EMC TEST REPORT

According to FCC CFR47 Part 18 Subpart C

JOB Number : LBE030973

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 : A3L5TH5896
2.2 Device Name : MICROWAVE OVEN
2.3 Trade Name : SAMSUNG Electronics Co.,Ltd.
2.4 Model Number : MW5896WC
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 : APRIL 30, 2003

Tested by: J. Y Park

Jay Yong, PARK / Test Engineer

Reviewed by: N. C. Park

No Cheon, PARK / Manager of EMC Lab.

Authorised by: K. B. Chung

Kyu Baek, CHUNG / 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 consumer use.
Model : MW5896WC is a 1100 W microwave oven with digital controls.
Installation Type: Count-Top
Clock Frequency : 8.0MHz

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

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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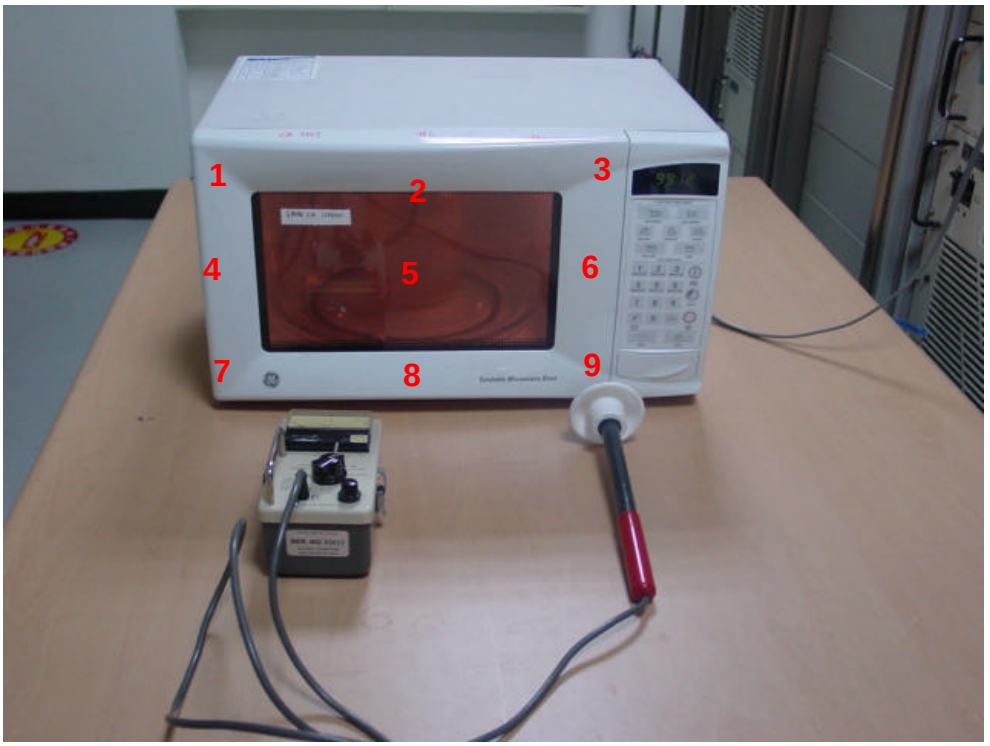
4. Radio Noise Emission Measurement Procedures/Results

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]
3	0.05	4.0
5	0.10	4.0
7	0.05	4.0
All others	0.05	4.0

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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.

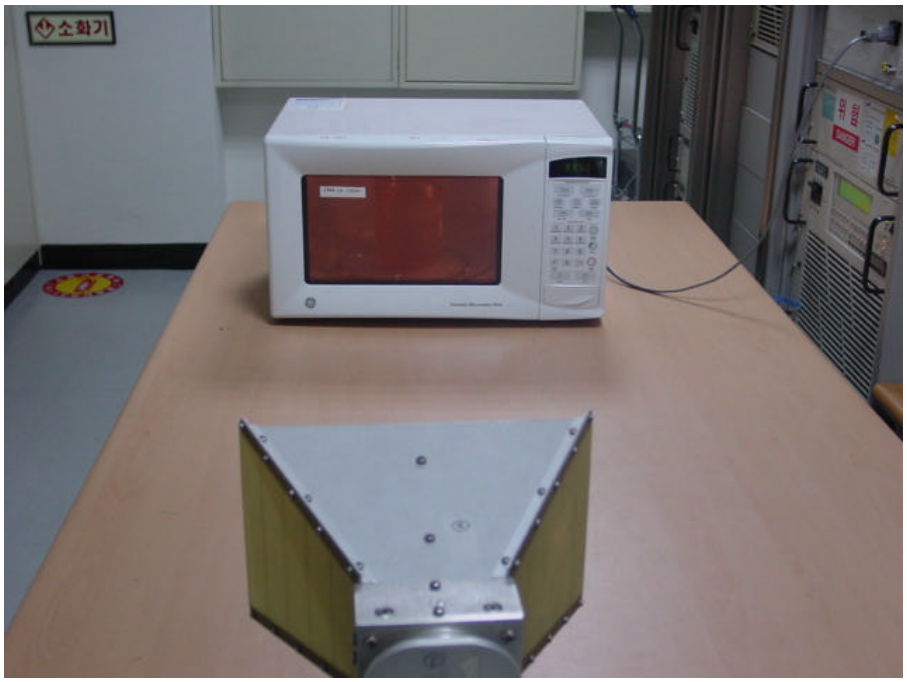

Fig. 2 Test Setup for Input power

The results of this test are as follows.

