EMC TEST REPORT

According to FCC CFR47 Part 18 Subpart C

JOB Number : SEMC1067

1. *This test reports does not constitute an endorsement by NIST/NVLAP or U.S Government.*
2. *This test report is to certify that the tested device properly complies with the requirements of FCC Rules and Regulations Part 18 CFR47 Subpart C Intentional Radiators. All tests necessary to show compliance to the requirements were and these results met the specifications requirement.*

This laboratory is registered by the NIST/NVLAP, U.S.A. The test reported herein have been performed in accordance with its terms of registration.

NVLAP LAB CODE 200447-0

1. Applicant Name : SAMSUNG ELECTRONICS CO., LTD.
416 Maetan 3 Dong, Paldal-Ku, Suwon City, Kyungki Do, Korea, 442-742

2. Identification of tested device

2.1 FCC ID : A3LMW1455
2.2 Device Name : MICROWAVE OVEN
2.3 Trade Name : SAMSUNG Electronics Co.,Ltd.
2.4 Model Number : MW1455WA
2.5 RF Output Power : 1200 W

3. Test Procedure and Items

3.1 FCC/OST MP-5 : 1986

4. Issued Date : February 22, 2001

Tested by: N. C. Park
No Cheon, PARK / Test Engineer

Reviewed by: S. K. Cha
Seung Kyu, CHA / Manager of EMC Lab.

Authorised by: T. J. Shin
Taek Jeong, SHIN / Chief of EMC Lab.

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TABLE OF CONTENTS

1. Product Description

2. Test Facility

3. Accreditation and Listing

4. Radio Noise Emission Measurement Procedures/Results

4.1 Radiation Hazard Measurement
4.2 Input Power Measurement
4.3 RF Output Power Measurement
4.4 Operation Frequency Measurement
4.4.1 Variation in Operating Frequency with Time Measurement
4.4.2 Variation in Operating Frequency with Voltage Measurement
4.4.3 Variation in Operating Frequency with Time Plot
4.4.4 Variation in Operating Frequency with Voltage Plot(96Vac)
4.4.5 Variation in Operating Frequency with Voltage Plot(120Vac)
4.4.6 Variation in Operating Frequency with Voltage Plot(150Vac)

4.5 Radiated Emission Measurement
4.5.1 Radiated Emission Measurement Procedure
4.5.2 Radiated Emission Measurement Configuration
4.5.3 Radiated Emission Measurement Data(30 - 1000MHz)
4.5.4 Radiated Emission Measurement Data(1 - 25GHz)

5. Measurement Equipment List

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1. Product Description

The equipment under test is a microwave oven sold for consumer use.
Model : MW1455WA is a 1200 W microwave oven with digital controls.

< Magnetron >

Model : OM-75P manufactured by Samsung Electronic Co., Ltd.
Installation Type: Counter-top

2. Test Facility

The Semi-anechoic chamber and Conducted measurement facilities used to collect the radiated data are located at 416 Maetan 3 Dong, Paldal-Ku, Suwon City, Kyungki Do, Korea.
The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22.

3. Accreditation and Listing

The test facilities used to perform radiated and conducted emissions tests are accrediated by National Voluntary Laboratory Accreditation Program for the specific of accreditation under Lab Code: 200447-0 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(Registration Number:98856, Anechoic Chamber #1).

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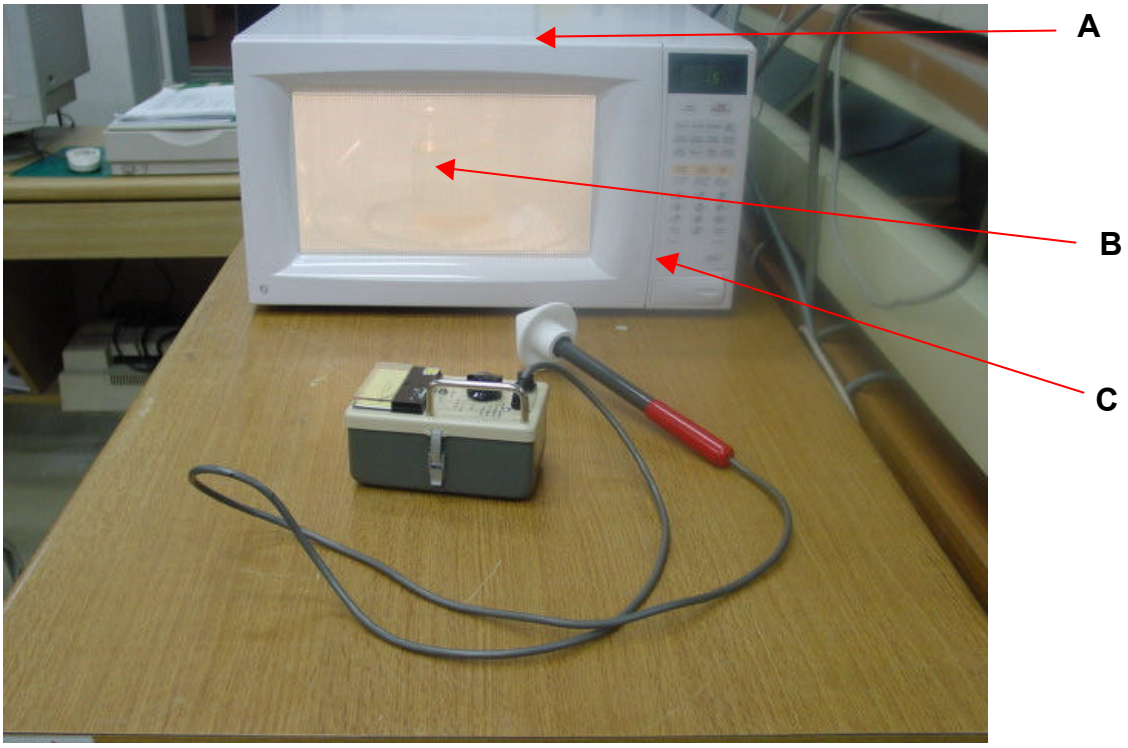
4. Radio Noise Emission Measurement Procedures/Results

