EMC TEST REPORT

According to FCC CFR47 Part 18 Subpart C

JOB Number : LBE060032

1. *This test report 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 200623-0

1. Applicant Name : SAMSUNG ELECTRONICS CO., LTD.
416 Maetan 3-Dong, Yeongtong-Gu, Suwon-Si,
Gyeonggi-Do, Korea, 443-742

2. Identification of tested device

2.1 FCC ID : A3LMW1136
2.2 Device Name : MICROWAVE OVEN
2.3 Trade Name : GE
2.4 Model Number : JES1136WL
Variant Model : None
2.5 RF Output Power : **1100** W (by IEC 705 method)

3. Test Procedure and Items

3.1 FCC/OST MP-5 : 1986

4. Issued Date : January 16, 2005

Tested by:
Hee Sung, KIM / Test Engineer

Reviewed by:
No Cheon, PARK / Manager of EMC Lab.

Authorised by:
Seung Kyu, CHA / Chief of EMC Lab.

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5. Measurement Equipment List

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1. Product Description

The equipment under test is a microwave oven sold for commercial use.
Model : JES1136WL is a 1100 W microwave oven with digital controls.
Installation Type: UTC
Clock Frequency : 8 MHz

< Magnetron >

Model : OM-75P manufactured by Samsung Electronic Co., Ltd.

< Electrical Ratings >

1) Power Supply : 120 V ac, 60 Hz
2) Operating Frequency : 2450 +/- 50 MHz
3) Power Input : 1550 W
4) RF Power Output : 1100 W (by IEC 705 method)

2. Test Facility

The Semi-anechoic chamber and Conducted measurement facilities used to collect the radiated data are located at 416, Maetan 3-Dong, Yeongtong-Gu, Suwon-Si, Gyeonggi-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: 200623-0 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.

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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.

Fig. 1 Test Setup for Radiation Hazard Measuerment

The results of this test are as follows.

Probe Location	Maximum Leakage [mW/Cm2]	Limit [mW/Cm2]
1	0.15	1.0
2	0.10	1.0
5	0.10	1.0
All others	0.10	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 current [amps]
120	**13.96**	**1615**	**1550**

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	10	**19.9**	120	1070.0
1000	10	**20.1**	120	1093.0
1000	10	**20.1**	120	1093.0
Average RF Power of 3 Trials				1085.3

$$\text{Power [W]} = \frac{(4.187) * L_w * (T_f - T_i) + 0.55 * B_i * (T_f - T_r)}{t}$$

Magnetron type: OM-75P

L_w : Mass of the water, in grams
B_i : Mass of the container, in grams
T_f : Final temperature of the water, in °C
T_i : Initial temperature of the water, in °C
T_r : Ambient temperature, in °C
t : Heating time in seconds, excluding the magnetron filament heat-up time.

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

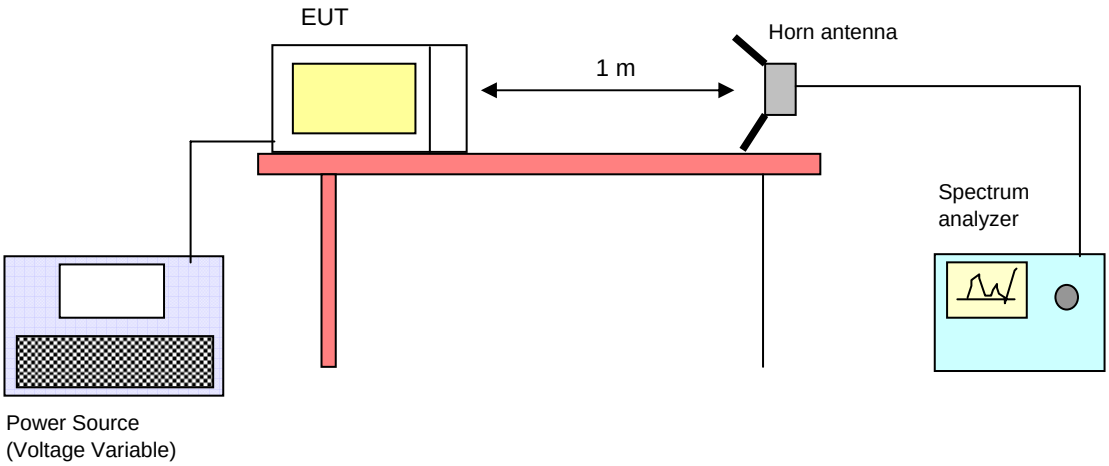

Fig. 4 Operating Frequency Measurements Configuration

4.4.1 Frequency 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 results of this test are as follows.
Line voltage varied from 96Vac to 150Vac.

Initial load : 1000 ml water in the glass beaker

(1) Frequency vs Line Voltage Variation Test

[Room Temperature : 21.0 ℃]

Line Voltage Variation (V)	Frequency (MHz)	Allowed Tolerance for the ISM Band (2450MHz)
150 (125%)	Lower : 2437	Lower: 2400 MHz Upper : 2500 MHz
	upper : 2468	
132(110%)	Lower : 2431	
	upper : 2469	
120 (Nominal)	Lower : 2440	
	upper : 2475	
108 (90%)	Lower : 2429	
	upper : 2471	
96 (80%)	Lower : 2425	
	upper : 2469	

Result : PASSED

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(2) Frequency vs Load Variation Test

Initial load : 1000 ml water in the glass beaker

[Room Temperature : 21 ℃]

Volume of Water (cc)	Frequency (MHz)	Allowed Tolerance for the ISM Band (2450MHz)
1000	Lower : 2440	Lower: 2400 MHz Upper : 2500 MHz
	upper : 2475	
800	Lower : 2411	
	upper : 2486	
600	Lower : 2406	
	upper : 2488	
400	Lower : 2420	
	upper : 2482	
200	Lower : 2424	
	upper : 2483	

Note : Frequency was measured by using nominal voltage (AC120V)

Result : **PASSED**

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4.5 Conducted Emission Measurement

4.5.1 Conducted Emission Measurement Procedure

Configurate the EUT System in accordance with ANSI C63.4-2003 section 6 and 7.
Connect the EUT's AC line cord to the EUT port of LISN.
All input terminals are terminated in the proper impedance.
The output ports are connected to the cable provided with the device and the ending port are terminated in the proper impedance.

Using a calibrated coaxial cable, the TEST RECEIVER is connected to the measuring port of the LISN for EUT.
To find out the maximum emission, change the position of the cable, and the EUT operation mode under normal usage of the EUT.
Then, the emission are scanned from 0.15MHz to 30MHz relative to the limit are recorded.