Input Voltage [Vac]	Input Current [amps]	Measured Input power [watts]	EUT Spec. Input power [watts]
120	12.8	1496	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	35.0	120	872.3
1000	10	35.0	120	872.3
1000	10	35.1	120	875.8
Average RF Power of 3 Trials				873.5

$$\textbf{Power} = \frac{(4.187\ \text{Joules/Cal}) \times (\text{Volume in ml}) \times (\text{Temp. Rise})}{\text{Time in seconds}}$$

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

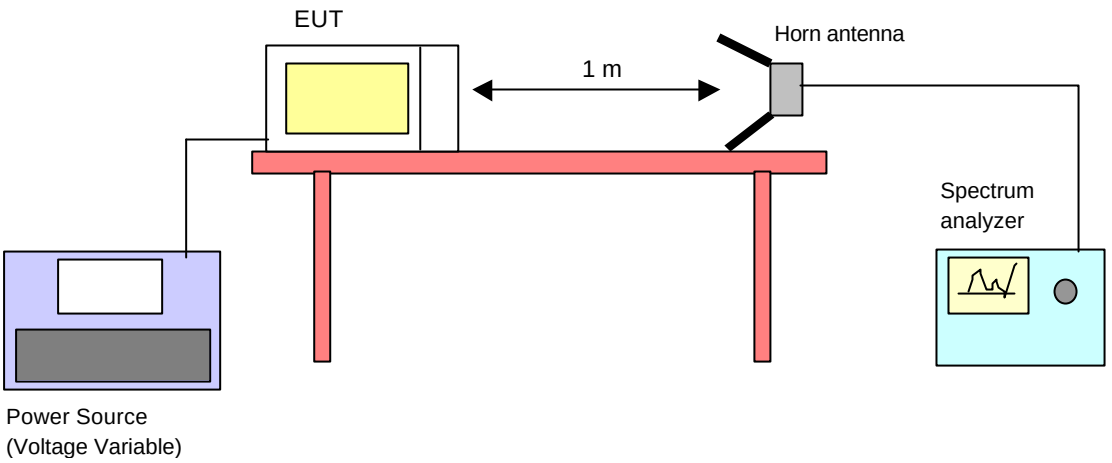

Fig. 4 Operating Frequency Measurements Configuration

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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 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.

Initial load : 1000 ml water in the glass beaker

(1) Frequence vs Line Voltage Variation Test

[Room Temperature : 23 ℃]

Line Voltage Variation (V)	Frequency (MHz)		Allowed Tolerance for the ISM Band (2450MHz)
150 (125%)	Lower :	2401	Lower: 2400 MHz Upper : 2500 MHz
	upper :	2498	
132(110%)	Lower :	2402	
	upper :	2499	
120 (Nominal)	Lower :	2402	
	upper :	2498	
108 (90%)	Lower :	2402	
	upper :	2500	
96 (80%)	Lower :	2400	
	upper :	2499	

Result : PASSED

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(2) Frequence vs Load Variation Test

Initial load : 1000 ml water in the glass beaker

[Room Temperature : 23 ℃]

Volume of Water (cc)	Frequency (MHz)		Allowed Tolerance for the ISM Band (2450MHz)
1000	Lower :	2402	Lower: 2400 MHz Upper : 2500 MHz
	upper :	2497	
800	Lower :	2400	
	upper :	2499	
600	Lower :	2400	
	upper :	2495	
400	Lower :	2409	
	upper :	2493	
200	Lower :	2409	
	upper :	2477	

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

Result : PASSED

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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

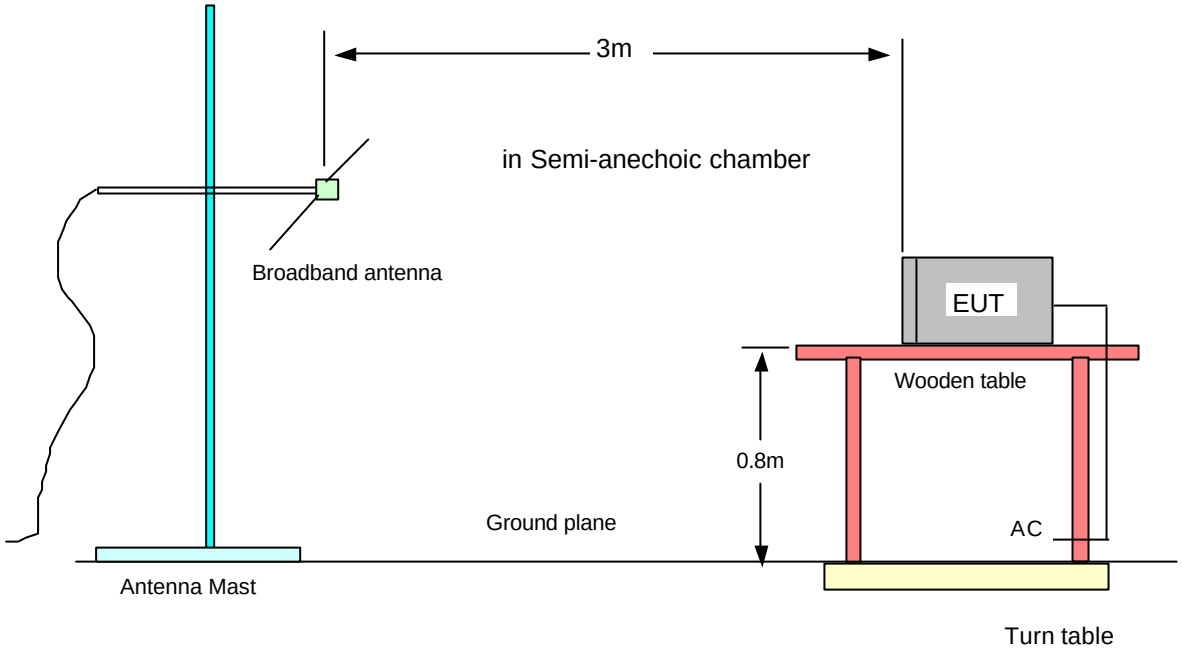

Fig. 6 Radiated Emission Configuration(30 - 1000MHz)

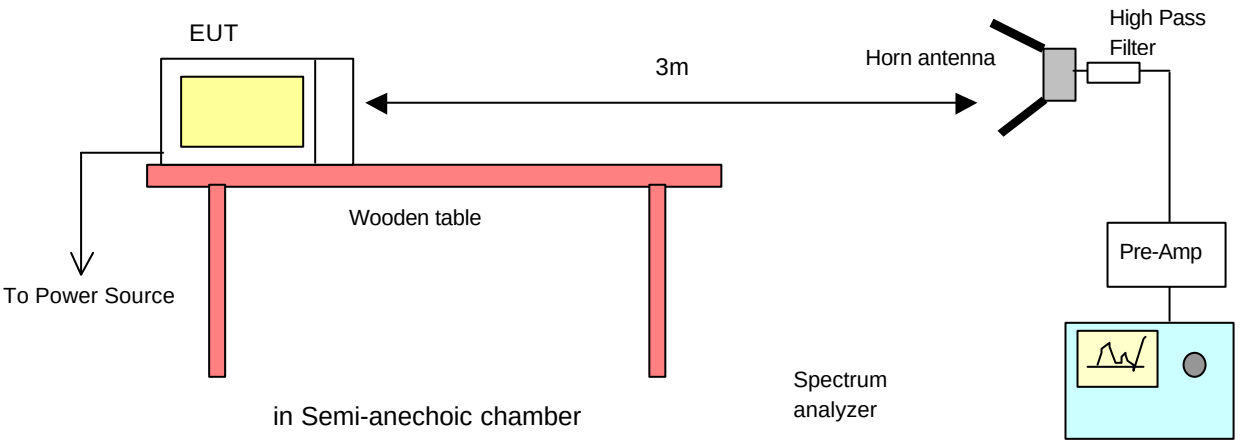

Fig. 7 Radiated Emission Configuration(1 - 25GHz)

