

CUSTOM TEST REPORT
7861- 36

**FCC CFR47: 2007, Part 18, Subpart C,
Microwave Oven Operating at ISM Frequency
2450 MHz $\pm$ 50MHz**

**Company: Sharp Manufacturing Co. of America
File No: 2041428
Date: May 22, 2008**

**Product: Microwave Oven Drawer
Model: KB-6024MS**

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This report contains 25 pages.

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SECTION 1 GENERAL

Introduction

This report documents the results of the EMI test measurements performed on the EUT described in this section of this report. These tests were conducted on a representative sample to be marketed for Certification of Compliance with **FCC CFR 47: 2007, Part 18, Subpart C, Consumer.**

Equipment Under Test (EUT)

Product	: Microwave Oven Drawer
Model	: KB-6024MS
Serial No.	: 111112
Rated Input Voltage	: 120Vac, 60Hz
AC Power Input	: 120Vac, 60Hz
RF Power Output	: 753.14Watts
Operating Frequency	: 2450MHz
Microprocessor Clock Frequency	: 4MHz
Date Sample Received	: April 28, 2008
Sample Size	: 60.5 cm wide by 62.5 cm deep by 40 cm high

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Cables Used on EUT

Type	Length	Manufacturer	Shielded Yes/No?	Type of Shield (i.e. wire braid or aluminum)	How Shield is Terminated to the Connector	Type of Connector at Each End of Cable and is Shell Metallic or Non-Metallic	Connected To	Connected From	Conductors (i.e. twisted pair)	Type of Termination
AC power Cord	1.2 m	P T HO WAH GENTING	No	NA	NA	Std 3 Pin Plug, Model: KB-2	AC power supply	EUT	AWG14 / 3C	NA

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Test Procedures

The Radiated Emissions measurements and frequency measurements were conducted in the 3m Semi-Anechoic Chamber at **CSA International's Toronto, Ontario** test laboratory.

CSA International's Toronto test facilities satisfy the requirements of ANSI C63.4-2003 and EN 50147-2:1996.

Site Attenuation Factors and a description of the 3m Semi-Anechoic Chamber are filed with the FCC.

Applied Standards and Test Summary

Applied Standard(s)	Equipment	Comments
FCC CFR 47: 2007, Part 18, Subpart C, Consumer	Microwave Oven	Complies with Applicable Standards

Applicable Documents

CFR 47: 2007, Part 18	Federal Communications Commission Code of Federal Regulations
ANSI C63.4 - 2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
FCC/OET MP-5: 1986	FCC Methods of Measurements of Radio Noise Emissions from Industrial, Scientific, and Medical Equipment
CISPR 16-1 Series CISPR 16-2 Series	Specification for Radio Disturbance and Immunity Measuring Apparatus and Methods

SECTION 2

TEST INSTRUMENTATION

Test Equipment

Instrument	Manufacturer	Model No.	Serial No.	CSA International I.D. Number
Spectrum Analyzer	Agilent	E7405A	US39150137	3900 8027
Spectrum Analyzer	Agilent	E4448A	US44300504	3900 9171
Preselector	Electrometrics	EM2701	B010579	3900 7878
LISN (V Network)	Rohde & Schwarz	ESH2-Z5	893406/001	4900 0618-2
BiLog Antenna	Chase	CBL6112A	2174	3900 7031
Horn Antenna	EMCO	3115	9611-5010	3900 7036
Pre-Amplifier	HD Communications	HD17453	--	3900 8000
3-m Semi-Anechoic Chamber	Panashield	-	-	3900 7060

Notes:

1. The above equipment was used for testing.
2. The calibration sticker was checked for a valid calibration date by the testing personnel.

Equipment Calibration and Traceability

Test equipment to produce qualification measurements is calibrated with standards traceable to the National Research Council, National Institute of Standards and Technology or other national standards. All equipment is calibrated at specified intervals. Each receiver and analyzer employs its own built-in calibration features for frequency and levels. Internal calibration checks are performed before qualification measurements are conducted.

SECTION 3 TEST CONFIGURATION AND TEST RESULTS

Test Configuration

The equipment under test (EUT) was configured and operated in accordance with the manufacturer's specifications. Procedures and methods used were in accordance with **FCC CFR 47: 2007, Part 18, Subpart C, Consumer.**

Operation Of EUT During Testing

The EUT was operated normally in all respects. The EUT power level set as high and water in the beaker was loaded. The operation of the EUT was monitored by observation of the system display panel. During the test, the EUT was exercised maximum power heating operation mode. Proper operation of the EUT was determined from the operator's point of view, which was based on available controls and indications.

