FCC CFR47 PART 18 SUBPART C
ISM EQUIPMENT

TEST REPORT

FOR

650W MICROWAVE OVEN

MODEL: MW3090W

FCC ID: A3LMW3090

REPORT NUMBER: 00U0299-1

ISSUE DATE: JUNE 16, 2000

Prepared for

SAMSUNG ELECTRONICS CO., LTD.
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San Jose, CA 95134
USA

Prepared by

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LAB CODE:200065-0

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1. VERIFICATION OF COMPLIANCE

COMPANY NAME : SAMSUNG ELECTRONICS CO., LTD
85 WEST TASMAN DRIVE
SAN JOSE, CA 95134

CONTACT PERSON : WALLANCE OH / MANAGER

TELEPHONE NO : (408) 828-8833

EUT DESCRIPTION: 650W MICROWAVE OVEN

MODEL NO/NAME : MW3090W

DATE TESTED : JUNE 16, 2000

TYPE OF EQUIPMENT:	CONSUMER ISM EQUIPMENT
TECHNICAL LIMIT:	SUBPART C
FCC RULES:	PART 18
MEASUREMENT PROCEDURE	FCC MP-5/1986
EQUIPMENT AUTHORIZATION PROCEDURE	CERTIFICATION
MODIFICATIONS MADE ON EUT	☐ YES ☒ NO

The above equipment was tested by Compliance Certification Services for compliance with the requirements set forth in the FCC CFR 47, PART 18. Th4 said equipment in the configuration described herein shows that maximum emission levels emanating from the equipment are within the compliance requirements.

Warning : This report documents conditions under which testing was conducted and the results of tests performed. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document.

Approved By

TOM N. COKENIAS / DIRECTOR OF ENGINEERING
COMPLIANCE CERTIFICATION SERVICES

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2. PRODUCT DESCRIPTION

The equipment under test is a microwave oven sold for consumer use. Model: MW3090W is a 650W microwave oven with mechanical controls.

3. TEST FACILITY

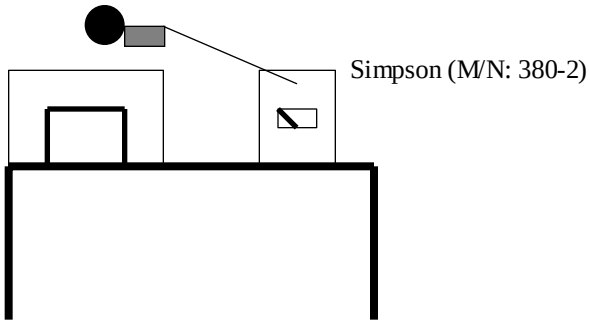
The open area test sites and conducted measurement facilities used to collect the radiated data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

4. ACCREDITATION AND LISTING

The test facilities used to perform radiated and conducted emissions tests are accredited by National Voluntary Laboratory Accreditation Program for the specific scope of accreditation under Lab Code:200065-0 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government. In addition, the test facilities are listed with Federal Communications Commission (reference no: 31040/SIT (1300B3) and 31040/SIT(1300F2))

5. RADIO NOISE EMISSION MEASUREMENTS PROCEDURES/RESULTS

5.1 RADIATION HAZARD MEASUREMENT



Radiation Hazard Measurements

A 700-ml water load was placed in the center of the oven. The power setting was set to maximum power. While the oven was operating, the Simpson probe was moved slowly around the door seams to check for leakage.

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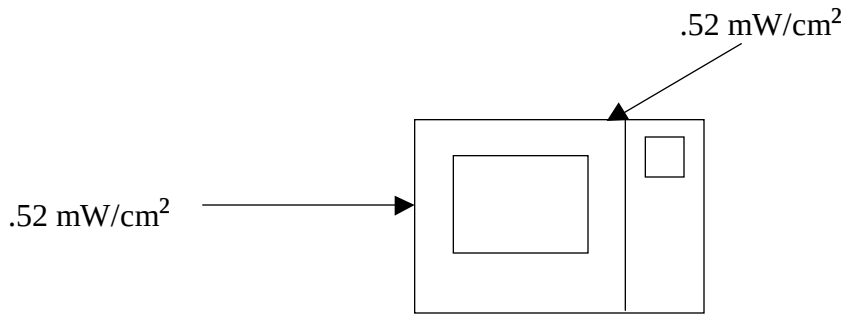

Fig.1

LOCATION	MAXIMUM LEAKAGE **(mW/cm²)**	LIMIT **(mW/cm²)**
Fig.1 shows the locations of maximum leakage	.52	1.0
All others	.13	1.0

5.2 INPUT POWER

Input power and current were measured using a wattmeter and an ampmeter. A 275 ml water load was placed in the center of the oven and the oven was set to maximum power. A 275-ml water load was chosen for its compatibility. Manufacturers to determine their input ratings commonly use this procedure.