4.5.2 Conducted Emission Measurement Configuration

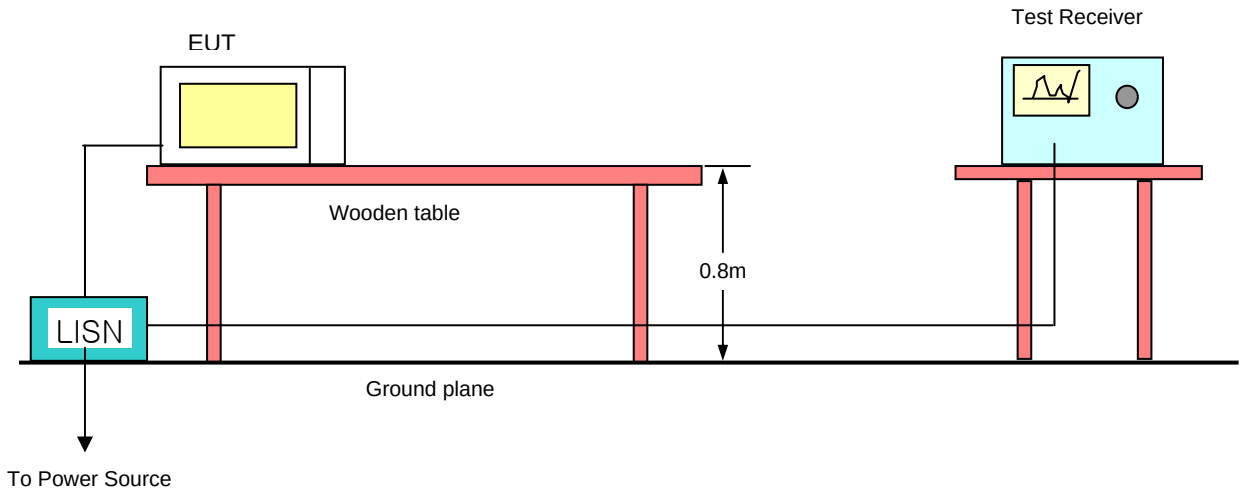
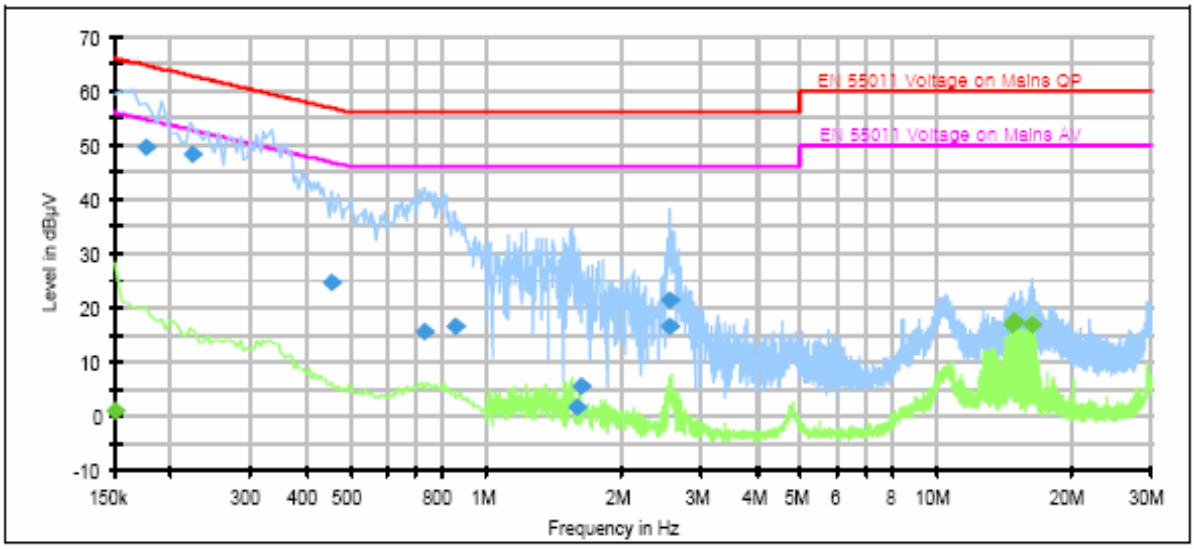


Fig. 5 Conducted Emission Configuration(0.15 - 30MHz)

4.5.3 Conducted Emission Measurement Data(0.15 - 30MHz)



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBµ V)	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)
0.175000	49.6	N	0.2	15.0	64.7
0.224000	48.4	L1	0.2	14.3	62.7
0.451750	24.6	L1	0.1	32.3	56.8
0.733250	15.7	N	0.2	40.3	56.0
0.855500	16.7	N	0.2	39.3	56.0
1.598250	1.7	N	0.2	54.3	56.0
1.627500	5.5	L1	0.2	50.5	56.0
2.552250	21.4	N	0.3	34.6	56.0
2.566750	16.6	L1	0.3	39.4	56.0

Final Measurement Detector 2

Frequency (MHz)	Average (dBµ V)	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)
0.150000	1.1	N	0.1	54.9	56.0
14.749500	17.0	L1	0.9	33.0	50.0
14.871000	17.7	L1	0.9	32.3	50.0
16.231000	16.9	N	1.0	33.1	50.0

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4.6 Radiated Emission Measurement

4.6.1 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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4.6.2 Radiated Emission Measurement Configuration

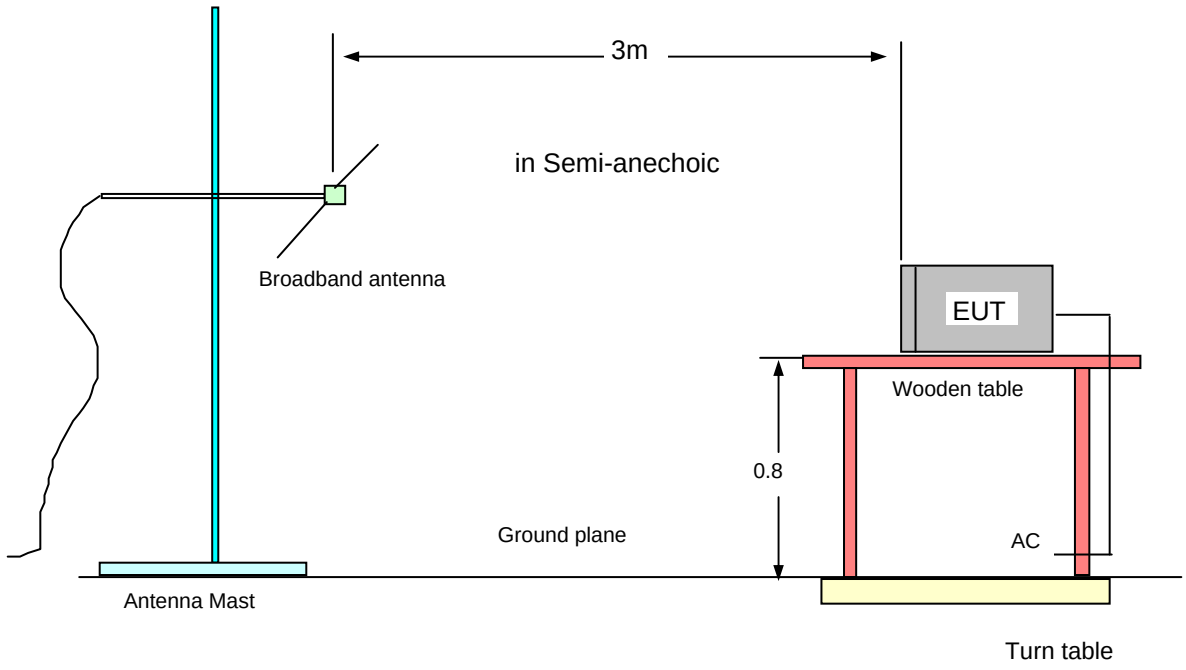

Fig. 6 Radiated Emission Configuration(30 - 1000MHz)