- ~ Load for power output measurement: 1000mL of water in the beaker, located in the center of the oven
- ~ Load for frequency measurement: 1000mL of water in the beaker, located in the center of the oven
- ~ Load for measurement of radiation on second and third harmonics: 2 loads, one of 700 mL and the other of 300mL of water was used. Each load was tested with the beaker located in the center of the oven and with it in the right front corner
- ~ Load for Radiated Emissions: 700mL of water, with the beaker located in the center of the oven

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Line Conducted Emissions Test Configuration

The EUT was set up and configured as per the manufacturer's instructions. The test setup was in accordance with FCC Part 18 / FCC_OET MP-5 requirements. The EUT was setup on a nonconductive platform 80cm from the LISN, and 40cm from an earth grounded conducting surface, in the 3m chamber. The EUT was set up in a way that represented a normal installation. The EUT was set up and operated normally.

Peak detector scans were made using the receiver system as described in the section Test Equipment Used, in the frequency range of 0.150 – 30 MHz on all phases. All phases were measured and a comparison of the results obtained was then conducted to find the phase with the highest level of emission.

Line Conducted Emissions Test

Location : CSA International, 178 Rexdale Blvd, Toronto,
Ontario, Canada, M9W 1R3
Site Dimensions : 20 ft x 30 ft x 17 ft high 3m Semi-Anechoic Chamber
Test Specs. : FCC CFR 47: 2007, Part 18, Subpart C
Supply Voltage : 120V AC, 60Hz
Tested By : Tina Ding
Date Tested : May 5, 2008
Ambient Temperature : 23.2 °C
Relative Humidity : 26.0 %
Atmospheric Pressure : 101.8 kPa

