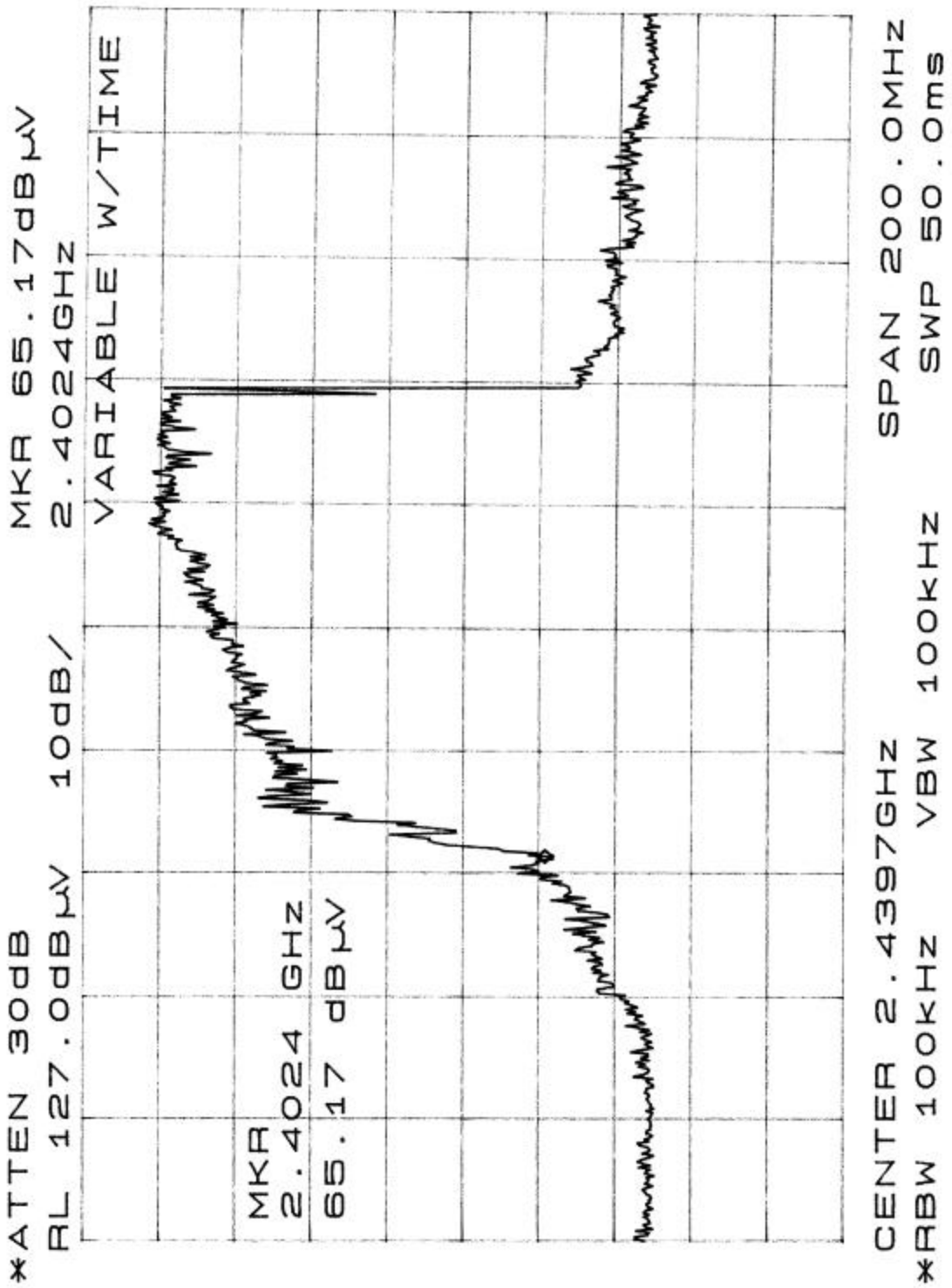
The operating frequency was measured using a spectrum analyzer. Starting with the EUT at room temperature, a 2600ml water load was placed in the center of the oven and the oven was operated at maximum output power. The fundamental operating frequency was monitored until the water load was reduced to 20 percent of the original load.