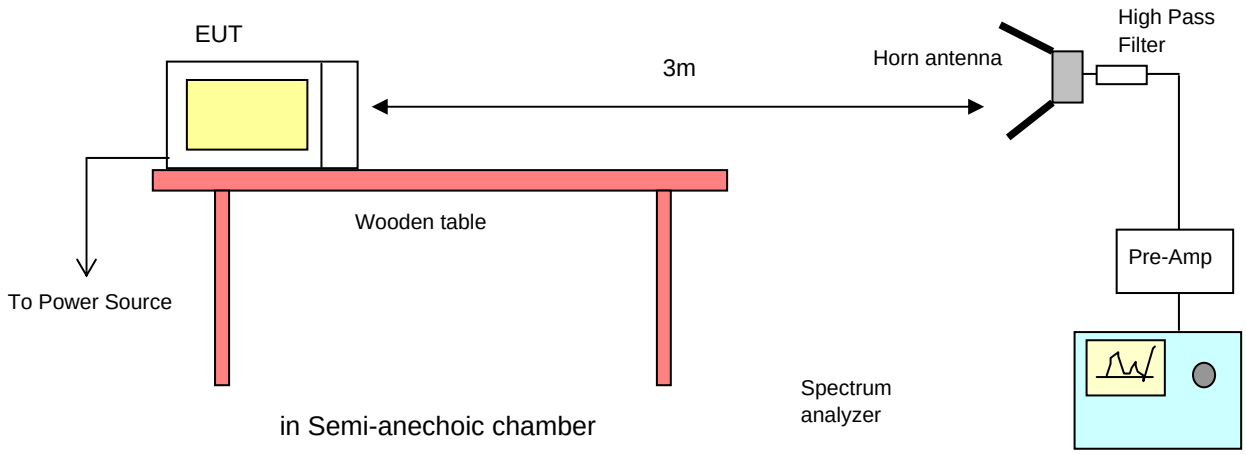

Fig. 7 Radiated Emission Configuration(1 - 25GHz)

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4.6.3 Radiated Emission Measurement Data(30 - 1000MHz)

Test distance : 3m

Tested Frequency [MHz]	Meter Reading [A] [dBuV]	Total Loss [B] [dB]	Results [A+B] [dBuV/m]	Limits at 3m [dBuV/m]	ANT Pol.	Margin (Limit-Result) [dB]	Antenna Height [Cm]	Turn table Degree [Deg]
	Pk		**Pk**			**Pk**		
43.5	47.6	-13.5	34.1	71.32	V	37.22	100	125
46.2	59.4	-14.7	44.7	71.32	V	26.62	200	159
47.3	52.6	-15.3	37.3	71.32	V	34.02	100	347
48.9	58.6	-16.1	42.5	71.32	V	28.82	100	347
50.0	55.0	-16.6	38.4	71.32	V	32.92	200	354
55.4	49.5	-19.2	30.3	71.32	V	41.02	100	125
59.2	47.7	-20.9	26.8	71.32	H	44.52	300	2
60.8	52.3	-21.4	30.9	71.32	V	40.42	100	347
63.0	54.1	-22.1	32.0	71.32	V	39.32	200	354
981.7	32.2	0.3	32.5	71.32	H	38.82	300	336

[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* 31.32 *dBuV/m.*

Add 40dB to 31.32 *dBuV/m gives a* 71.32 *dBuV/m @ 3 meters.*

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4.6.4 Radiated Emission Measurement Data(1 - 25GHz)

Test distance : 3m

Tested Frequency [MHz]	Meter Reading [dBuV]	Total Loss [dB]	AMP [dB]	HPF [dB]	Results at 300m [dBuV/m]	Limits at 300m [dBuV/m]	ANT Pol.	Margin [dB]
1220	39.8	25.4	37.4	0	-12.20	31.32	H	-43.52
2390	53.3	29.4	38.3	0	4.40	31.32	H	-26.92
4936	58.6	35.4	39.5	1	14.50	31.32	V	-16.82
5386	60.2	35.8	39.4	1	16.60	31.32	V	-14.72
6161	63.2	36.7	39.2	1	20.70	31.32	V	-10.62
6521	61.5	37.1	39.1	1	19.50	31.32	V	-11.82
7070	62.3	37.9	39.0	1	21.20	31.32	V	-10.12
7926	60.8	40.4	39.0	1	22.20	31.32	V	-9.12
10430	57.3	42.5	39.1	1	20.70	31.32	V	-10.62
12780	57.4	43.7	39.2	1	21.90	31.32	V	-9.42
14800	60.7	41.3	39.3	1	22.70	31.32	V	-8.62
17870	58.3	44.0	38.2	1	24.10	31.32	V	-7.22

** **f**o = 2450MHz*
** **Total Loss** : Antenna Factor + Cable Loss, **HPF** : High Pass Filter(4.5GHz)*
** **AMP** : Pre-amplifier*
** The limit at 300 meters is 20 * LOG (25 * RF Power/500)*
** Margin = Limit-Result*

CALCULATIONS - Calculation of the equivalent 300 meter field strength was performed assuming a linear fall-off in the field strength with increased distance from the EUT.

** Field Strength (uV/meter at 300 meters) = K x 10 ^ [(MR+TL-AMP) / 20]*
Where: K is the ratio of: [measurement distance / requirement distance]
MR: Meter Reading
TL: Total Loss

[NOTE]
1. Load for measurement of radiation on second and third harmonic : Two loads, one of 1000ml and the other of 450ml, of water were used. Each load was tested both with the beaker located in the center of the oven and with it in the corner.