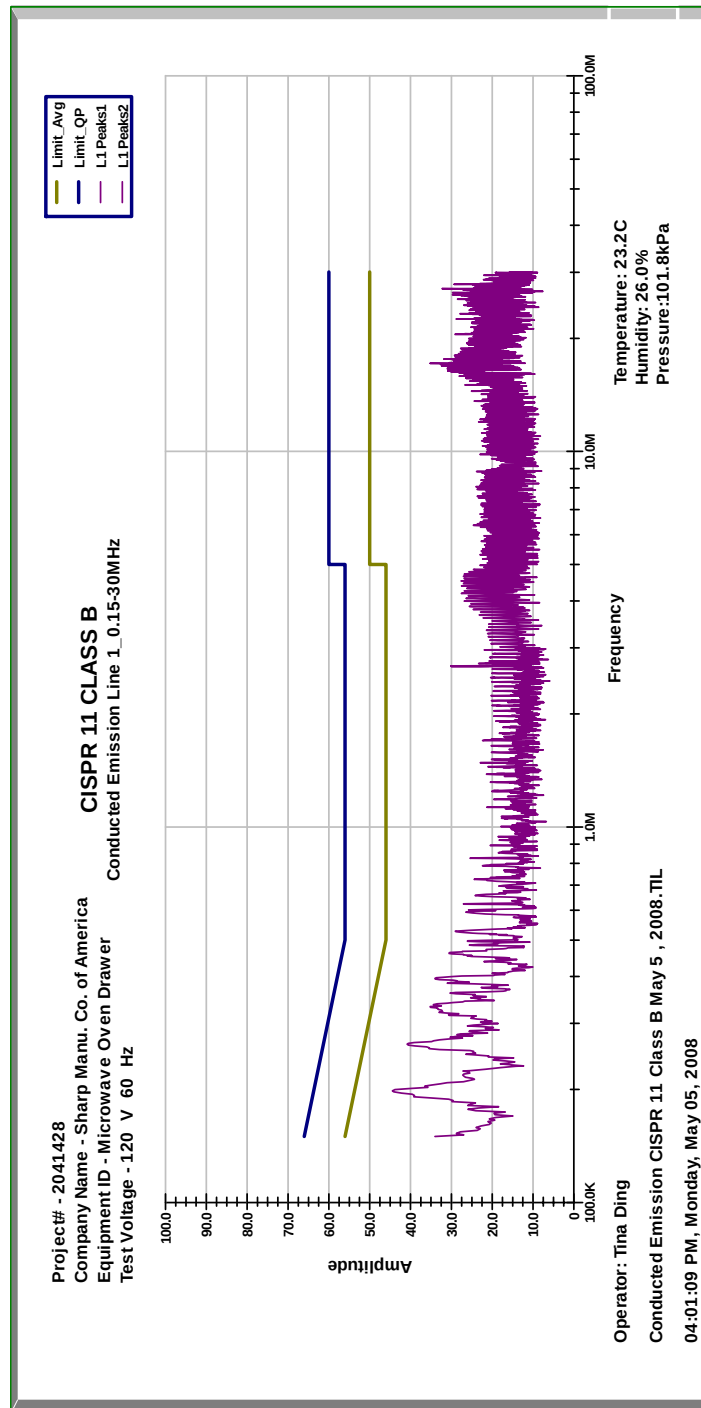
Line Conducted Emissions Limits

FCC Part 18		
Frequency Range (MHz)	Limits in dBµV	
	Quasi-peak	Average
0.15 - 0.5	66-56*	56-46*
0.5 - 5	56	46
5 - 30	60	50

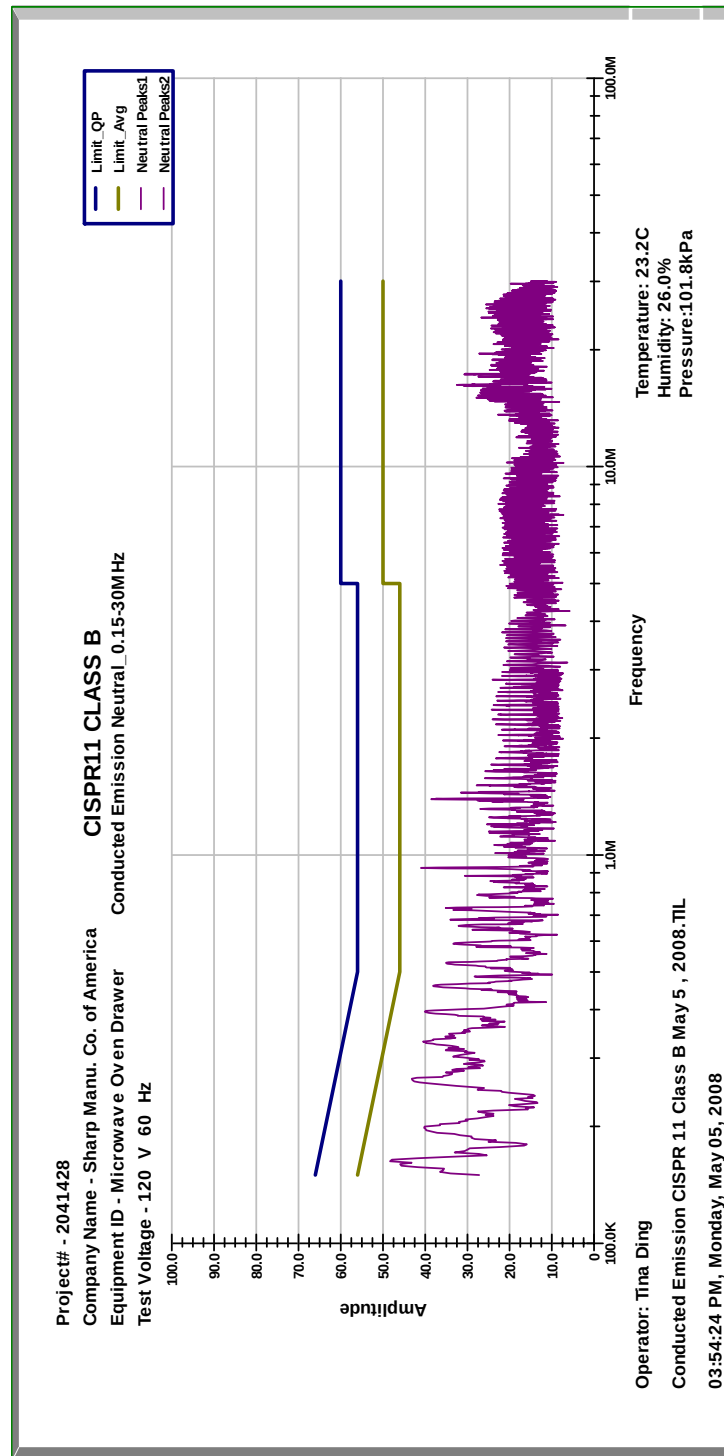
* Decreasing linearly with the logarithm of the frequency.