	Input Voltage (Vac)	**Input Current (amps)**	**Measured Input power (watts)**
1000W:	120	8.48	875

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

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5.3 RF OUTPUT POWER MEASUREMENT

The Caloric Method was used to determine maximum output power. The initial temperature of a 1000-ml water load was measured.

The water load was placed in the center of the oven. The oven was operated at maximum output power for 120 seconds. Then the temperature of the water was re-measured.

Quantity of water (ml)	Starting Temperature (C°)	Final Temperature (C°)	Elapsed Time (seconds)	RF Power (watts)
1000	23.66	36.66	120	447.3
1000	23.66	36.66	120	447.3
1000	24.00	36.66	120	427.7

Average of 3 Trials: 440.76 W

$$\text{Power} = \frac{(4.2\ \text{Joules/Cal}) \times (\text{Volume in ml}) \times (\text{Temp. Rise})}{\text{Time in seconds}}$$

The measured output was found to be BELOW 500Watts. Therefore, in accordance with section 18.305 of Subpart B, the measured out-of-band emissions were compared to the 25 uV/m @ 300M limit.

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5.4 OPERATING FREQUENCY MEASUREMENTS

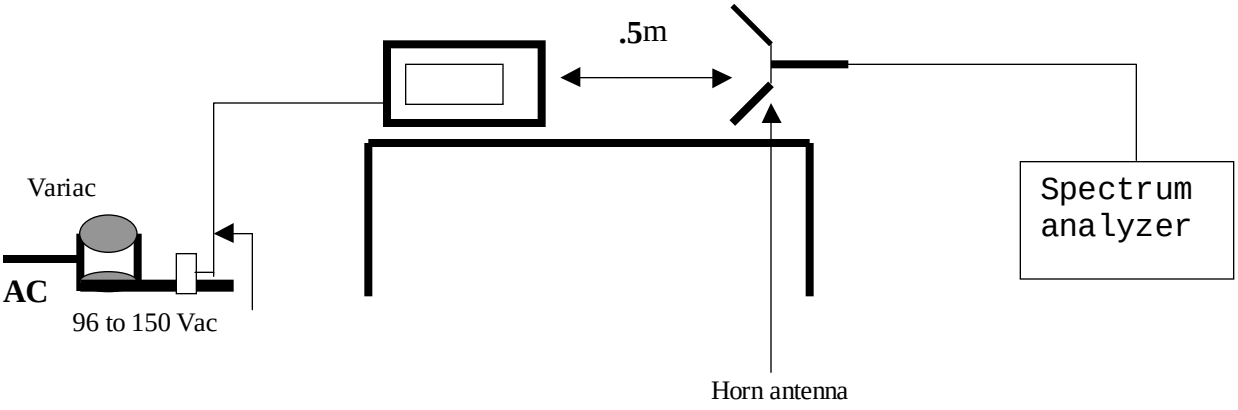

Figure 1. Operating Frequency Measurement Set-up

5.5 VARIATION IN OPERATING FREQUENCY WITH TIME

The operating frequency was measured using a spectrum analyzer. Starting with the EUT at room temperature, a 1000-ml water load was placed in the center of the oven and the oven was operated at maximum output power.

The fundamental operating frequency was monitor until the water load was reduced to 20% of the original load.

The results of this test are as follows.

Initial load: 1000 ml
Load at completion of test: 200 ml

Minimum frequency observed: 2402 MHz
Minimum frequency allowed: **2400 MHz**

Maximum frequency observed: 2467 MHz
Maximum frequency allowed: **2500 MHz**

Refer to spectrum analyzer plot under ATTACHMENTS: **VARIATION IN OPERATING FREQUENCY WITH TIME PLOT** for details of frequency variation with operating time.

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5.6 VARIATION IN OPERATING FREQUENCY WITH VOLTAGE

Following the above test, after operating the oven long enough to assure that stable operating temperature were obtained, the operating frequency was monitored as the input voltage was varied between 80 to 125 percent of the nominal rating.

The water load was maintained at 200 ml for the duration of the test.

The results of this test are as follows:

Line voltage varied from 96Vac to 150Vac.