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5. Measurement Equipment List

Equipment	Model No.	Serial No.	Makers	Next calibration date and Interval
EMI TEST RECEIVER	ESCI	100086	R & S	06/08/23, 12Months
ARTIFICIAL MAINS NETWORK	ESH2-Z5	831886/007	R & S	06/10/11, 12Months
Measurement Software	EMC 32	Ver 4.40	R & S	N/A
EMI TEST RECEIVER	ESI26	832692/002	R & S	06/02/26, 12Months
EMI TEST RECEIVER	ESI26	100290	R & S	06/04/13, 12Months
Biconilog Antenna	CBL6141A	4265	SCHAFFNER	06/05/24, 12Months
Pre-Amplifier	310N	251673	SONOMA	06/03/08, 12Months
Double Ridged Guide Antenna	3115	9505-4441	EMCO	06/01/16, 24Months
Microwave Survey Meter	HI-1501	93661	H.I	06/10/02, 12Months
High Pass Filter	3H10-4500	2	K & L	06/11/30, 12Months
Amplifier	DWT-18213	004-9942	DSB Microwave	06/12/01, 12Months

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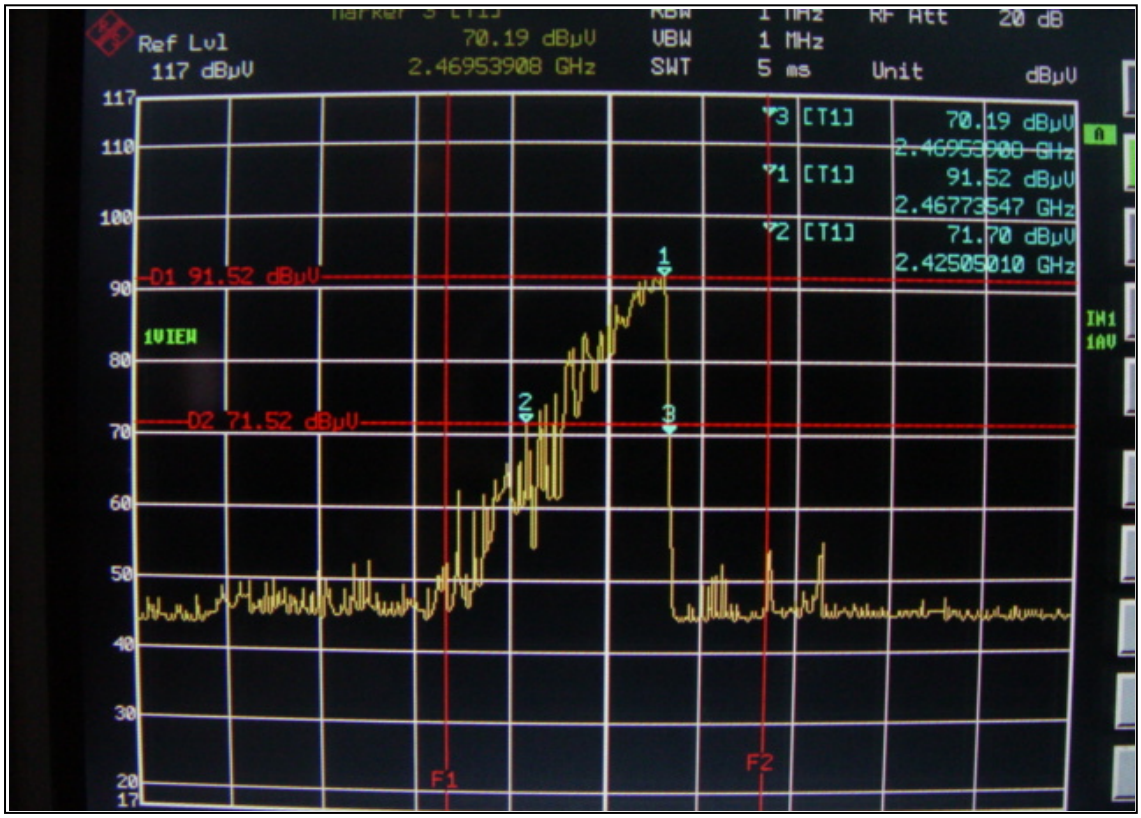
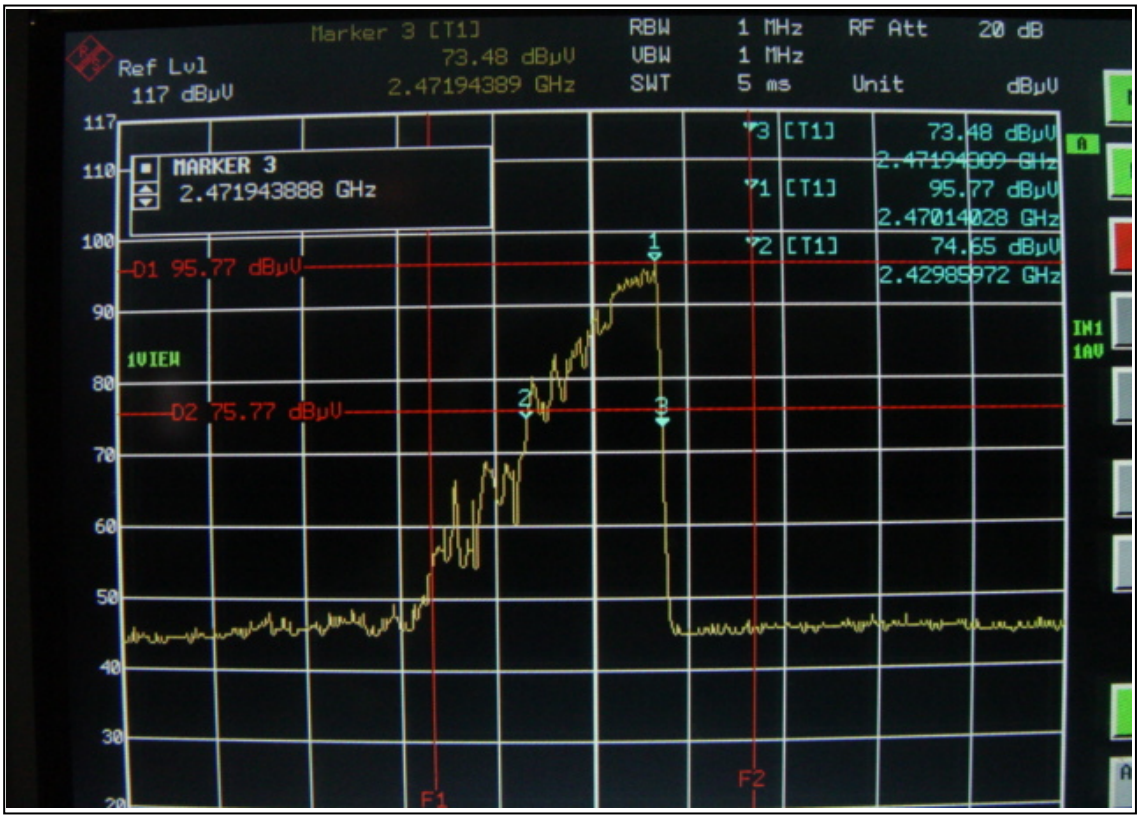
Frequence vs Line Voltage Variation Test

96V(80%)