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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 300m [dBuV/m]	ANT Pol.	Margin (Result-Limit) [dB]	Antenna Height [Cm]	Turn table Degree [Deg]
	Pk		**Pk**			**Pk**		
44.1	17.4	11.2	28.6	70.38	V	-41.75	100	0
56.3	20.3	7.1	27.4	70.38	V	-43.02	100	0
129.2	13.9	13.3	27.2	70.38	H	-43.17	350	30
145.2	17.0	12.8	29.8	70.38	H	-40.62	350	30
257.0	11.4	16.1	27.5	70.38	V	-42.90	320	0
329.4	12.8	13.6	26.4	70.38	H	-43.95	270	30
331.3	15.0	18.0	33.0	70.38	V	-37.40	100	0
658.0	15.6	25.1	40.7	70.38	H	-29.66	100	30
854.0	11.3	25.3	36.6	70.38	H	-33.80	100	30
912.0	16.1	28.16	44.3	70.38	V	-26.12	100	0

[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* 30.38 *dBuV/m.*

Add 40dB 30.38 *dBuV/m gives a* 70.38 *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)

Test distance : 3m

Tested Frequency [MHz]	Meter Reading [dBuV]	Total Loss [dB]	AMP [dB]	HPF [dB]	k Factor	Results [A+B] [dBuV/m]	Limits at 300m [dBuV/m]	ANT Pol.	Margin [dB]
1228	48.7	27.6	38.7	0	0.0022	0.17	30.38	V	-30.21
2398	52.9	30.4	40.4	0	0.0062	0.87	30.38	V	-29.52
2508	53.8	30.4	41.3	0	0.0065	0.90	30.38	V	-29.48
3720	48.5	34.7	41.7	0	0.0088	1.05	30.38	V	-29.33
4584	47.5	34.6	42.0	1	0.01	1.13	30.38	V	-29.25
4984	49.8	35.8	42.0	1	0.01	1.70	30.38	V	-28.68
6232	53.5	36.8	41.5	1	0.01	3.08	30.38	V	-27.30
6921	55.1	38.5	41.5	1	0.01	4.56	30.38	V	-25.83
9808	46.5	41.8	41.4	1	0.01	2.49	30.38	V	-27.89
12250	48.8	42.3	40.7	1	0.01	3.73	30.38	V	-26.65
14700	48.0	42.8	42.5	1	0.01	2.93	30.38	V	-27.45

** **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)*
** Results : Field Strength abobe 1000MHz (at 300m)(uV/m) = K*10 [Field strengh at 3m(dBuV/m)/20]*
** Margin = Result-Limit*

[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.

** k : Conversion Factor*

$K = 0.0137 * \log F - 0.0401$ (if $F < 4575$ MHz)

$K = 0.01$ (if $F \geq 4575$ MHz)

F = Meter Reading Frequency

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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	03/ 3/15, 12Months
Quasi-peak adapter	85650A	2521A00687	H.P	02/10/10, 12Months
RF Preselector	85685A	2602A00224	H.P	02/10/10, 12Months
Pre-Amplifier	8449B	3008A00705	H.P	02/ 7/ 3, 12Months
Field strength meter	ESI	832692/002	R & S	02/ 6/13, 12Months
	ESVS30	842807/007	R & S	02/ 8/07, 12Months
Double Ridged Guide Antenna	3115	9505-4441	EMCO	01/ 5/23, 24Months
Microwave Survey Meter	HI-1501	93661	H.I	02/10/2, 12Months
High Pass Filter	3H10-4500	2	K & L	02/11/23, 12Months
Amplifier	DWT-18213	4	DSB Microwave	02/11/05, 12Months
Biconilog Antenna	CBL6112B	2766	SCHAFFNER	02/04/26, 12Months