4.1 Radiation Hazard Measurement

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 Microwave Survey Meter probe was moved slowly around the door seams to check for leakage.



The results of this test are as follows.

Probe Location	Maximum Leakage [mW/Cm2]	Limit [mW/Cm2]
A	0.05	1.0
B	0.05	1.0
C	0.05	1.0
All others	0.05	1.0

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4.2 Input Power Measurement

Input power and current were measured using a Power Analyzer.
A 700ml water load was placed in the center of the oven and the oven set to maximum power. A 700 ml water load was chosen for its compatibility. Manufacturers to determine their input ratings commonly use this procedure.

Fig. 2 Test Setup for Input power

The results of this test are as follows.

Input Voltage [Vac]	Input Current [amps]	Measured Input power [watts]	EUT Spec. Input power [watts]
120	13.5	1620	1650

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

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4.3 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 re-measured.

Fig.3 Test Setup for RF output power

Quantity of water [ml]	Starting Temperature [centigrade]	Final Temperature [centigrade]	Elapsed Time [seconds]	RF Power [watts]
1000	18.2	40.1	120	766.5
1000	19.3	41.4	120	773.5
1000	19.1	41.5	120	784
Average RF Power of 3 Trials				774.6666667

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

The measured output was found to be **ABOVE 500Watts**. Therefore, in accordance with section 18.305 of Subpart C, the measured out-of-band emissions were compared to the 25xSQRT(power/500)[uV/m] @ 300M limit.

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4.4 Operation Frequency Measurement

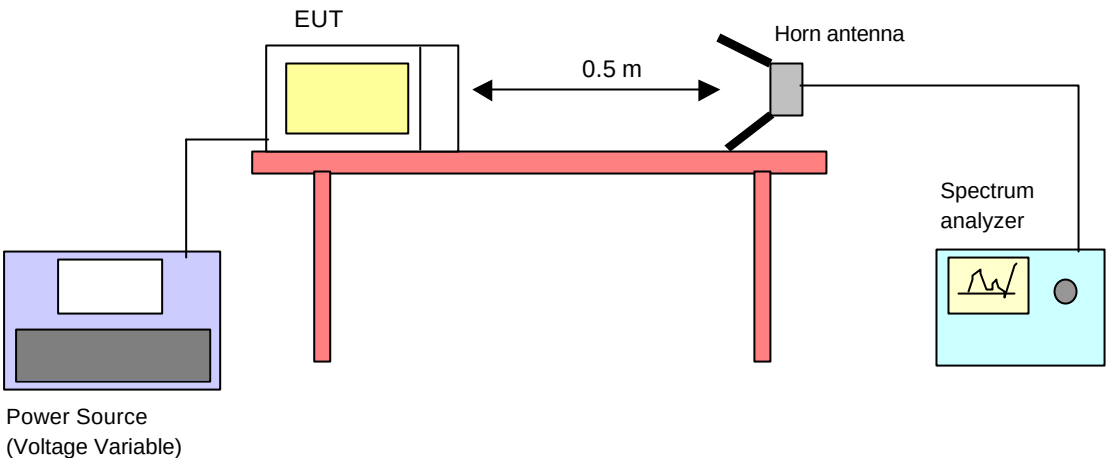

Fig. 4 Operating Frequency Measurements Configuration

Fig. 5 Test Setup for Operating Frequency Measurements

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4.4.1 Variation in Operating Frequency with Time Measurement

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 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 :	**2439** MHz
Minimum frequency allowed :	2400 MHz
Maximum frequency observed :	**2463** 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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4.4.2 Variation in Operating Frequency with Voltage Measurement

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.