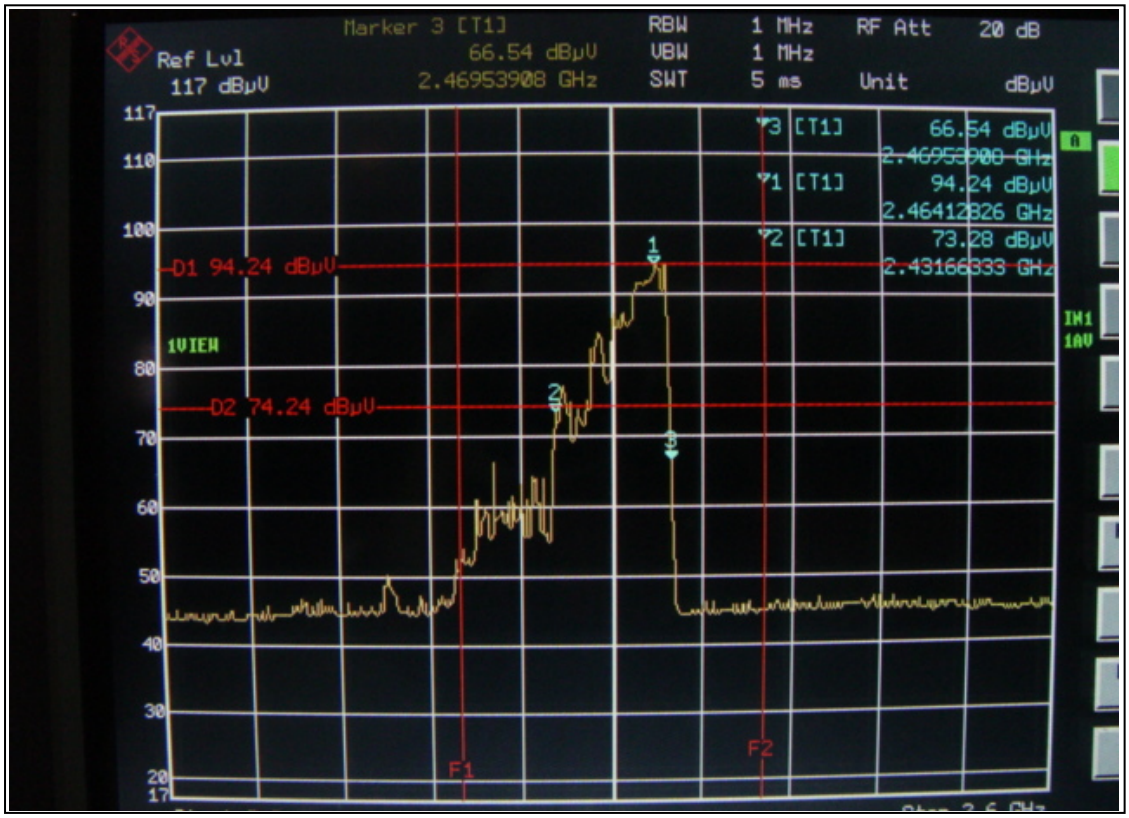


108V(90%)

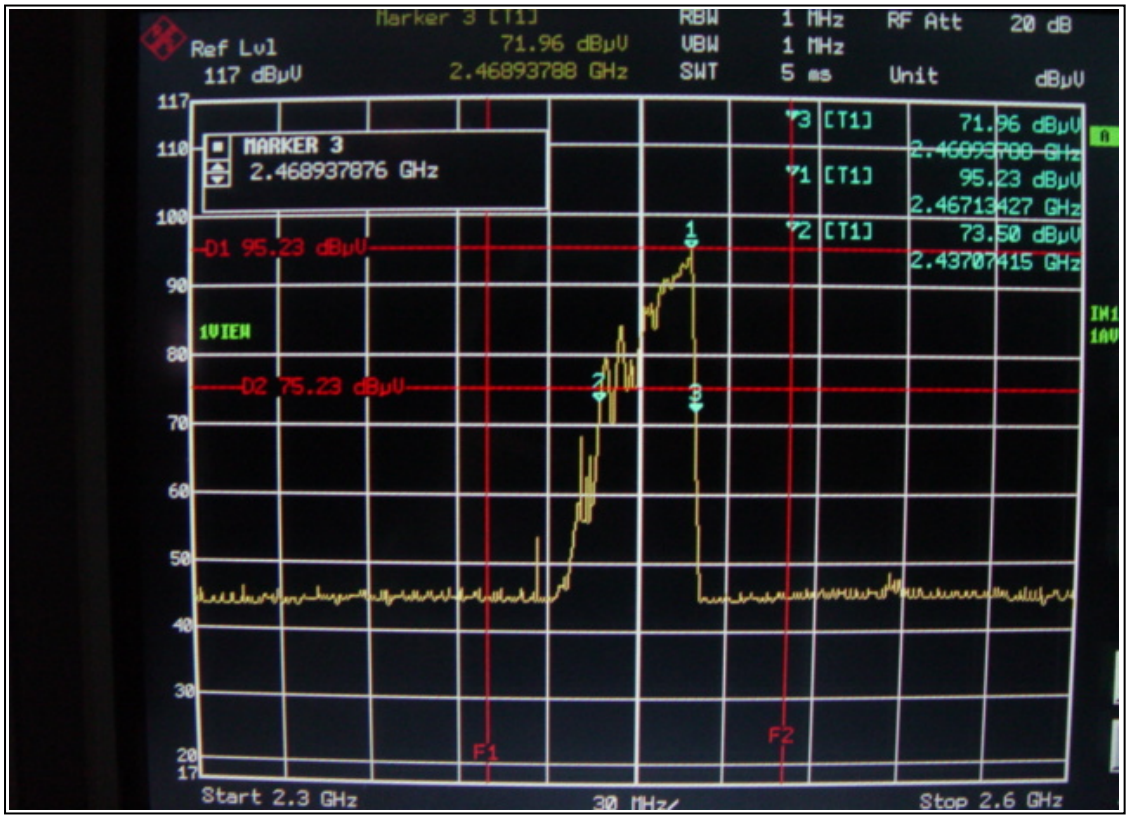


Frequence vs Line Voltage Variation Test

132V(110%)

