

LG Electronics Inc.

Quality & Reliability Center

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CERTIFICATION OF COMPLIANCE

Date of Issue : Feb. 13, 1999

Test Report No : 00431-4521-F9027

Applicant :	LG Electronics Inc.
Regulation :	FCC Part 18
Test procedure :	MP-5 : 1985
Equipment Class :	Industrial, Scientific, and Medical equipment
EUT Type :	Microwave oven
Brand Name(s) :	Goldstar or LG
Model No. :	MS-114YE
FCC ID :	BEJS110XF

This device has been verified to comply with the applicable requirements in the FCC Part 18 and was tested in accordance with the measurement procedures specified in MP-5 : 1985.

I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.



Pan-Hwan Byun / General Manager
Quality and Reliability Center

REPORT FOR A MICROWAVE OVEN

Scope - Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.

Test Report No : 00431-4521-F9027

EUT Type :	Microwave oven
Model No. :	MS-114YE
FCC ID :	BEJS110XF
Rule Part :	FCC Part 18
Test Procedure :	MP-5 : 1985
Date of Test :	Feb. 11, 1999 to Feb. 13, 1999
Date of Issue :	Feb. 13, 1999
Test Result :	Positive

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The Quality and Reliability Center was accredited by National Voluntary Laboratory Accreditation Program for the FCC Part15 : Digital device of accreditation under Lab Code : 200040-0.

Tested by :



D.H. Kim / Associate Research Engineer
Quality and Reliability Center

Reviewed by :



J.C. Lee / Associate Research Engineer
Quality and Reliability Center

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1. CLIENT INFORMATION

The EUT has been tested by request of:

Company: LG Electronics Inc. Cooking Appliances OBU
391-2, Gaeumjung-dong, Changwon city, Gyeongnam, Korea
Name of contact: B. H. Kim
Telephone: +82-551-60-3463
Fax: +82-551-60-3223

2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT

Equipment: Microwave oven
Model: MS-114YE
Brand name: GoldStar or LG
Serial number: N/A
Manufacturer: LG Electronics Inc. Cooking Appliances OBU
391-2 Gaeum Jeong-dong, Changwon city
Gyeong-nam 641-110 KOREA
Country of origin: Korea
Rating: 120V~, 60Hz

2.2 Additional information about the EUT

The EUT consists of the following parts:

<u>Component</u>	<u>Type / model</u>	<u>Technical data</u>	<u>Maker</u>
Magnetron	2M248J	2,450MHz	TOSHIBA
Alt. Magnetron	2M246	2,450MHz	LG

3. TEST SITE

3.1 Semi-anechoic chamber

Measurement of radiated emissions from EUT was made at semi-anechoic chamber that has been in compliance with Federal Communications Commissions(FCC) requirements of clause 2.948 according to ANSI C63.4-1992 on April 21, 1998.

4. CALIBRATIONS OF MEASURING INSTRUMENTS

All measurements were made with instruments calibrated according to the recommendation by manufacturer. Measurement of radiated emissions and power line conducted emissions were made with instruments conforming to American National Standard Specification, ANSI C63.4-1992. The calibration of measuring instrument, including any accessories that may affect test results, was performed according to the recommendation by manufacturer.

5. DESCRIPTION OF TEST CONDITION

5.1 Radiated emissions measurements

5.1.1 Test site

Measurements were made in semi-anechoic chamber as described at 3.1 in this report.

5.1.2 Detector function selection and bandwidth

In radiated emissions measurement, field strength meters that has CISPR quasi-peak and average detector were used. The bandwidth of the detector of instrument is 120 KHz over frequency range of 30 to 1000 MHz, and 1 MHz over frequency range of 1 to 18 GHz. Emissions to be measured are detected in average mode.