96Vac	Minimum frequency observed :	**2429** MHz
	Minimum frequency allowed :	2400 MHz
	Maximum frequency observed :	**2462** MHz
	Maximum frequency allowed :	2500 MHz
120Vac	Minimum frequency observed :	**2439** MHz
	Minimum frequency allowed :	2400 MHz
	Maximum frequency observed :	**2463** MHz
	Maximum frequency allowed :	2500 MHz
150Vac	Minimum frequency observed :	**2423** MHz
	Minimum frequency allowed :	2400 MHz
	Maximum frequency observed :	**2462** MHz
	Maximum frequency allowed :	2500 MHz

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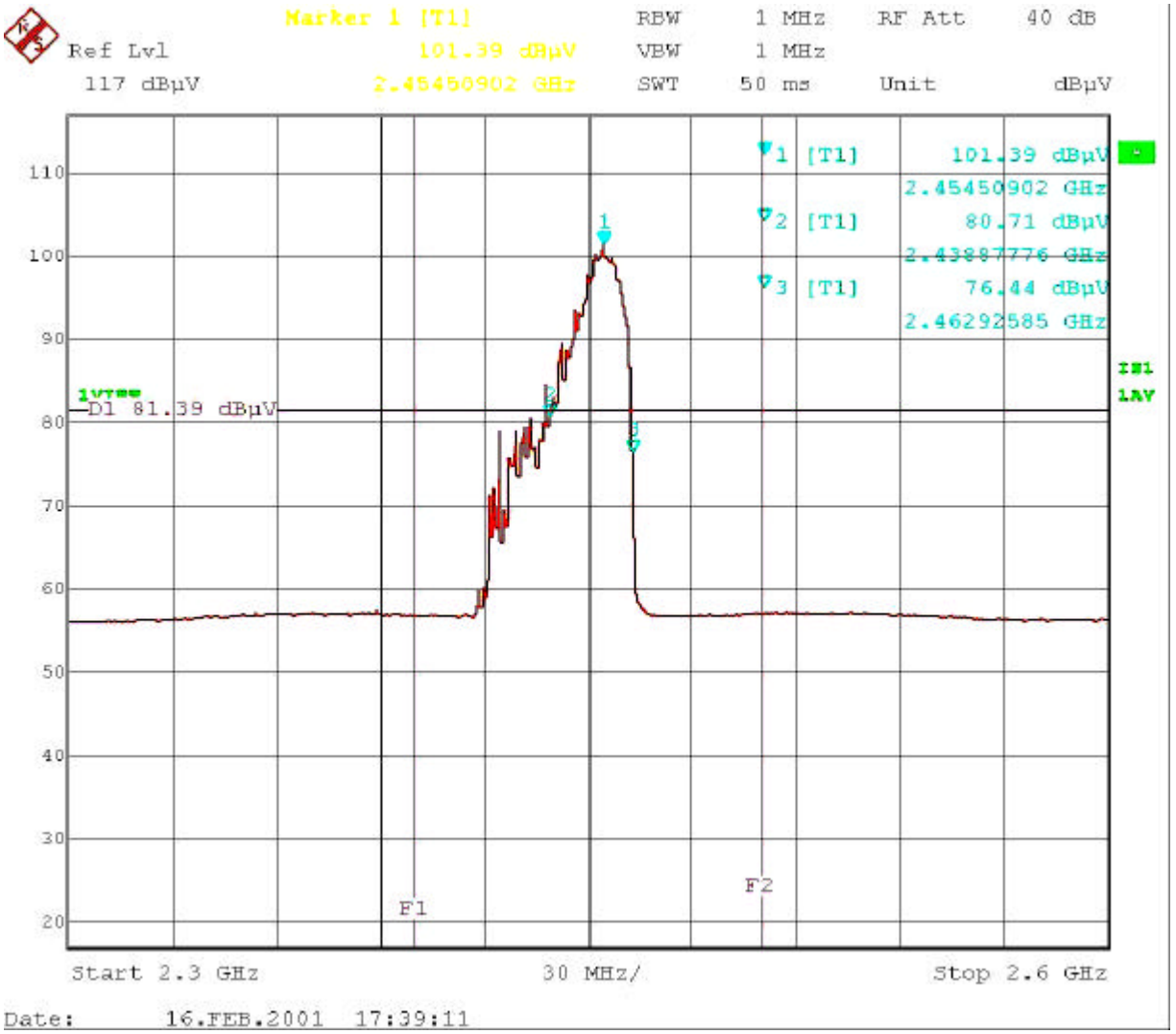
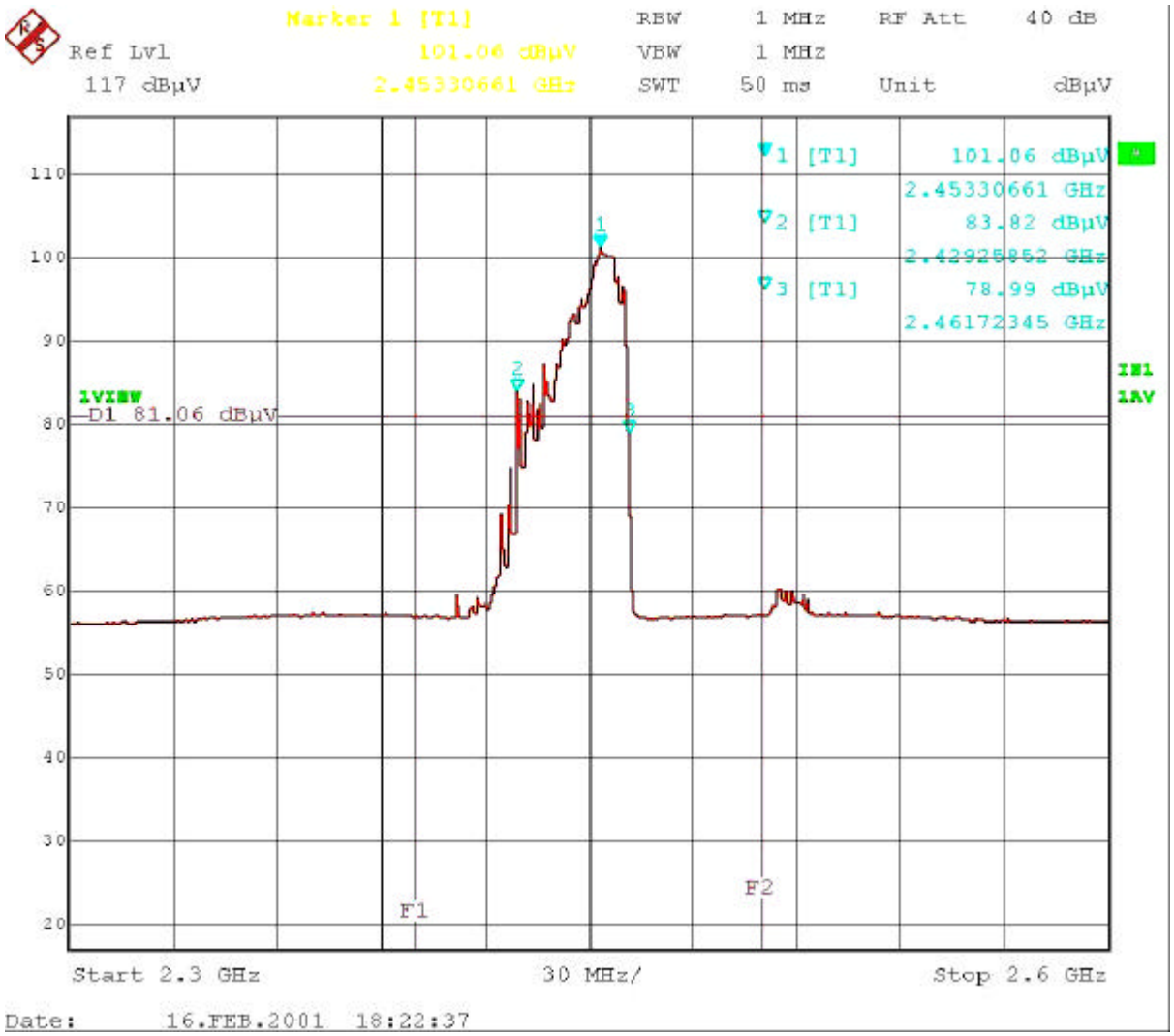
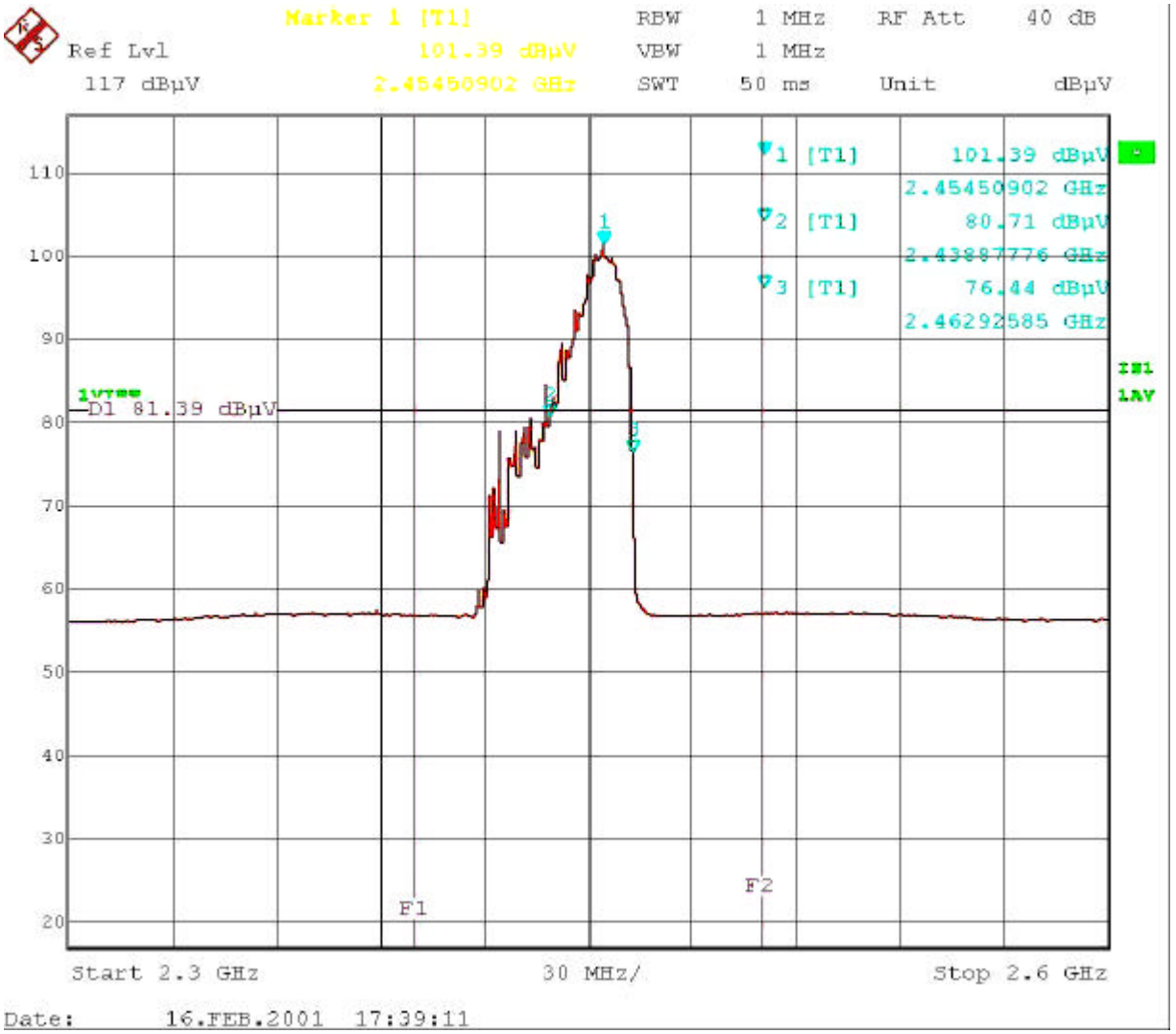
4.4.3 Variation in Operating Frequency with Time Plot