* This limit is the equivalent as CISPR 11 Class B, therefore the result is based on CISPR Class B

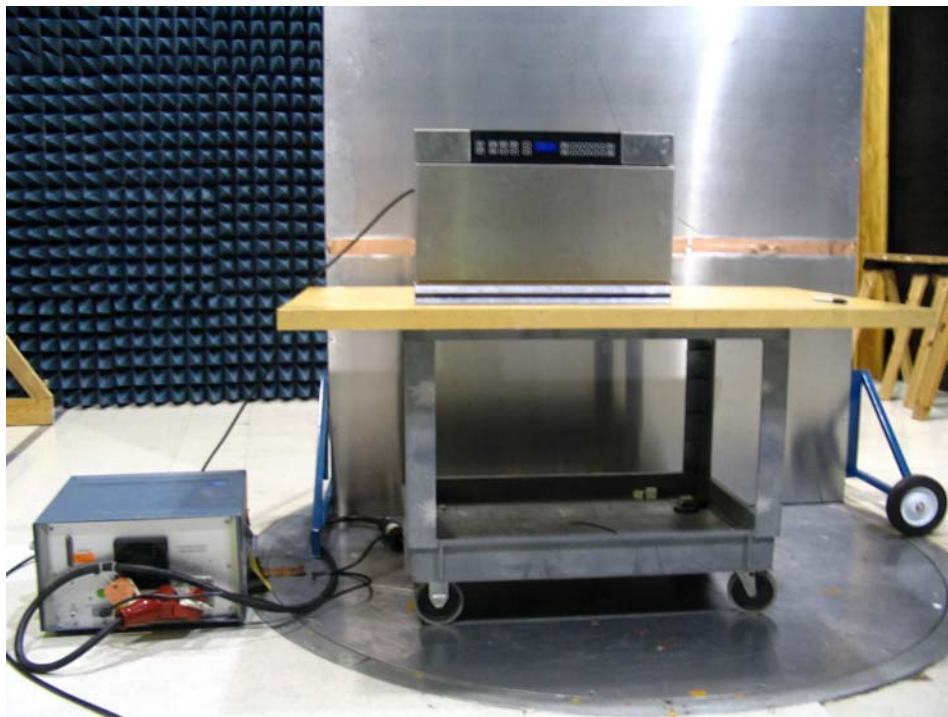
Line Conducted Emissions Test Results (continued)



Line Conducted Emissions Test Results (continued)



Conducted Emissions Photograph(s) Taken During Testing



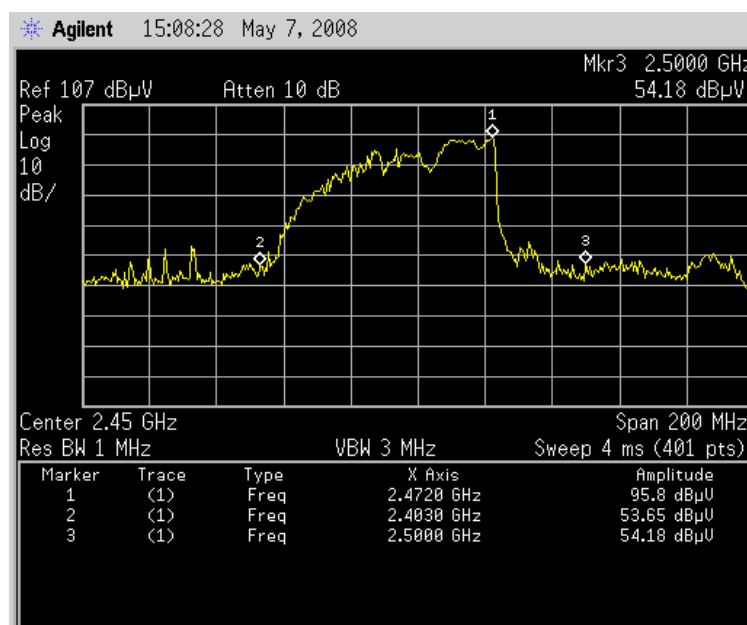
Maximum Frequency Deviation Test

Location : CSA International, 178 Rexdale Blvd, Toronto,
 Ontario, Canada, M9W 1R3
Site : 20 ft x 30 ft x 17 ft high 3m Semi-Anechoic Chamber
Test Spec. : FCC CFR 47: 2007, Part 18, Subpart C
Supply Voltage : 120V AC, 60Hz
Tested By : Tina Ding
Date Tested : May 7, 2008
Ambient Temperature : 22.4°C
Relative Humidity : 25.9%
Atmospheric Pressure : 101.2kPa

The EUT was positioned in the center of the turntable. The measurement distance between the EUT and the antenna was set at 3m. A beaker with 1000mL of water was placed in the center of the oven. Measurement results can be found in the following pages.