5.1.3 Unit of measurement.

Test results of radiated emissions measurement are reported in microvolts per meter at the specific distance. Using the unit of dBuV on the test instrument, the indication unit was converted to field strength unit of uV/m as following method;

$$F / S = 10^{\{(R+AF+CF)/20\}} \text{ (uV/m)}$$

here,

F / S : Field Strength in uV/m,	R : Meter Reading Level in dB(uV),
AF : Antenna Factor in dB/m	
CF : Conversion Factor	
* 30 MHz ~ 1 GHz : CF = CL	
* Above 1 GHz :CF = CL – PG + FL + AL	
CL : Cable Loss (dB)	FL : Filter Loss (dB)
PG : Preamplifier Gain (dB)	AL : Attenuator Loss (dB)

5.1.4 Antennas

Measurements were made using calibrated biconical antenna in range of 30 to 300 MHz, log-periodic antenna in range of 300 to 1000 MHz and horn antenna in range of 1 to 18GHz to determine the emission characteristics of the EUT. Measurements were also made for both horizontal and vertical polarization.

The horizontal distance between the receiving antenna and the closest periphery of the EUT was 3 meters.

5.1.5 Frequency range to be scanned

For radiated emissions measurements, the spectrum in the range of 30 to 1000 MHz and above, if found, was investigated.

5.1.6 Test conditions and configuration of EUT

The EUT was configured and operated in all modes of operation so as to find the maximum RF energy generated from EUT.

The power was furnished with rated (normal) AC 120 volts, as specified in the Owner's manual of EUT. The EUT was placed on a 1 m high non metallic 1m x 1.5 m table. The turn table containing the system was rotated and the antenna height was varied 4 m to find the maximum RF energy generated from EUT.

Each type of accessory provided by manufacturer or typically used and support equipment were connected to the EUT during measurement to the typical usage and applicable as nearly as practicable.

5.1.7 Measurement uncertainty

Radiated emissions measurements, biconical antenna : $\pm 4.4\text{dB}$

Radiated emissions measurements, log-periodic antenna : $\pm 5.0\text{dB}$

Radiated emissions measurements, horn antenna : $\pm 5.0\text{dB}$

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT in the above mentioned way.

The measurement uncertainty was calculated in accordance with NAMAS NIS 81 : The treatment of uncertainty in EMC measurement."

The measurement uncertainty was given with a confidence of 95%.

6. MEASURING INSTRUMENTS AND SET-UP

6.1 Radiated emissions

6.1.1 Test receiver

- a) Rohde & Schwarz, Model ESVP (20 MHz to 1300 MHz)
Detector function : Average
IF Bandwidth : 120 KHz
- b) Rohde & Schwarz, Model ESMI (1 GHz to 18 GHz)
Detector function : Average
IF Bandwidth : 1 MHz

6.1.2 Receiving Antennas

- a) Schwarzbeck, Model VHA9103 : Biconical antenna (30 to 300 MHz)
- b) Schwarzbeck, Model UHAL9107 : Log-periodic antenna (300 to 1000MHz)
- c) EMCO, Model 3115 : Horn antenna (1 GHz to 18GHz)

6.1.3 Preamplifier / Filter / Attenuator

- a) H/P, Model 8449B : 1 GHz to 26.5GHz (Gain : 30 dB)
- b) K&L, Model 11SH10 : 0 Hz to 4.5 GHz
- c) Anritsu, Model MP721B : 0 Hz to 12 GHz (6dB)

6.2 Frequency measurements

6.2.1 Test receiver

- a) Rohde & Schwarz, Model ESMI (1 GHz to 18 GHz)
Detector function : Average
IF Bandwidth : 1 MHz

6.2.2 Receiving Antennas

- a) EMCO, Model 3115 : Horn antenna (1 GHz to 18GHz)

7. RF POWER OUTPUT MEASUREMENT AND RESULTS

The Calorimetric Method was used to determine maximum output power. A 1000 ml water load was placed in the center of the oven. A mercury thermometer was used to measure temperature rise.

$$\text{Power (W)} = \frac{(4.2 \text{ Joules/Cal}) * (\text{Volume in ml}) * (\text{Temperature Rise})}{\text{Time in Seconds}}$$

(1) Magnetron type : 2M248J (TOSHIBA)

<u>Quantity of Water</u>	<u>Starting Temperature</u>	<u>Final Temperature</u>	<u>Elapsed Time</u>
1000 ml	20.7 C	45.7 C	120 Sec

$$\text{Power (W)} = \frac{4.2 * 1000 * 25}{120}$$

Power (W) = 875 Watts

(2) Magnetron type : 2M246 (LG)