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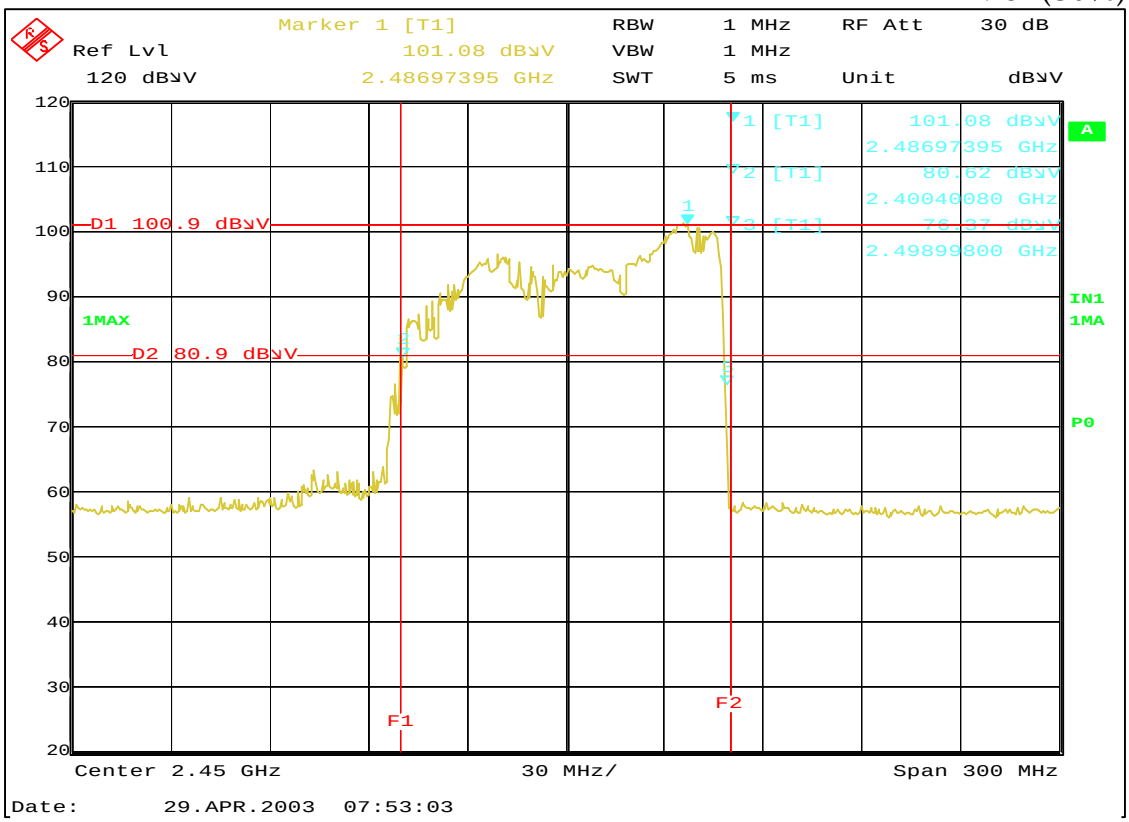
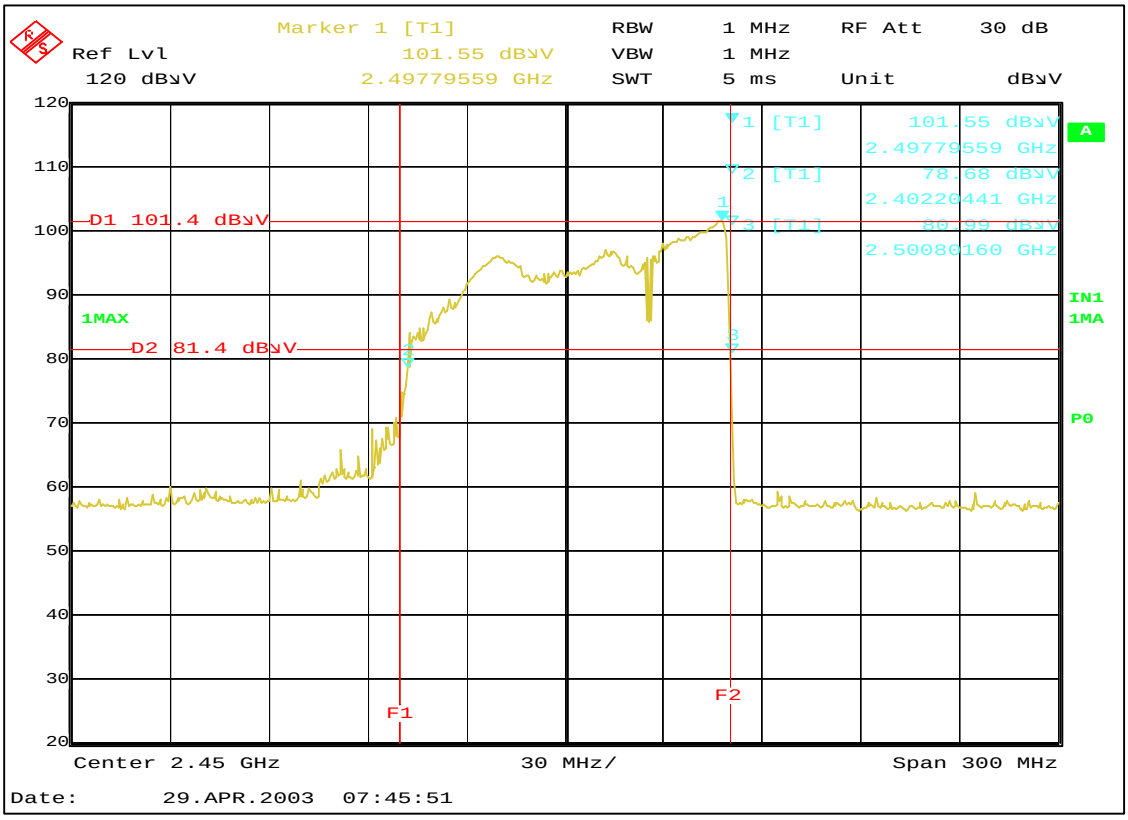
Frequence vs Line Voltage Variation Test

96V(80%)

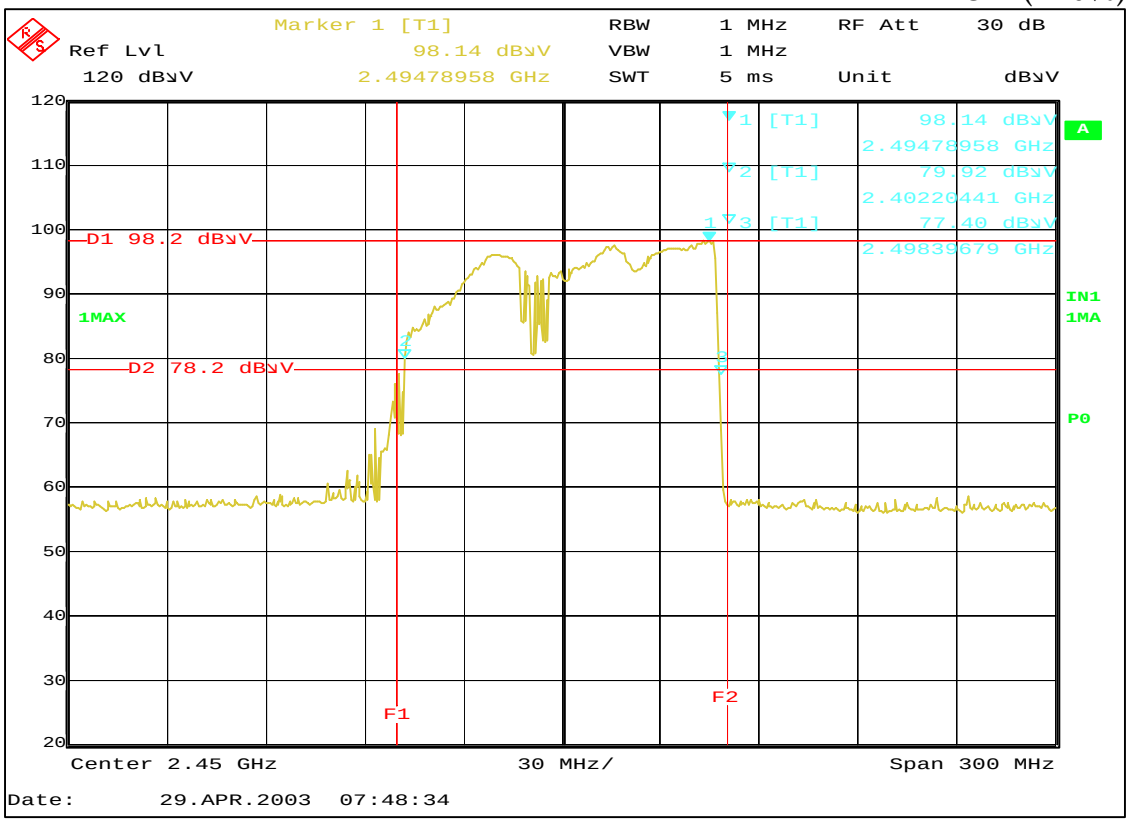


108V(90%)