Maximum Frequency Deviation Limit

Rated Frequency (MHz)	Measured (MHz)	Deviation (MHz)
2450	2450	± 50 MHz, Satisfied the requirement



Power Output Measurement

Measured AC power input to the Microwave oven: 1.56KWatts

Measured power output: 753.14Watts. The power output was measured by the change in temperature of a 1L beaker of water over a period of 5 minutes. The power setting was set at the maximum.

** The power output in Watts can then be calculated using the following conversion factors:

1 calorie = 1 °C of temp. increase in 1 cc of water for 1 minute. Therefore, it would take 1000 calories to increase the temp. of 1000mL of water by 1 deg. in 1 minute. Take the total temperature increase for 5 minutes and divide it by 5 to get the temp. rise for 1 minute. Multiply this number by 1000 to find the calories used in raising the temp. of 1000mL water. Then to convert to Watts, use the following conversion factors, **1 CAL = 3.9685×10^{-3} BTU** & **1.0 BTU = 17.57 WATTS**. Therefore **1 WATT = $(1.0/3.9685 \times 10^{-3})/17.57 = 14.34$ CAL/W**.

Start Temp. = 22.6°C

Final Temp. = 76.6°C

Time = 5 min.

$(76.6^{\circ}\text{C} - 22.6^{\circ}\text{C}) / 5 \text{ min} = 10.8^{\circ}\text{C/min}$

$10.8^{\circ}\text{C/min} \times 1000 \text{ mL} = 10800 \text{ cal.}$

$10800 \text{ cal} / 14.34 \text{ cal/W} = 753.14 \text{ Watts}$

Radiated Emissions Test

Location : CSA International, 178 Rexdale Blvd, Toronto,
Ontario, Canada, M9W 1R3
Site : 20 ft x 30 ft x 17 ft high 3m Semi-Anechoic Chamber
Test Spec. : FCC CFR 47: 2007, Part 18, Subpart C
Supply Voltage : 120V AC, 60Hz
Tested By : Tina Ding
Date Tested : May 6-8, 2008
Ambient Temperature : 24.5 °C
Relative Humidity : 23.6 %
Atmospheric Pressure : 101.8 kPa

The EUT was positioned on the turntable as required by FCC Part 18 /OET MP-5:1986.

Scans were made using the receiver system described in Section 2 "Test Instrumentation". These scans were performed in the frequency range of 30MHz - 25GHz, locating any frequencies in which the EUT radiated.

The EUT was rotated about its vertical axis on the turntable, and the polarization and height of the receiving antenna were varied to obtain the highest field strength on each measured frequency.

Measurement results can be found in the following pages.

The Radiated Emissions, measured at 3m distance, shall not exceed the field strength below as per FCC Part 18 Subpart C §18.305:

RF Power Generated by Equipment (Watts)	Radiated Strength Limit @ 300 meters ($\mu\text{V/m}$)	Radiated Strength Limit @ 3m (dB $\mu\text{V/m}$)
Below 500	25	---
Above 500	25 SQRT (power/500)	69.7

Calculation Steps list as below:

$$\text{V/m @ 300 m for } 753.14 \text{ W output} = 25 \times \sqrt{(753.14 / 500)} = 30.7 \mu\text{V/m}$$

Converting from $\mu\text{V/m}$ to dB $\mu\text{V/m}$ @ 300m:

$$\text{dB}\mu\text{V/m} = 20 \text{ Log } (30.7 \text{ V/m}) = 29.7 \text{ dB}\mu\text{V/m}$$

To calculate limit from 300m to 3m:

$$\text{dB}\mu\text{V/m at 3 m} = 29.7 \text{ dB}\mu\text{V/m} + 20 \text{ Log } (300 \text{ m} / 3 \text{ m}) = 69.7 \text{ dB}\mu\text{V/m}$$