<u>Quantity of Water</u>	<u>Starting Temperature</u>	<u>Final Temperature</u>	<u>Elapsed Time</u>
1000 ml	20.4 C	45.1 C	120 Sec

$$\text{Power (W)} = \frac{4.2 * 1000 * 24.7}{120}$$

Power (W) = 864.5 Watts

8. TEST DATA

8-1. Radiated emissions (Section 18.305)

8.1.1 Magnetron type : 2M248J (TOSHIBA), RF Power Output : 875.0 W

Test distance : 3m

Freq. (MHz)	Pol.	Reading at 3m (dBuV)	AF (dB/m)	CF (dB)	K-Factor	F/S at 300m (uV/m)	Limit at 300m
4915.0	V	36.1	34.4	-18.7	0.01	3.9	33.1
4945.0	H	27.5	34.5	-18.7	0.01	1.5	33.1
6396.0	H	29.6	35.2	-18.1	0.01	2.2	33.1
7365.0	H	29.1	37.2	-17.3	0.01	2.8	33.1

8.1.2 Magnetron type : 2M246 (LG), RF Power Output : 864.5 W

Test distance : 3m

Freq. (MHz)	Pol.	Reading at 3m (dBuV)	AF (dB/m)	CF (dB)	K-Factor	F/S at 300m (uV/m)	Limit at 300m
737.4	H	10.6	22.7	4.6	-	0.8	32.9
4877.0	V	36.4	34.3	-18.8	0.01	3.9	32.9
4912.6	V	30.1	34.4	-18.7	0.01	1.9	32.9
4921.0	H	27.8	34.4	-18.7	0.01	1.5	32.9

Result : Positive

* Limit (at 300m) = $25 * (\text{RF Power}/500)^{1/2}$ (uV/m)

* Field Strength below 1000 MHz (at 300m) (uV/m) = $10^{[(\text{Field strength at 3m}(\text{dBuV/m})-40)/20]}$

* Field Strength above 1000 MHz (at 300m) (uV/m) = $K * 10^{[(\text{Field strength at 3m}(\text{dBuV/m})/20]}$

NOTES:

- Two representative modes(Full power and defrost) of operation were investigated.
- A glass beaker was used as the container and the test was made with a shelf in its initial normal position.
- Load for measurement of radiation on second and third harmonic : Two loads, one of 700 and the other of 300 ml, of water were used. Each load was tested both with the beaker located in the center of the oven and with it in the right front corner.
- Load for all other measurements : 700ml of water, with the beaker located in the center of the oven
- All other emissions are non-significant.
- AF = Antenna Factor CF = Conversion factor F/S = Field Strength
- The tests were made with average detector for frequency range of 30 MHz to 18GHz.

8-2. Frequency measurements

8.2.1 Magnetron type : 2M248J (TOSHIBA)

(1) Frequency vs Line Voltage Variation Test

[Room Temperature : 24 C]

Line Voltage Variation(V)	Frequency (MHz)	Deviation for ISM Frequency (MHz)
150(125%)	2461	11
135(112.5%)	2468	18
120(Nominal)	2465	15
108(90%)	2467	17
96(80%)	2450	0

Note : Load was used 1000 cc water in the 1 liter glass beaker.

Result : Positive

(2) Frequency vs Load Variation Test

[Room Temperature : 24 C]

Volume of Water (cc)	Frequency (MHz)	Deviation for ISM Frequency (MHz)
1000	2465	15
800	2463	13
600	2458	8
400	2459	9
200	2460	10

Note : Frequency was measured by using nominal voltage(AC 120V).

Result : Positive

8.2.2 Magnetron type : 2M246 (LG)

(1) Frequency vs Line Voltage Variation Test

[Room Temperature : 24 C]

Line Voltage Variation(V)	Frequency (MHz)	Deviation for ISM Frequency (MHz)
150(125%)	2452	2
135(112.5%)	2456	6
120(Nominal)	2467	17
108(90%)	2467	17
96(80%)	2430	20

Note : Load was used 1000 cc water in the 1 liter glass beaker.