The results of this test are as follows:

Manufacturer	Model	Minimum Frequency	Maximum Frequency
Midea	EV1044X-Y	2401MHz	2472MHz

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


*ATTEN 30dB
RL 127.0dBµV 10dB/
MKR 62.17dBµV
2.4791GHz
VARIABLE W/TIME
MKR
2.4791 GHz
62.17 dBµV
CENTER 2.4397GHz
SPAN 200.0MHz
*RBW 100KHz
VBW 100KHz
SWP 50.0ms


*ATTEN 30dB
RL 127.0dBμV 10dB/
MKR 65.17dBμV
2.4024GHz
VARIABLE W/TIME
MKR
2.4024 GHz
65.17 dBμV
CENTER 2.4397GHz
SPAN 200.0MHz
*RBW 100KHz VBW 100KHz SWP 50.0ms

3.5.2 Variation in Operating Frequency with Line Voltage

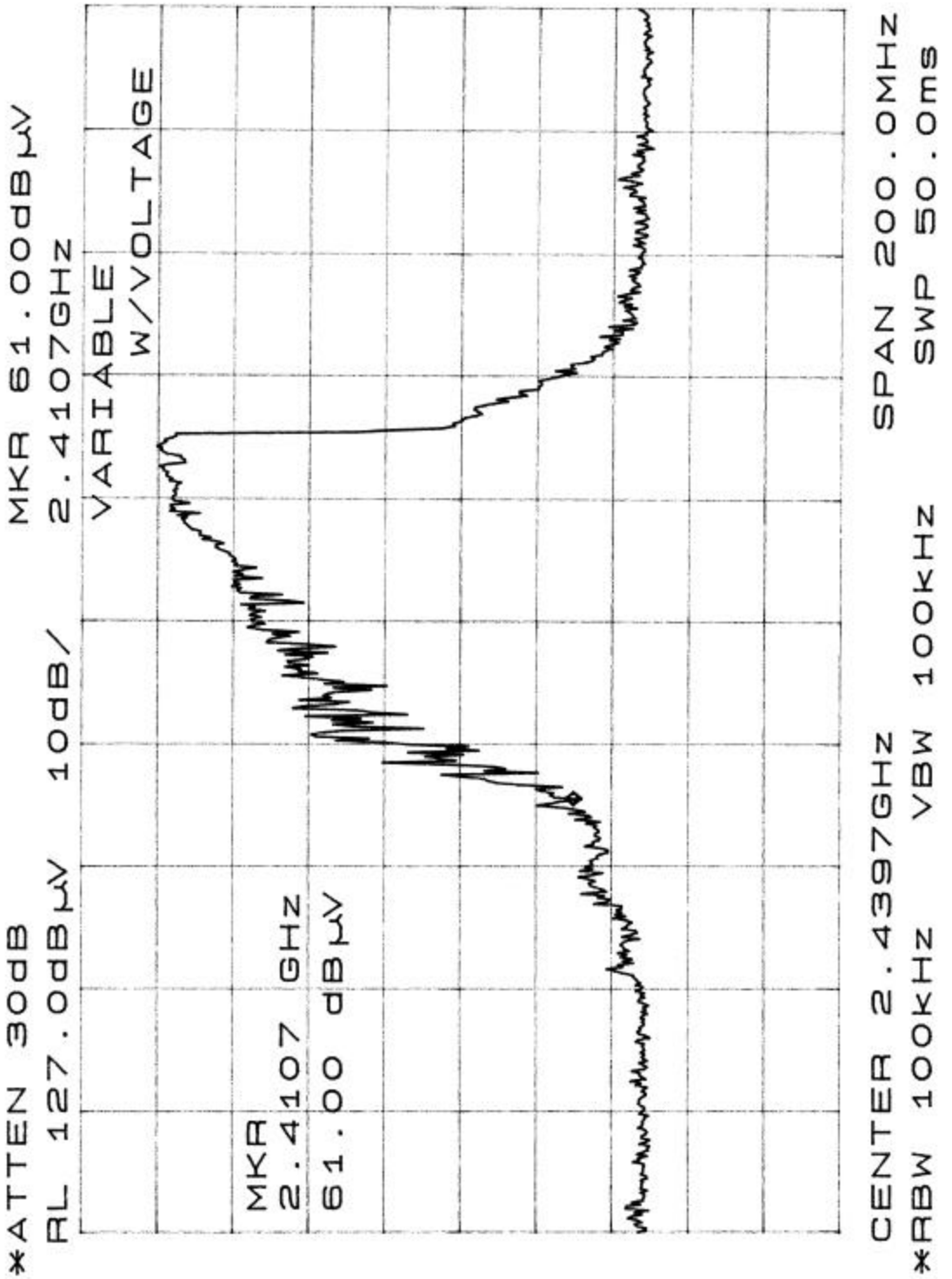
The EUT was operated / warmed by at least 10 minutes of use with a 2600ml water load at room temperature at the beginning of the test. Then the operating frequency was monitored as the input voltage was varied between 80 and 125 percent of the nominal rating.