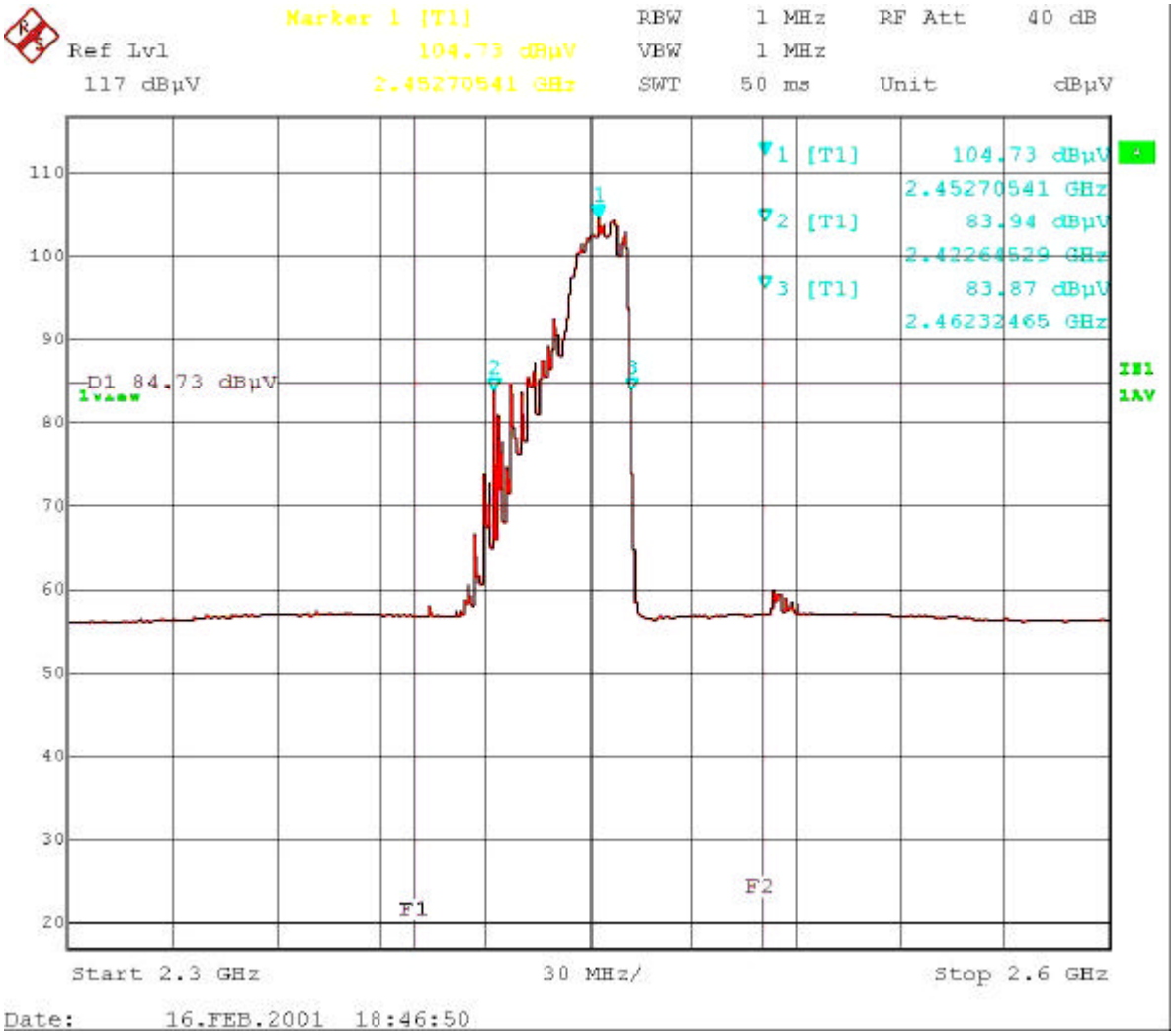
4.4.4 Variation in Operating Frequency with Voltage Plot(96Vac)