150Vac
Minimum frequency observed: 2424 MHz
Minimum frequency allowed: **2400** MHz

Maximum frequency observed: 2471 MHz
Maximum frequency allowed: **2500** MHz

120Vac
Minimum frequency observed: 2402 MHz
Minimum frequency allowed: **2400** MHz

Maximum frequency observed: 2476 MHz
Maximum frequency allowed: **2500** MHz

96Vac
Minimum frequency observed: 2422 MHz
Minimum frequency allowed: **2400** MHz

Maximum frequency observed: 2483 MHz
Maximum frequency allowed: **2500** MHz

Refer to spectrum analyzer plots under ATTACHMENTS: **VARIATION IN OPERATING FREQUENCY WITH VOLTAGE PLOTS** for details of Frequency variation with operating voltage.

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5.7 RADIATED EMISSIONS

Radiated emissions were measured over an inclusive frequency range to 30 MHz through the tenth harmonic of the operating frequency. For this test, a 1-meter high wooden table in an open laboratory area supported the device under test. The table was placed on a turntable.

The measurement antenna was placed 3 meters for measurements from 30 - 1000MHz and .5 to 1 meter for measurements from 1000 - 25,000MHz, respectively, for the device under test. The indicated frequency range was swept as the device under test was rotated along its vertical axis in 90° increments.

During the preliminary tests, the load consisted of 700-ml tap water placed in the center of the oven. The emissions were observed while the device under test was operated at maximum output power.

The level of the emissions near the edge of the designated ISM frequency band was measured. For this test, the load consisted of 700-ml water load located in the center of the oven.

The levels of the second and third harmonic were measured inclusively with a 300 ml and 700 ml water load alternately placed in the center and right front corner of the oven. Harmonics beyond the third were measured with a 700-ml load placed in the center of the oven. The data obtained during these tests is contained on the attached spreadsheet.

All other out-of-band emissions were measured while a 700-ml load was placed in the center of the oven. Maximum readings were recorded after variations in antenna polarizations, height, device orientation, load position, and size. For frequencies above 1 GHz, the video bandwidth of the spectrum analyzer was set to simulate a linear average detection mode (10Hz).

For all emissions the equivalent 300 meters intensity was calculated assuming a linear decrease in the intensity of the RFI field with increased distance. In the operating modes and conditions described, there were no over-limit emissions discovered.

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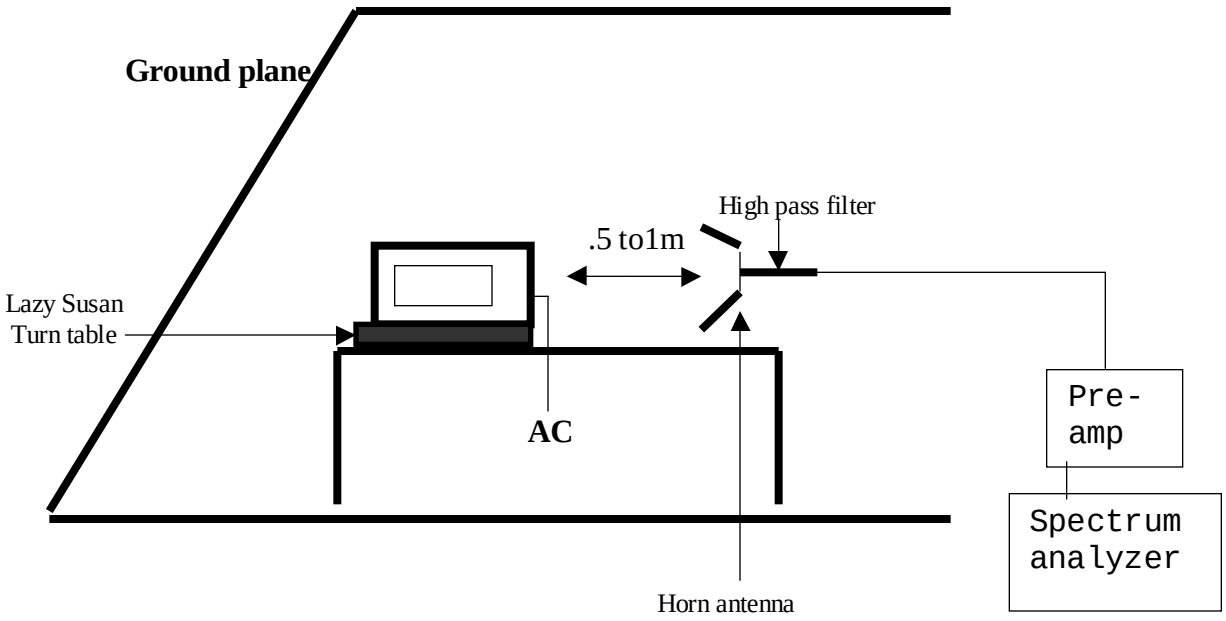

Figure 2. Radiated Emissions Configuration

Emissions were detected from the EUT in the 30 - 1000 MHz and in the 1000 - 25,000 MHz region. Separate spreadsheet are included for both frequency ranges under ATTACHMENTS: **RADIATION EMISSION DATA**.