The results of this test are as follows:

Line voltage varied from 96Vac to 150Vac.

Manufacturer	Model	Minimum Frequency	Maximum Frequency
Midea	EV1044X-Y	2422MHz	2463MHz

Please refer to following pages for details of the variation in operating frequency with line voltage measurement.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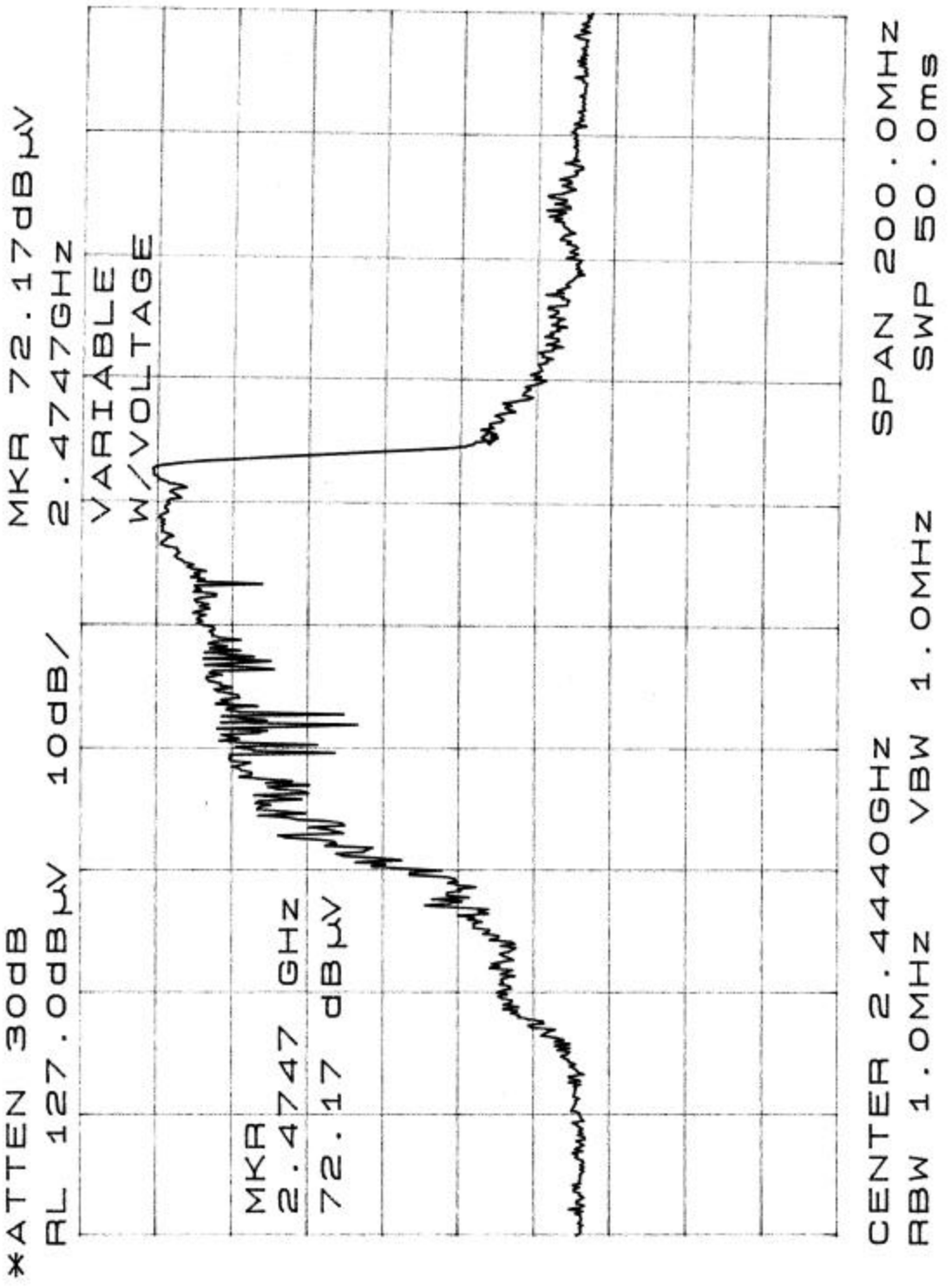
RL 127.0dBµV 10dB/
MKR 61.00dBµV
2.4107GHz
VARIABLE W/VOLTAGE
MKR
2.4107 GHz
61.00 dBµV
CENTER 2.4397GHz
*RBW 100KHz VBW 100KHz
SPAN 200.0MHz
SWP 50.0ms