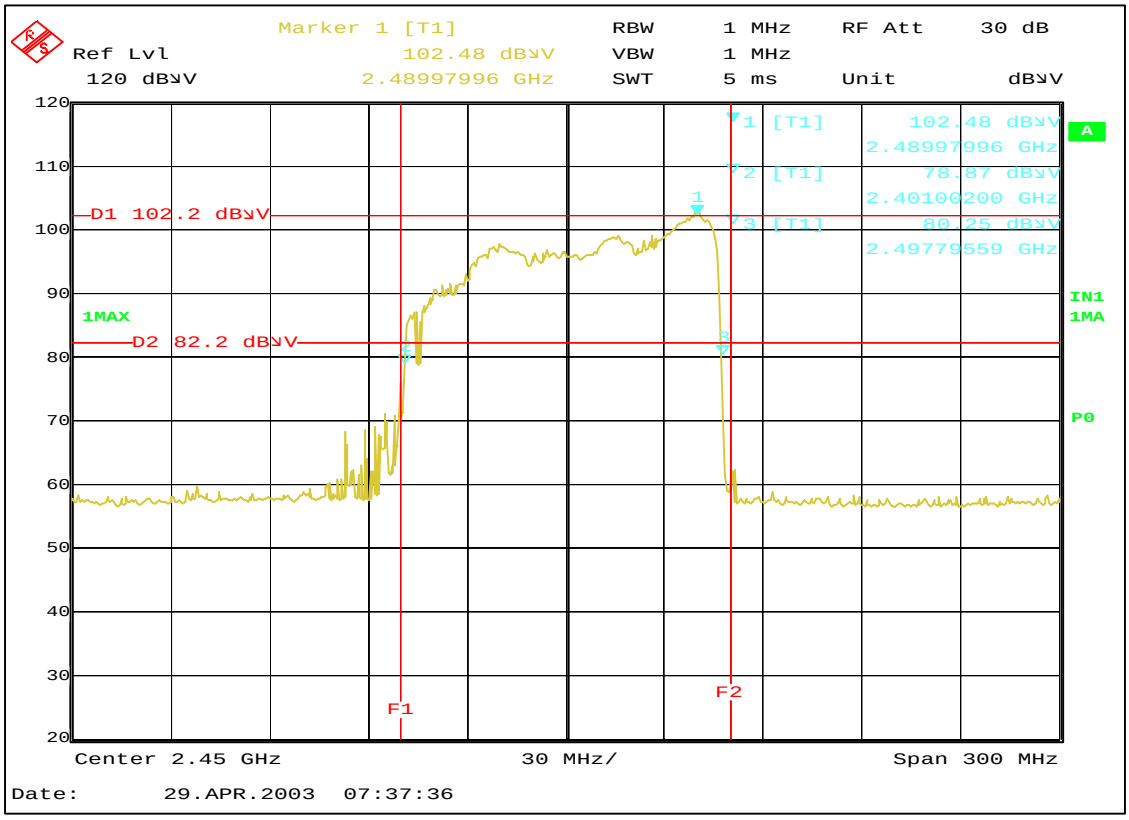


Frequence vs Line Voltage Variation Test

132V(110%)

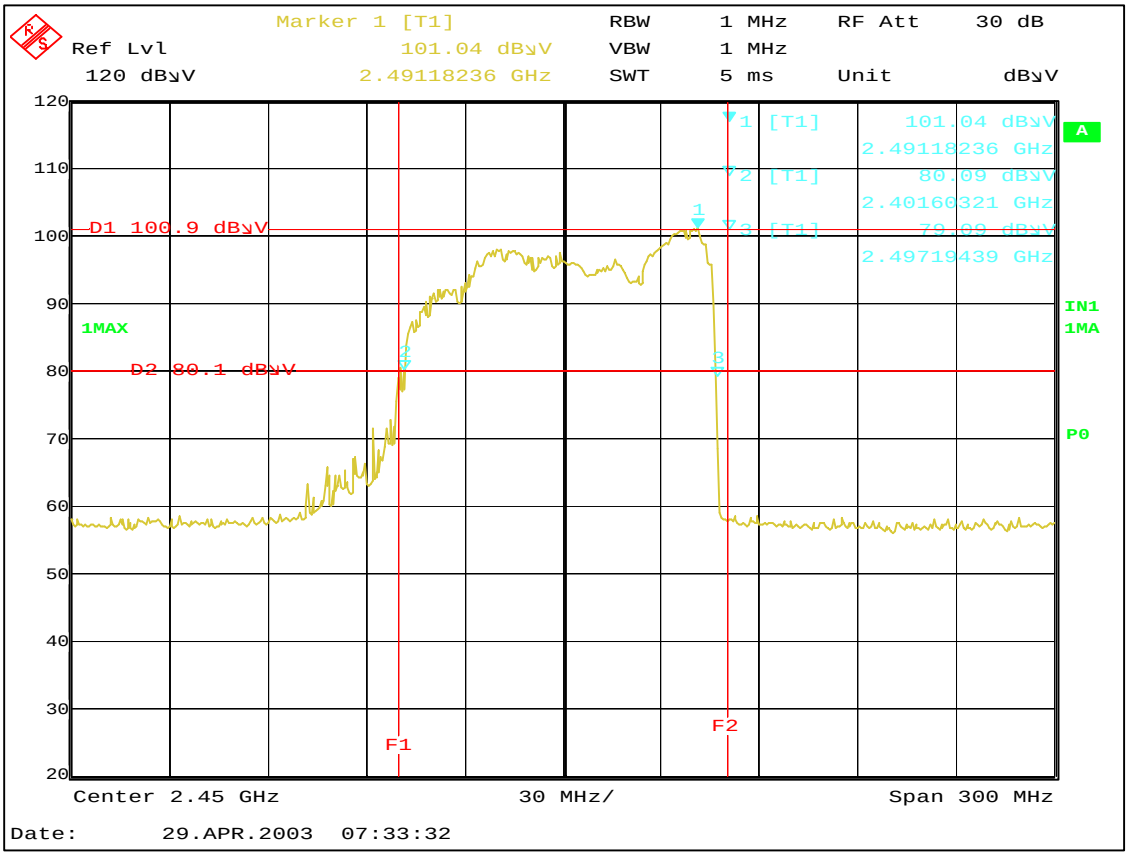


150V(125%)