4.4.5 Variation in Operating Frequency with Voltage Plot(120Vac)



4.4.6 Variation in Operating Frequency with Voltage Plot(150Vac)



4.5 Radiated Emission Measurement

4.5.1 Radiated Emission Measurement Procedure

Radiated emission were measured over an inclusive frequency range to 30MHz through the tenth harmonic of the operating frequency. For this test, a 0.8-meter high wooden table in a semi-anechoic chamber supported the device under test. The table was placed on a turntable.

The measurement antenna was placed 3 meters for measurement from 30 to 1,000MHz and 1 meter for measurement from 1 - 25GHz, respectively, for the device under test. The indicated frequency range was swept as device under test was rotated along its vertical axis in 90 degree 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 level of the second and third harmonic were measured inclusively with a 300-ml and 700-ml water load alternately placed in the center and side(or right front corner) of the oven.
The data obtained during these tests is contained on this report.

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 1GHz, the test receiver detecting mode was set to average detection mode(Model no.:ESI , Rohde & Schwarz).

For all emissions the equivalent 300 meters intensity was calculated assuming linear decrease in the described, there were no over-limit emissions discorvered.

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4.5.2 Radiated Emission Measurement Configuration

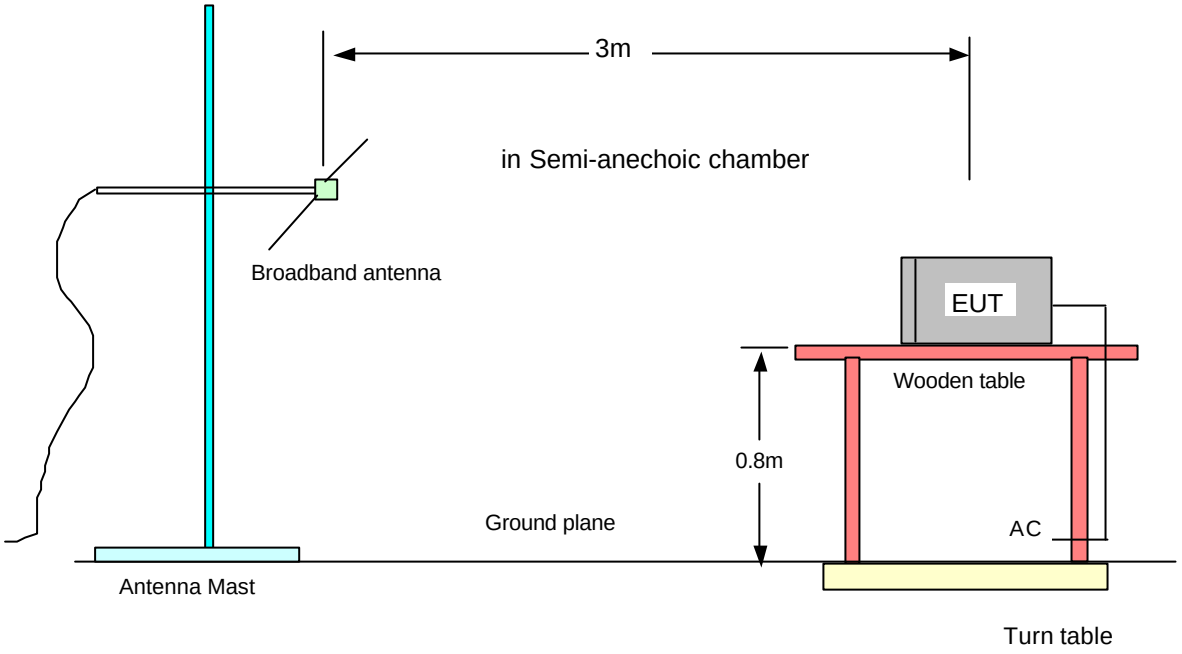

Fig. 6 Radiated Emission Configuration(30 - 1000MHz)