Converting limit in dB $\mu\text{V/m}$ back to $\mu\text{V/m}$ @ 3m:

$$\mu\text{V/m} = 10^{(69.7 \text{ dB}\mu\text{V/m} / 20)} = 3054.92 \mu\text{V/m} \text{ (it is equivalent to 300m)}$$

Radiated Emissions Test Results

<u>Company:</u> Sharp Manufacturing Co. of America	<u>File Number:</u> 2041428
<u>Product:</u> Microwave Oven Drawer	<u>Date:</u> May 6-7, 2008
<u>Model:</u> KB-6024MS	<u>Tested By:</u> Tina Ding
<u>Voltage:</u> 120V, 60Hz	<u>Test Spec:</u> FCC Part 18, Consumer
Notes: • Measurements made in the 3m Semi-Anechoic Chamber. Those measurements of pass margin with (-) indicate failures. • The Pass Margin Ratio is calculated by dividing the Average Signal Level in $\mu\text{V/m}$ into the Limit Value in $\mu\text{V/m}$. • ISM equipment operating on a frequency specified in §18.301 is permitted unlimited radiated energy in the band specified for that frequency. Load for Radiated Emissions: 700 mL of water with the beaker located in the centre of the oven.	

Frequency	Antenna Height	Antenna Polarization	Azimuth	Average Signal Level		Limit Value		Pass Margin
(MHz)	(Meters)	(V or H)	(Degrees)	(dB $\mu\text{V/m}$)	($\mu\text{V/m}$)	(dB $\mu\text{V/m}$)	($\mu\text{V/m}$)	(dB $\mu\text{V/m}$)
30.025	1	V	0	10.2	3.24	73.85	4927.77	63.65
30.416	1	H	0	13.2	4.57	73.85	4927.77	60.65
896.68	1	H	71	19.68	9.64	73.85	4927.77	54.15
952.3	1	V	325	20.46	10.54	73.85	4927.77	53.39
9800	1	V	40	52.44	418.79	73.85	4927.77	21.41
9800	1	H	170	47.6	239.88	73.85	4927.77	26.25
12250	2	V	300	38	79.43	73.85	4927.77	35.85
12250	1	H	160	42.08	127.06	73.85	4927.77	31.77
14700	1	V	0	45.7	192.75	73.85	4927.77	28.15
14700	1	H	140	46.92	221.82	73.85	4927.77	26.93
17150	1	V	0	49.47	297.51	73.85	4927.77	24.38
17150	1	H	160	49.44	296.48	73.85	4927.77	24.41