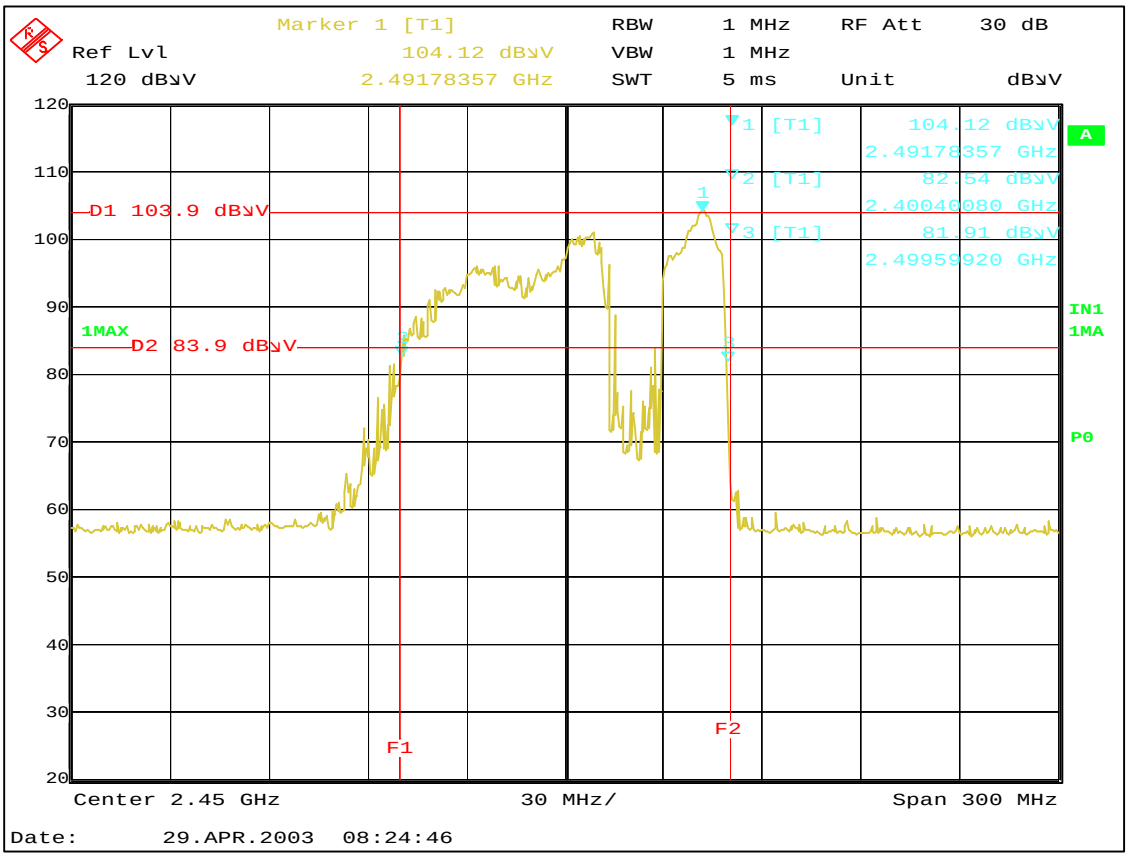


Frequence vs Load Variation Test

120V(1000ml)

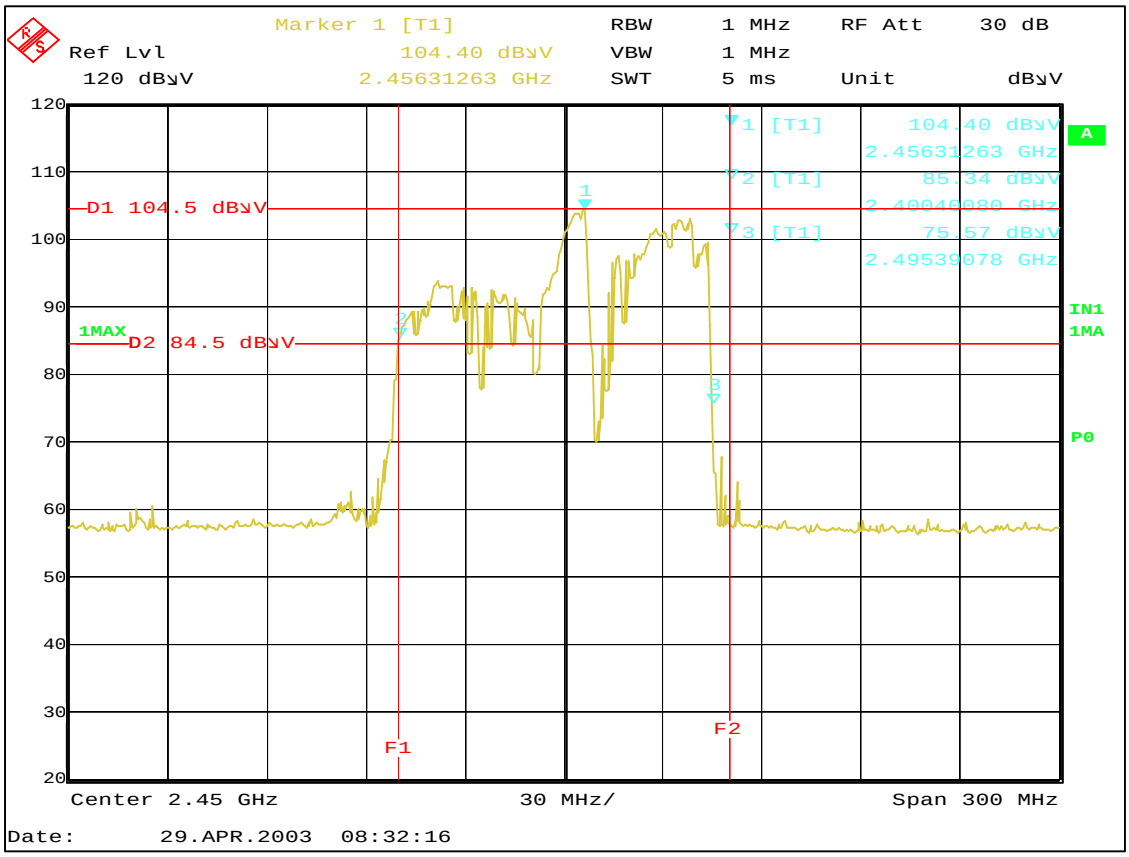


120V(800ml)