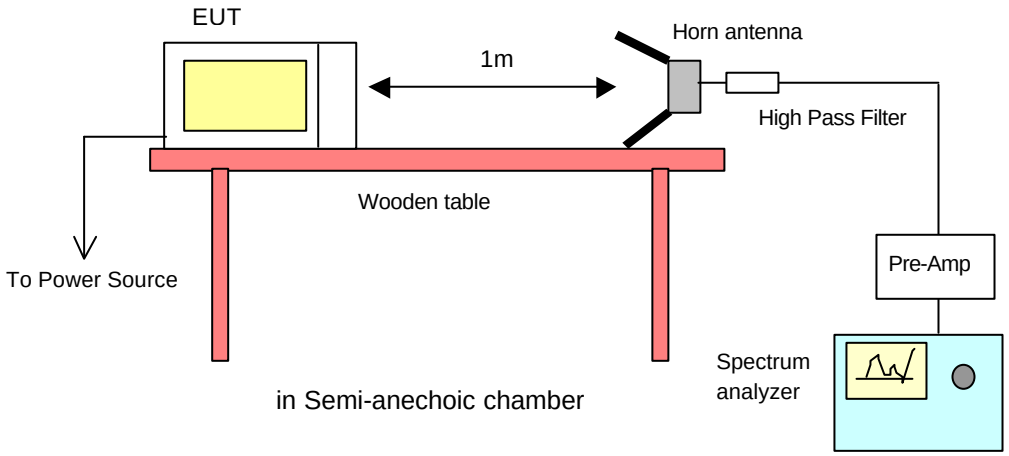

Fig. 7 Radiated Emission Configuration(1 - 25GHz)

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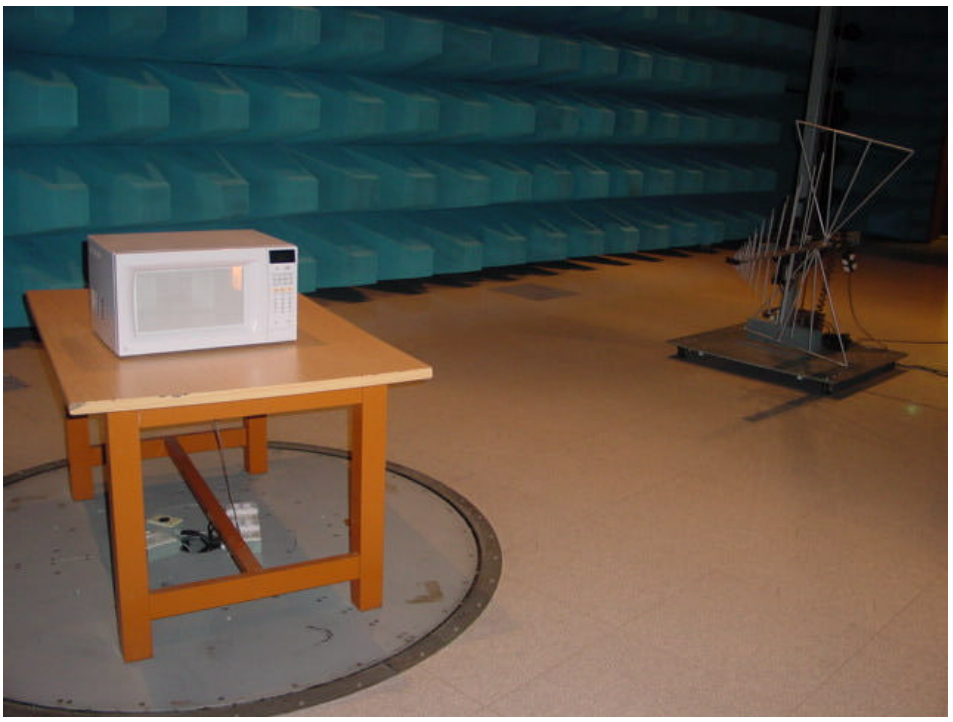

Fig. 8 Radiated Emission setup(30 - 1000MHz)

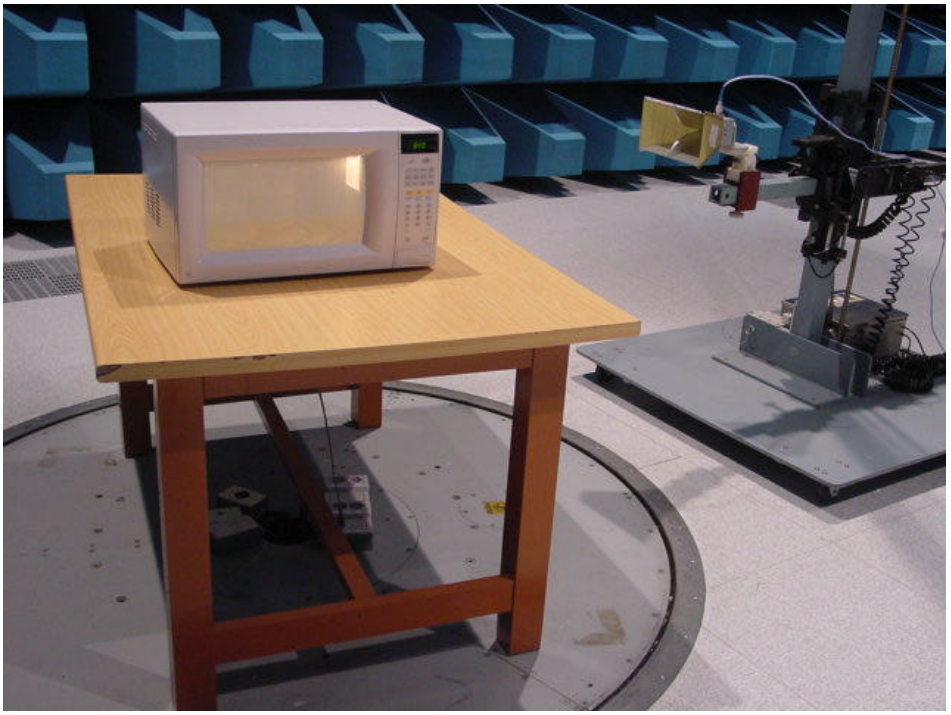

Fig. 9 Radiated Emission setup(1 - 25GHz)