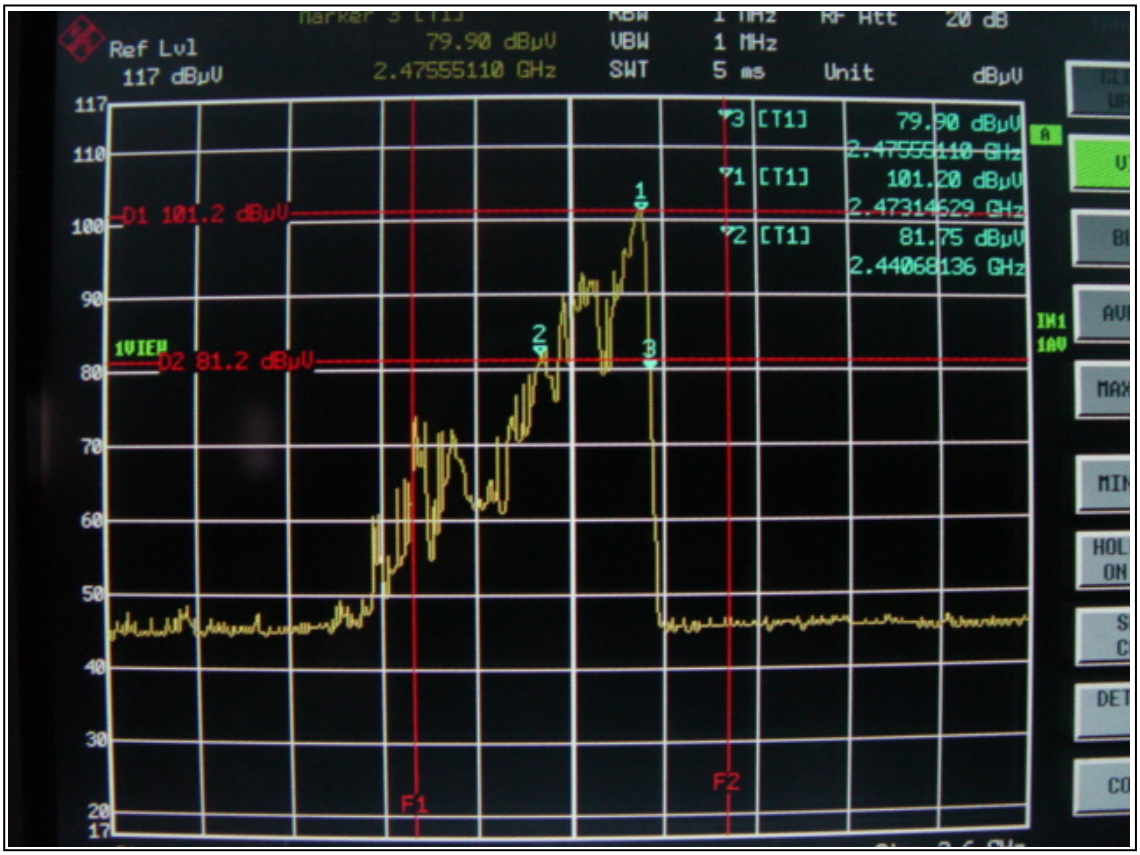


150V(125%)

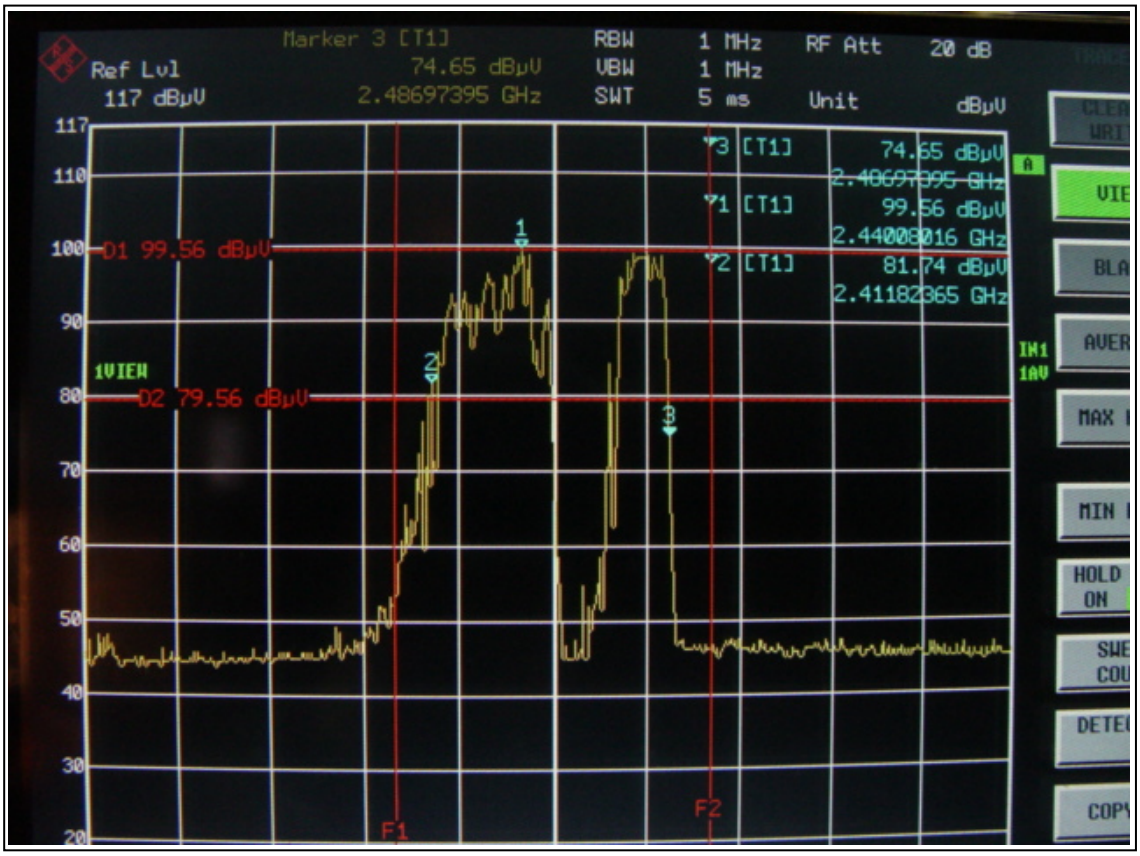


Frequence vs Load Variation Test

120V(1000ml)