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6. MEASUREMENT EQUIPMENT LIST

Equipment	Manufacturer	Model No.	Serial No.	Site	Cal Date	Due Date
Spectrum Analyzer	**H.P.**	**8566B**	**2140A01296**	**A**	**12/99**	**12/00**
Antenna	**Chase**	**CBL6112**	**2049**	**A**	**11/99**	**11/00**
Spectrum Analyzer	**H.P.**	**8593EM**	**3710A00205**	**F**	**05/99**	**05/00**
Pre-Amp	**Miteq**	**NSP2600-44**	**646456**	**A**	**12/99**	**12/00**
Horn Antenna	**EMCO**	**3115**	**9001-3245**	**A**	**12/97**	**12/00**
Digital Multimeter	**Fluke**	**87**	**4035173**	**A**	**11/99**	**11/00**
Wattmeter	**Valhalla**	**2111A**	**33-386**	**A**	**10/99**	**10/00**
Variac (0 – 280Vac)	**Powerstat**	**N/A**	**N/A**	**A**	**N/A**	**N/A**
Microwave Leakage Tester	**Simpson**	**380-2**	**N/A**	**A**	**12/99**	**12/00**

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7. EUT SETUP PHOTOS.

Radiated Hazard Test

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Frequency Vs Time Test Setup

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RF Power Output Test

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Frequency Vs. Voltage Test Setup

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Power Input Test Setup

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Radiated Above 1 GHz Test Setup

Lazy Susan Turntable

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Radiated Test Setup Below 1 GHz (Front Side)

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Radiated Test Setup Below 1 GHz (Back Side)

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ATTACHMENTS

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RADIATION EMISSION DATA

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RADIATED TEST ABOVE 1GHz

COMPANY: SAMSUNG ELECTRONICS
EUT NAME: 650W MICROWAVE OVEN
M/N: MW 3090W

Freq. (Mhz)	Level (dBuv)	AF (dB)	CL (dB)	AMP (dB)	Other (dB)	DIST (dB)	Total (dBuv/m)	Limit (dBuv/m)	Margin (dB)
2.451	28.40	28.1	3.6	0	0	-49.5	10.6	28	-17.40
4.889	31.29	33.2	5.4	-41.99	1	-49.5	-20.6	28	-48.60
4.897	32.40	33.8	5.4	-41.99	1	-49.5	-18.89	28	-46.89
7.234	27.30	37.2	6.66	-40.60	1	-49.5	-17.94	28	-45.94
7.289	27.90	37.3	6.66	-40.60	1	-49.5	-17.24	28	-45.24
9.606	26.30	38.1	7.92	-39.30	1	-49.5	-15.48	28	-43.48
9.696	25.40	38.1	7.92	-39.3	1	-49.5	-16.38	28	-44.38
12.061	21.90	39.3	9.0	-39.56	1	-49.5	-17.86	28	-45.86
14.443	21.50	41.2	10.26	-42.30	1	-49.5	-17.84	28	-45.84
16.843	21.10	43.1	11.7	-43.75	1	-49.5	-16.35	28	-44.35
19.294	20.90	32.0	13.14	-43.11	1	-49.5	-25.57	28	-53.57
21.745	21.70	32.6	13.5	-42.45	1	-49.5	-23.15	28	-51.15
24.196	21.0	33.0	15.88	-43.95	1	-49.5	-22.57	28	-50.57

DIST: Distance Correction (-49.5dB,1M)
Analyzer: HP8593E, cal due:5/28/01
Antenna: EMCO 3155,cal due: 9/24/02
Preamp: MITEQ, NSP2600-44
Other: High pass filter insertion loss

Analyzer B/W setting:

	Peak	Ave
Res	1Mhz	1Mhz
Vid	1Mhz	10Hz

Limit=25X $\sqrt{P/500}$ =28dBuv/m at 300m

AF= Antenna Factor
CL= Cable Loss
AMP= Amplifier
Other= High pass filter (4.56GHz)

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VARIATION IN OPERATING FREQUENCY WITH TIME PLOTS

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VARIATION IN OPERATING FREQUENCY WITH VOLTAGE PLOTS

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PROPOSED FCC ID LABEL

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