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4.5.3 Radiated Emission Measurement Data(30 - 1000MHz)

Tested Frequency [MHz]	Meter Reading [A] [dBuV]	Total Loss [B] [dB]	Results [A+B] [dBuV/m]	Limits at 3m [dBuV/m]	ANT Pol.	Margin (Result-Limit) [dB]	Antenna Height [Cm]	Turn table Degree [Deg]
	Pk		**Pk**			**Pk**		
65.3	26.5	9.2	35.7	69.86	H	-34.16	148	312
89.5	32.3	9.12	41.4	69.86	H	-28.44	150	316
123.5	34.3	9.46	43.8	69.86	H	-26.10	152	285
194.1	36.5	11.93	48.4	69.86	V	-21.43	143	287
215.2	25.9	12.12	38.0	69.86	H	-31.84	128	324

[NOTE]

** fo = 2450MHz*
** Test distance : 3m*
** Results = Meter Reading + Total Loss(Antenna factor + Cable loss)*
** Distance Correction factor : 20 x log(d1/d2)[dBuV/m]*

20 x log(300/3) = + 40dBuV/m

** The limit at 300 meters is* 29.86 *dBuV/m.*
Add 40dB to 29.86 *dBuV/m gives a* 69.86 *dBuV/m @ 3 meters.*
** Spectrum analyzer setting*
Peak(Pk) : Resolution Bandwidth(1MHz), Video Bandwidth(1MHz)

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4.5.4 Radiated Emission Measurement Data(1 - 25GHz)

Tested Frequency [MHz]	Meter Reading [dBuV]	Total Loss [dB]	AMP [dB]	DIST [dB]	HPF [dB]	Results [A+B] [dBuV/m]	Limits at 1m [dBuV/m]	ANT Pol.	Margin [dB]
	Av					**Av**	**Av**		**Av**
1.093	29.4	39.82	31.25	49.54	0	-11.57	29.86	V	-41.43
2.261	32	39.82	31.25	49.54	0	-8.97	29.86	V	-38.83
3.434	22.3	39.82	31.25	49.54	0	-18.67	29.86	V	-48.53
4.597	31.2	39.82	31.25	49.54	1	-8.77	29.86	V	-38.63
4.912	36.3	39.82	31.25	49.54	1	-3.67	29.86	V	-33.53
5.4	30.7	41.4	31.25	49.54	1	-7.69	29.86	H	-37.55
6.875	31.65	41.4	31.25	49.54	1	-6.74	29.86	H	-36.60
6.384	33.8	42.14	31.25	49.54	1	-3.85	29.86	V	-33.71
7.367	42.5	42.14	31.25	49.54	1	4.85	29.86	V	-25.01
12.274	32.3	46.75	31.25	49.54	1	-0.74	29.86	V	-30.60
14.724	45	47.21	31.25	49.54	1	12.42	29.86	V	-17.44
19.647	33.2	47.51	31.25	49.54	1	0.92	29.86	V	-28.94

[NOTE]

** **f**o = 2450MHz*

** **DIST**: Correction to extrapolate reading to 300m specification distance*

** **Total Loss**: Antenna Factor+ Cable Loss, **HPF** : High Pass Filter(4.5GHz)*

** **AMP** : Pre-amplifier*

** Distance Correction factor : 20 x log(d1/d2)[dBuV/m]*

20 x log(300/1) = + 49.542dBuV/m

** The limit at 300 meters is* 29.86 *dBuV/m @ 1 meters.*

** Results = Meter Reading +Total Loss-AMP-DIST+HPF*

** Margin = Result-Limit*

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5. Measurement Equipment List

Equipment	Model No.	Serial No.	Makers	Calibration Last calibration and Interval
Spectrum analyzer	8566B	3340A21744	H.P	00/ 3/15, 12Months
Spectrum analyzer	8563E	3623A05349	H.P	00/ 3/15, 12Months
Quasi-peak adapter	85650A	2521A00687	H.P	00/10/10, 12Months
RF Preselector	85685A	2602A00224	H.P	00/10/10, 12Months
Pre-Amplifier	8449B	3008A00705	H.P	00/ 7/ 3, 12Months
Field strength meter	ESI	832692/002	R & S	00/ 6/13, 12Months
Field strength meter	ESS	844861/005	R & S	00/ 6/23, 12Months
Double Ridged Guide Antenna	3115	9505-4441	EMCO	00/ 5/23, 12Months
Double Ridged Guide Antenna	3116	2202	EMCO	00/ 5/23, 12Months
Microwave Survey Meter	HI-1501	93661	H.I	00/10/2, 1Months
High Pass Filter	3H10-4500	2	K & L	00/11/23, 12Months
Biconilog Antenna	3142	1237	EMCO	01/1/2, 12Months

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