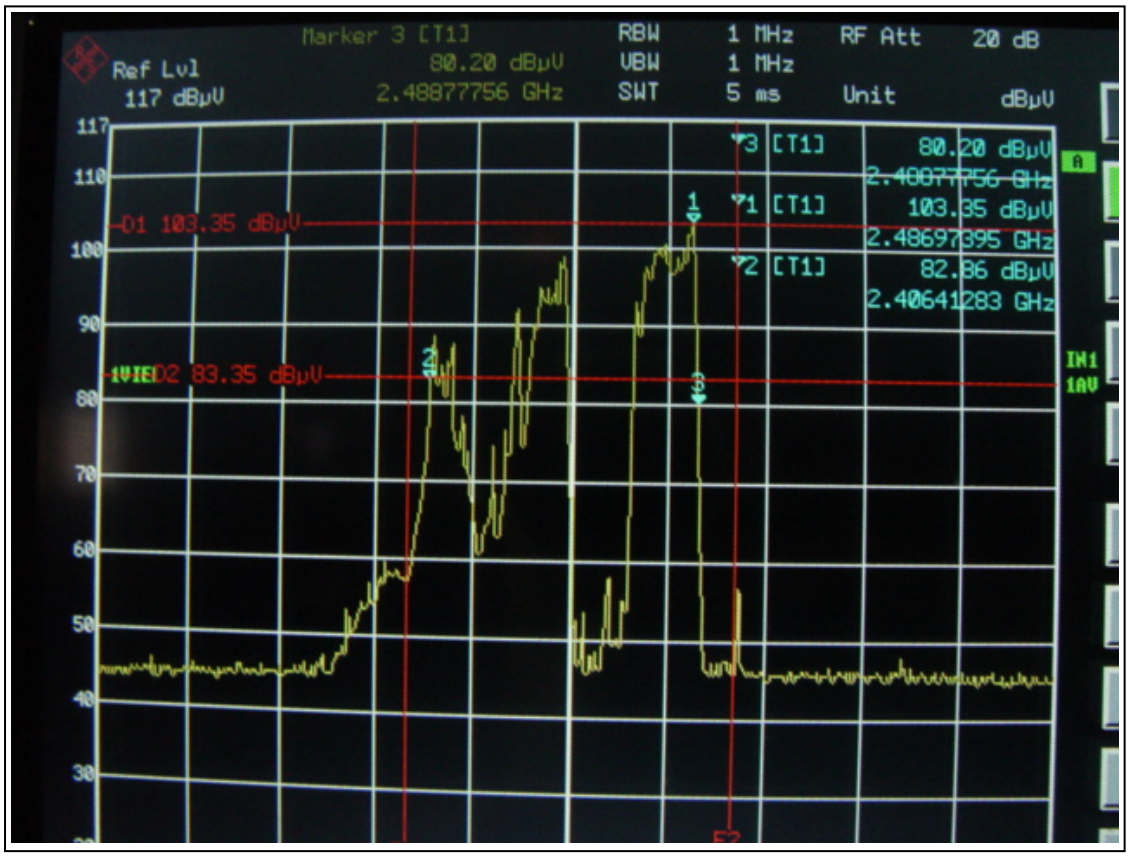


120V(800ml)

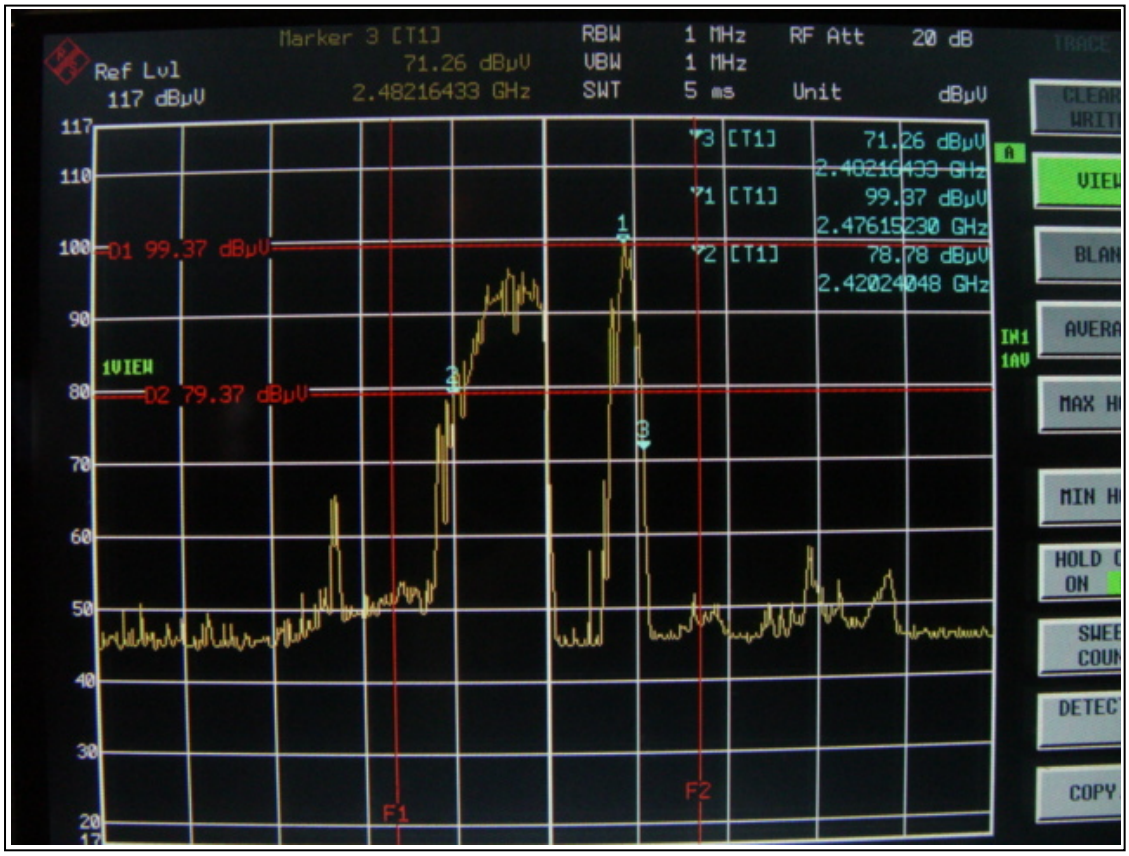


Frequence vs Load Variation Test

120V(600ml)