*ATTEN 30dB
RL 127.0dBµV 10dB/
MKR 72.17dBµV
2.47447GHz
VARIABLE
W/VOLTAGE
MKR
2.4747 GHz
72.17 dBµV
CENTER 2.4440GHz
SPAN 200.0MHz
RBW 1.0MHz
VBW 1.0MHz
SWP 50.0ms

4 - RADIATED EMISSION DATA

4.1 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 $\pm$4.0 dB.

4.2 EUT Setup

The radiated emission tests were performed in the open area 3-meter test site, using the setup accordance with the 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.

4.3 Spectrum Analyzer Setup

According to FCC rules, 47 CFR 18.309(a), the EUT was tested to 10th harmonic (24.5GHz).

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

Start Frequency	30 MHz
Stop Frequency	24.5 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	1MHz

4.4 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.

4.5 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

4.6 Summary of Test Results

According to the data in section 4.7, the EUT complied with the FCC Part 18 Subpart C, and had the worst margin of:

-3.4 dBmV at **4919.00 MHz** in the **Horizontal** polarization, **30MHz to 24.5GHz.**

4.7 Radiated Emissions Test Result Data

4.7.1 Final Test Data, 30MHz –18GHz, 3 Meters

INDICATED		TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC PART 18	
Frequency MHz	Ampl. dBmV/m	Angle Degree	Height Meter	Polar H/ V	Antenna dBmV/m	Cable dB	Amp. dB	Corr. Ampl. dBmV/m	Limit dBmV/m	Margin dB
2465.00	90.1	0	1.2	V	28.1	3.4	30.0	91.6		
2431.00	90.3	0	1.0	H	28.1	3.4	30.0	91.8		
4919.00	61.2	180	1.2	H	32.5	4.9	32.5	66.1	69.5	-3.4
4919.00	60.9	180	1.2	V	32.5	4.9	32.5	65.8	69.5	-3.7
7411.00	56.0	360	1.2	V	35.1	5.6	32.0	64.7	69.5	-4.8
7411.00	55.5	360	1.4	H	35.1	5.6	32.0	64.2	69.5	-5.3
9833.00	53.0	360	1.4	H	35.1	5.6	31.5	62.2	69.5	-7.3
9833.00	50.0	360	1.2	V	35.1	5.6	31.5	59.2	69.5	-10.3
12279.00	48.0	180	1.4	H	35.1	5.6	31.7	57.0	69.5	-12.5
12279.00	44.0	180	1.2	V	35.1	5.6	31.7	53.0	69.5	-16.5
2300.00	48.6	0	1.2	H	28.1	3.4	30.0	50.1	73.33	-23.23
2300.00	48.5	0	1.2	V	28.1	3.4	30.0	50.0	73.33	-23.33
1722.00	49.2	90	1.2	V	25.3	2.6	30.0	47.1	73.33	-26.23
1814.00	48.8	0	1.0	V	25.3	2.6	30.0	46.7	73.33	-26.23
1814.00	48.5	45	1.0	H	25.3	2.6	30.0	46.4	73.33	-26.93
1722.00	44.0	90	1.2	H	25.3	2.6	30.0	41.9	73.33	-31.43