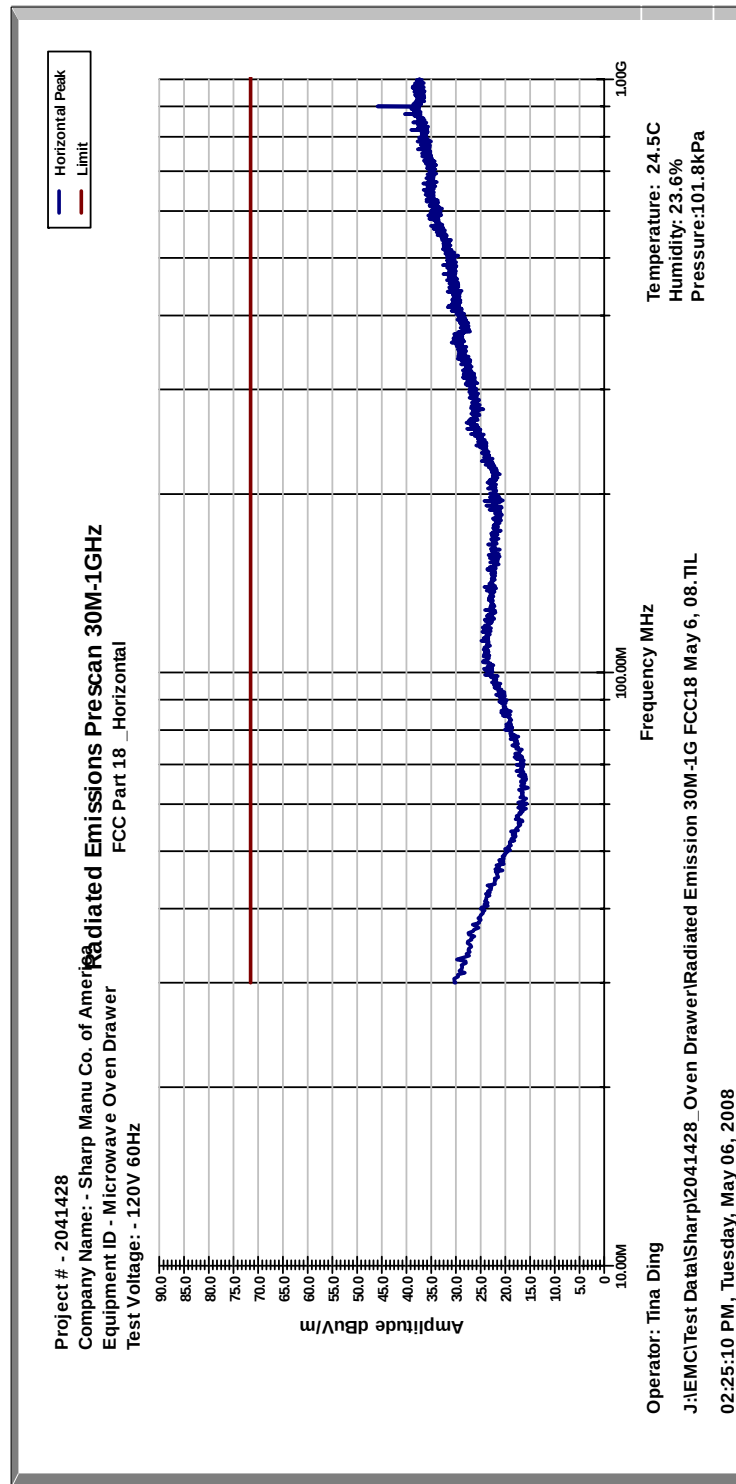
Radiated Emissions Test Results (continued)

Measurement of 2nd and 3rd Harmonics

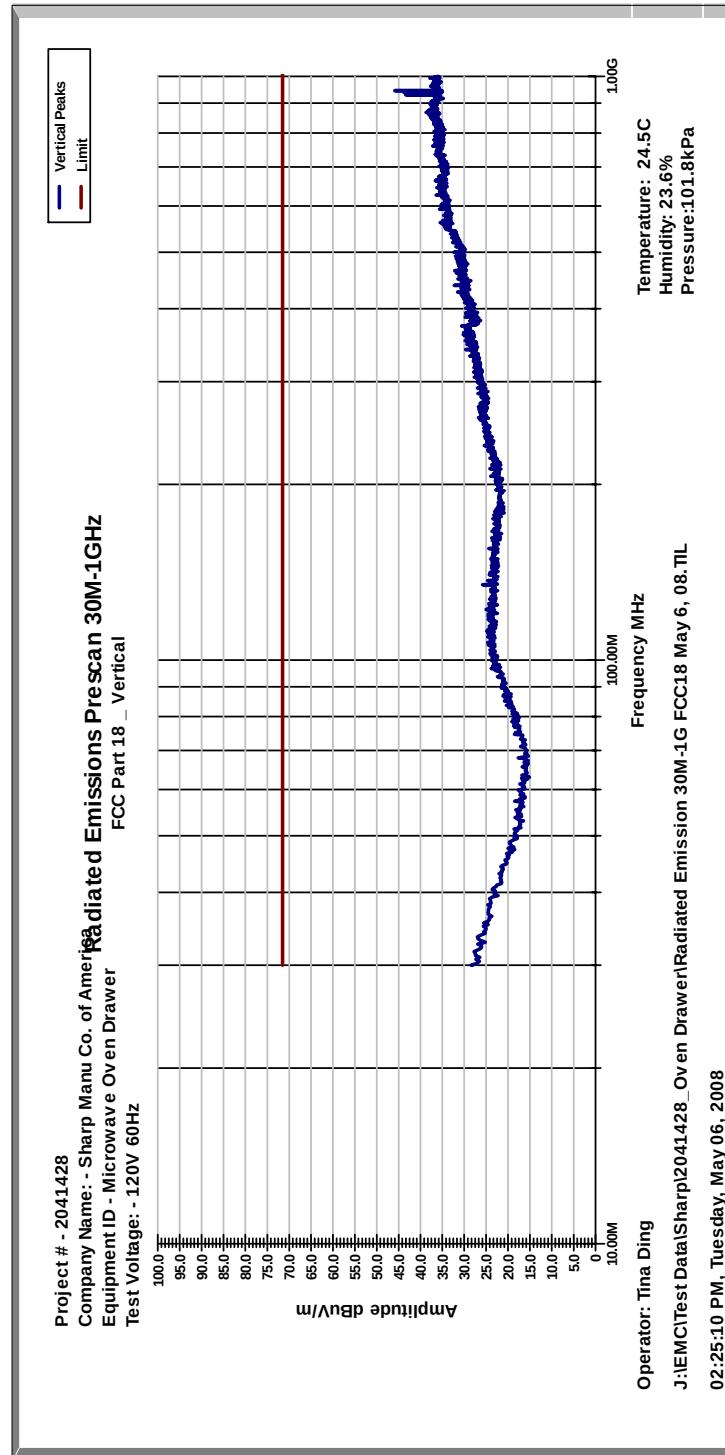
<u>Company</u> : Sharp Manufacturing Co. of America	<u>File Number</u> : 2041428
<u>Product</u> : Microwave Oven Drawer	<u>Date</u> : May 7, 2008
<u>Model</u> : KB-6024MS	<u>Tested By</u> : Tina Ding
<u>Voltage</u> : 120V, 60Hz	<u>Test Spec</u> : FCC Part 18, Consumer
Notes: - Measurements made in the 3m Semi-Anechoic Chamber. Those measurements of pass margin with (-) indicate failures. - The Pass Margin Ratio is calculated by dividing the Average Signal Level in $\mu\text{V/m}$ into the Limit Value in $\mu\text{V/m}$.	
Load: The highest signal levels were found to be with 700mL of water, with the beaker located in the center of the oven.	