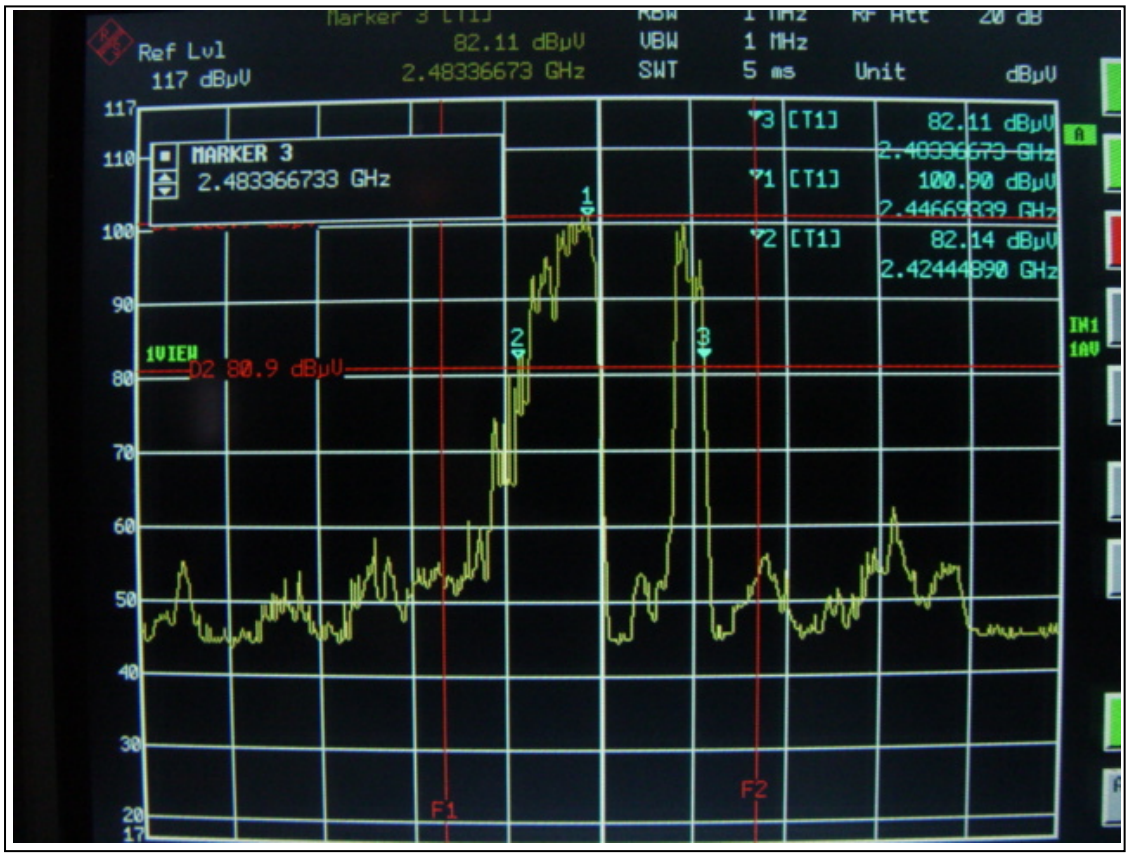


120V(400ml)



Frequence vs Load Variation Test

120V(200ml)



Label location

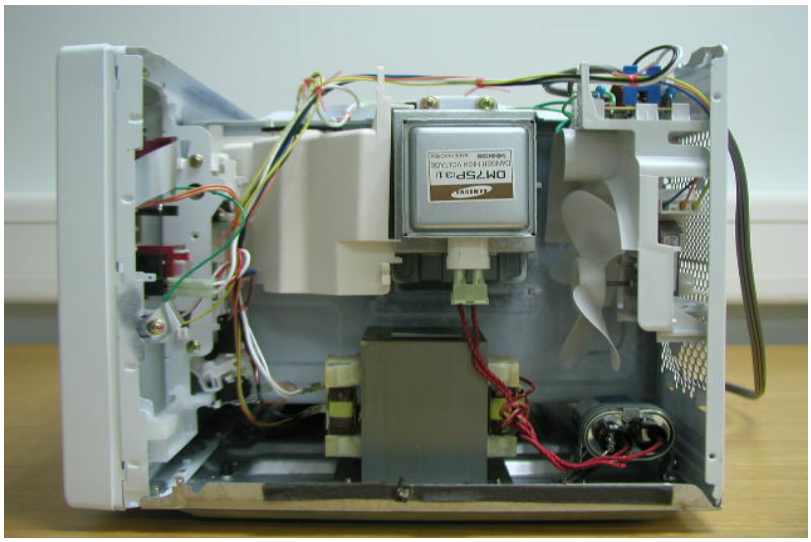
EUT Photography

Front

Left

Right

Rear

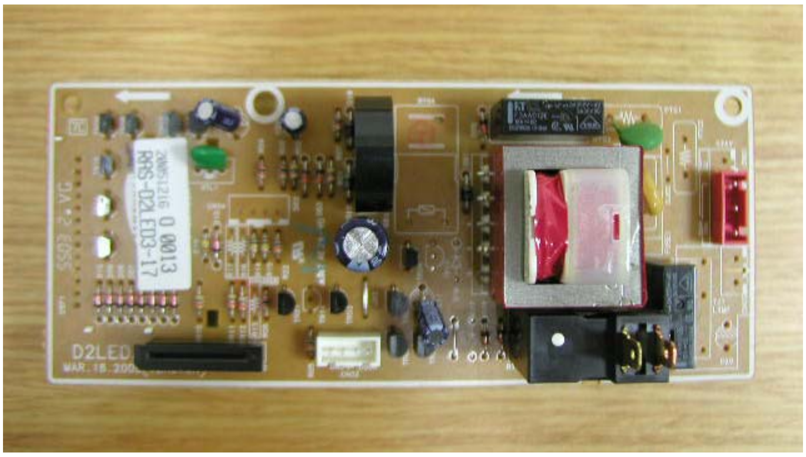


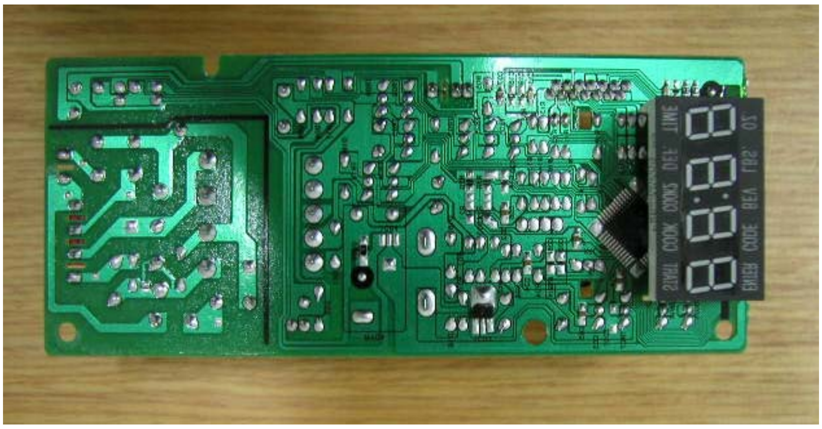
Inside

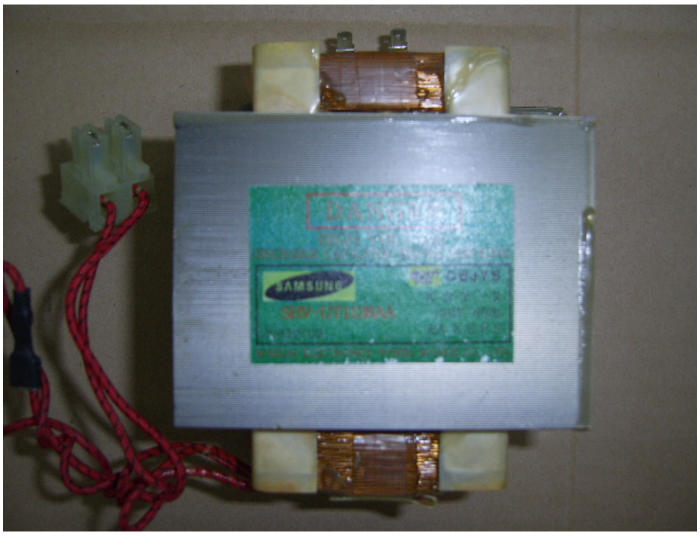
SAMSUNG
OM75P(31)
DANGER HIGH VOLTAGE
54BN043890
MADE IN KOREA

H.V.CAPACITOR
HCH-212095C TB5 B
2100VAC 50/60Hz
0.95 uF ± 3% 10/085/21
NO PCB'S
DANGER H. V.
2501-001016

250V FUSE 20A
LF
GND
UF11B


D2LED




SAMSUNG