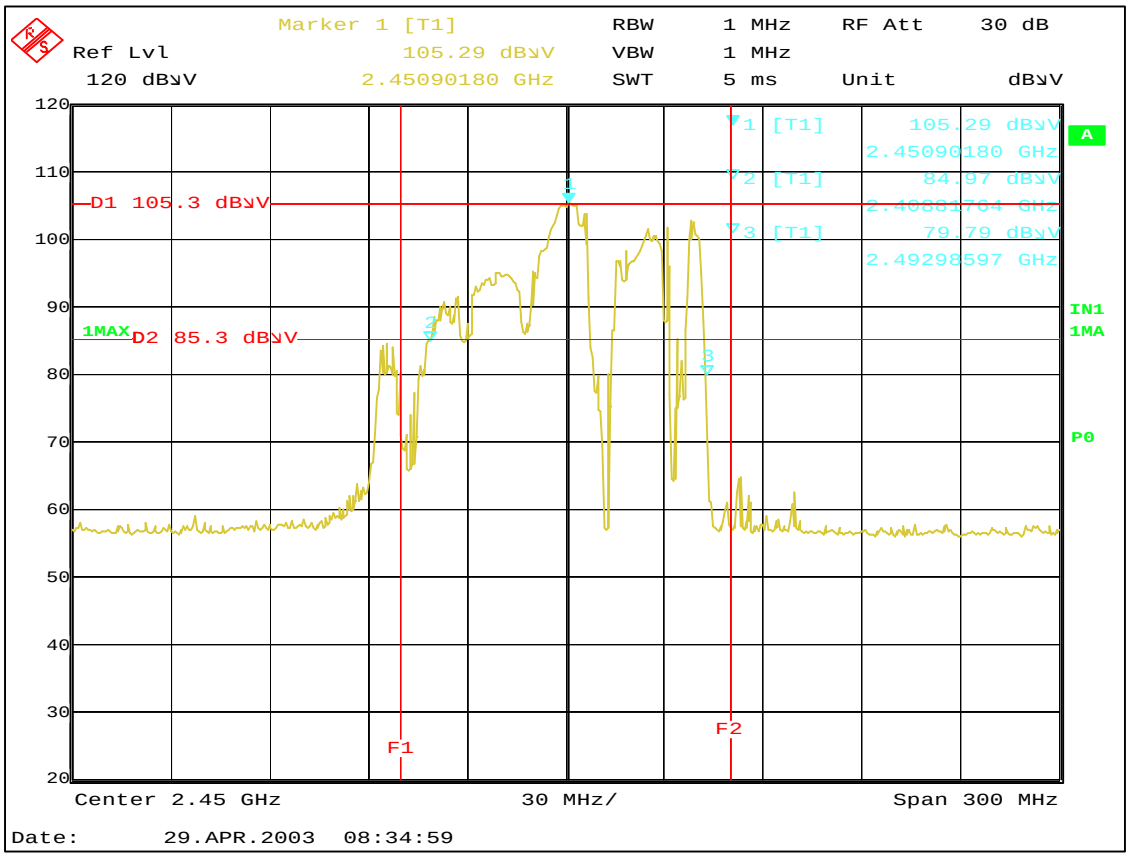


Frequence vs Load Variation Test

120V(600ml)