Frequency	Antenna Height	Antenna Polarization	Azimuth	Average Signal Level		Limit Value		Pass Margin
(MHz)	(Meters)	(V or H)	(Degrees)	(dB $\mu\text{V/m}$)	($\mu\text{V/m}$)	(dB $\mu\text{V/m}$)	($\mu\text{V/m}$)	(dB $\mu\text{V/m}$)
4900	1	V	30	71.7	3845.92	73.85	4927.77	2.15
4900	1	H	146	71.0	3548.13	73.85	4927.77	2.85
7350	1	V	30	59.4	933.25	73.85	4927.77	14.45
7350	1	H	150	61.45	1181.68	73.85	4927.77	12.4

Radiated Emissions Test Results (continued)



Radiated Emissions Test Results (continued)



Radiated Emissions Photograph(s) Taken During Testing



Radiated Emissions Photograph(s) Taken During Testing (Continued)



Engineering Statement

The Microwave Oven Drawer, Model KB-6024MS, satisfies the requirements of FCC CFR 47: 2007, Part 18, Subpart C, Consumer.

Modifications Required/Comments

No modifications (suppressions, additions, replacements) were done on the EUT to make it compliant with FCC CFR 47: 2007, Part 18, Subpart C, Consumer.

Uncertainty calculations are documented in DQD 381.02 of CSA International. These uncertainties are available to all customers upon request.

Test Specification Deviation

No deviations to or exclusions from the applied standards have been made.

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SECTION 4 APPENDIX A

LABELLING REQUIREMENTS AND USER INFORMATION

Reference: TELECOMMUNICATION REGULATIONS CFR 47: 2007 Part 18, Subpart C.

18.209 Identification of Authorized Equipment

- (b) Devices authorized under the Declaration of Conformity procedure shall be labelled with the logo shown below. The label shall not be a stick-on, paper label. It shall be permanently affixed to the product and shall be readily visible to the purchaser at the time of purchase, as described in 2.925(d) of this chapter. *Permanently affixed* means that the label is etched, engraved, stamped, silkscreened, indelibly printed, or otherwise permanently marked on a permanently attached part of the equipment or on a nameplate of metal, plastic, or other material fastened to the equipment by welding, riveting, or a permanent adhesive. The label must be designed to last the expected lifetime of the equipment in the environment in which the equipment may be operated and must not be readily detachable. The logo follows:



18.213 Information to the User

Information on the following matters shall be

provided to the user in the instruction manual or on the packaging if an instruction manual is not provided for any type of ISM equipment:

- (a) The interference potential of the device or system
- (b) Maintenance of the system
- (c) Simple measures that can be taken by the user to correct interference.