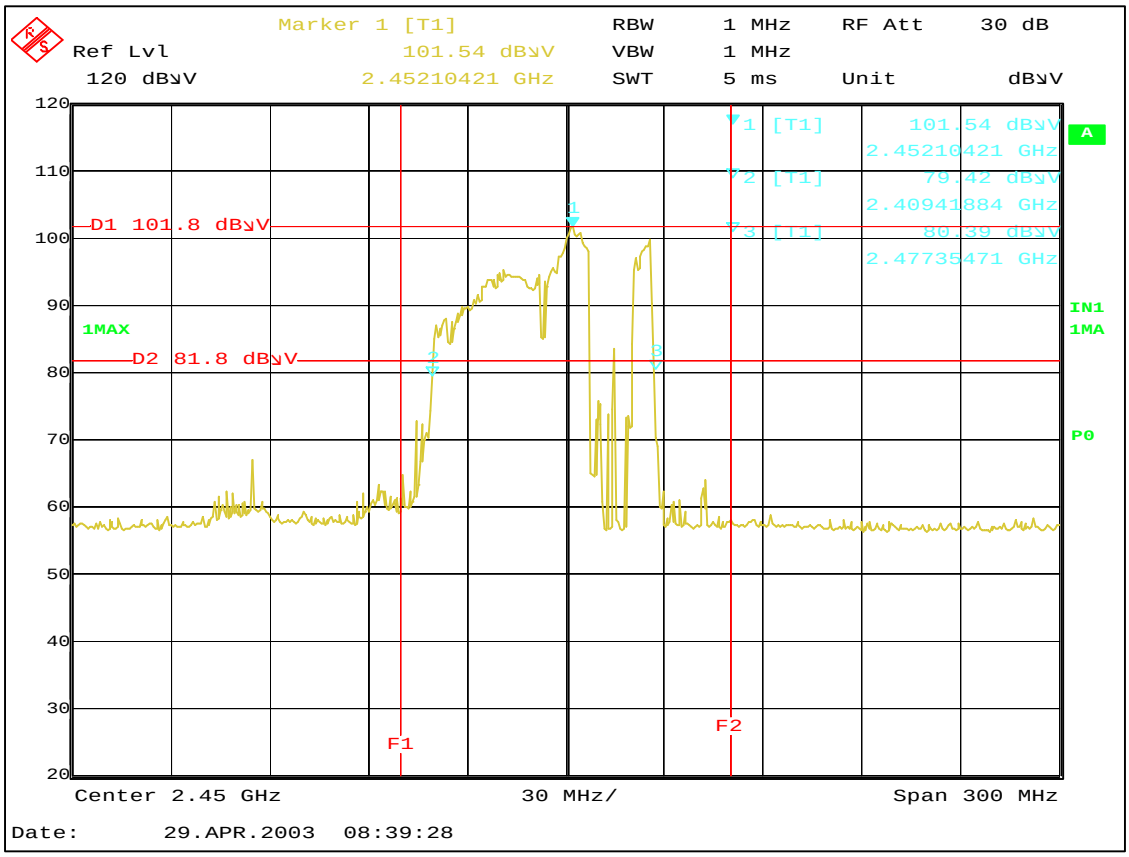


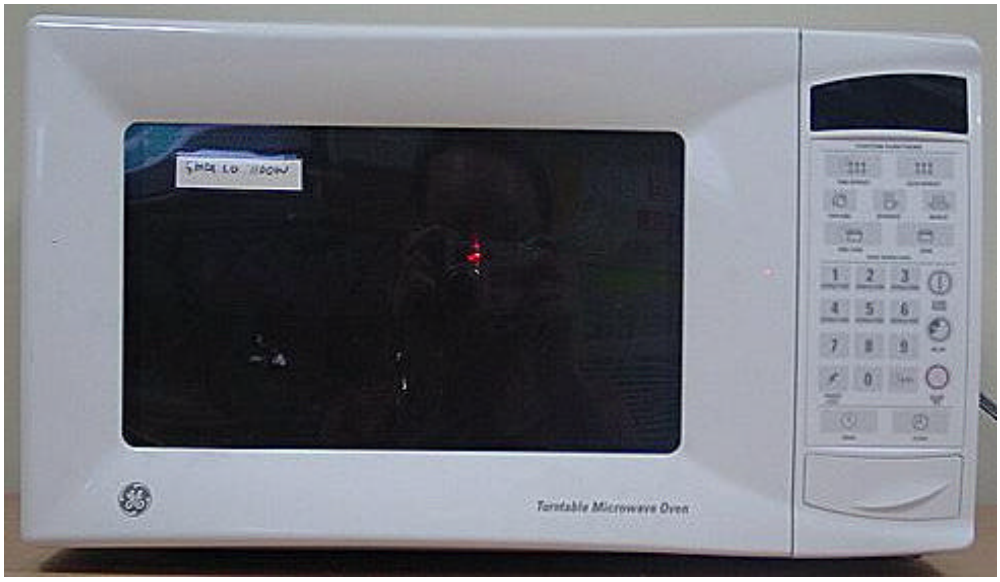
120V(400ml)

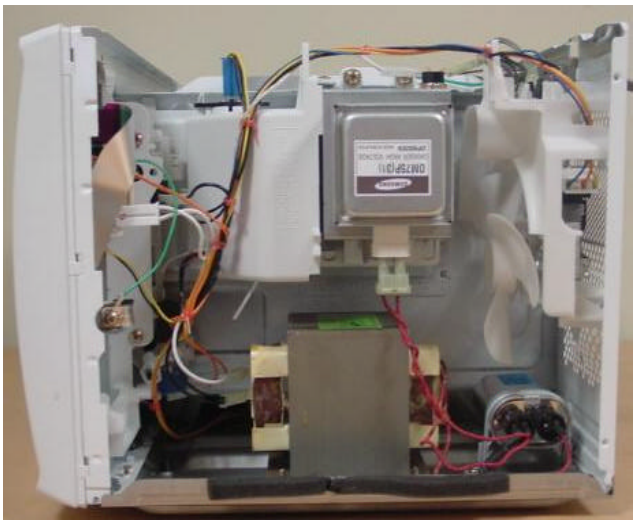


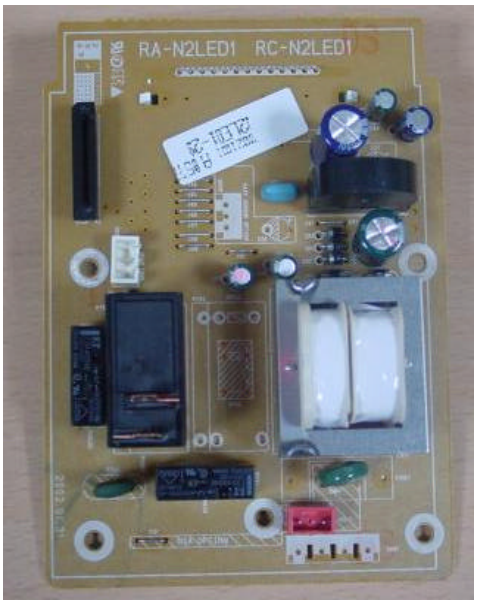
Frequence vs Load Variation Test

120V(200ml)




Turntable Microwave Oven

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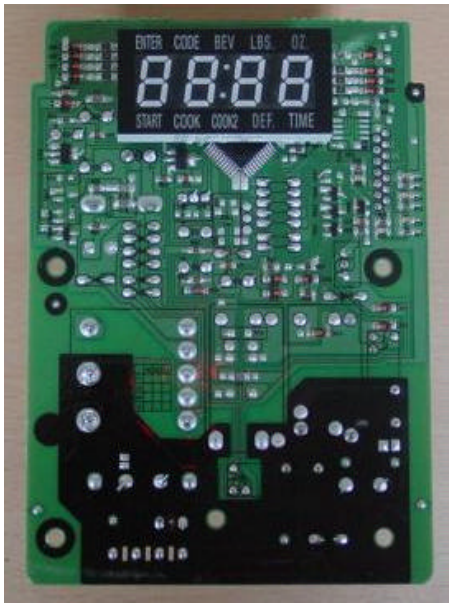
ENTER CODE BEV LBS. OZ.
88:88
START COOK COOK2 DEF. TIME

SAMSUNG
OM75P(31)
DANGER HIGH VOLTAGE
33PN002934 MADE IN MALAYSIA

DANGER
HIGH VOLTAGE
DISCHARGE CAPACITOR BEFORE SERVICING
SAMSUNG
SHV-U11KA
120V
60Hz
KOREAN ELECTRONICS POWER SOURCE CO.,LTD.