Result : Positive

(2) Frequency vs Load Variation Test

[Room Temperature : 24 C]

Volume of Water (cc)	Frequency (MHz)	Deviation for ISM Frequency (MHz)
1000	2467	17
800	2465	15
600	2461	11
400	2460	10
200	2459	9

Note : Frequency was measured by using nominal voltage(AC 120V).

Result : Positive

9. LIST OF INSTRUMENTS USED

Type	Maker	Model	Cal. Date	N Date	Control No.
Test receiver	R&S	ESVP	05/08/98	05/08/99	F0000194AAZL
Test receiver	R&S	ESMI	03/06/98	03/06/99	F0034898AAZL
Pre amplifier	H/P	8449B	07/06/98	07/06/99	F0000239AAZL
Biconical antenna	S/B	VHA9103	05/08/98	05/08/99	F0000401AAZB
Log-periodic antenna	S/B	UHAL9107	05/22/98	05/22/99	F0000404AAZB
Horn antenna	EMCO	3115	06/09/97	06/09/99	F0000392AAZB
Filter	K&L	11SH10	06/02/98	06/02/00	FTE00076AAZA
Attenuator	Anritsu	MP721B	03/09/98	03/09/99	-

Note : H/P : Hewlett-packard
R&S : Rohde & Schwarz
S/B : Schwarzbeck
Cal. Date : Calibration date
N Date : Next calibration date

APPENDIX A The EUT Photographs

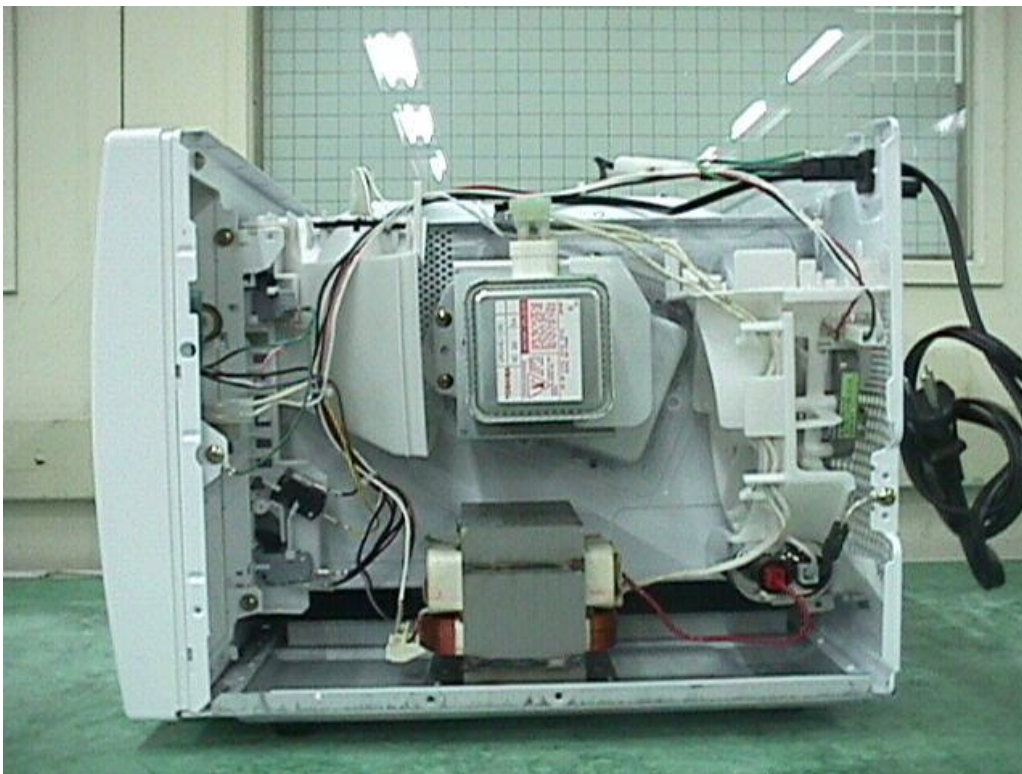
EXTERNAL VIEW

FCC ID : BEJS110XF

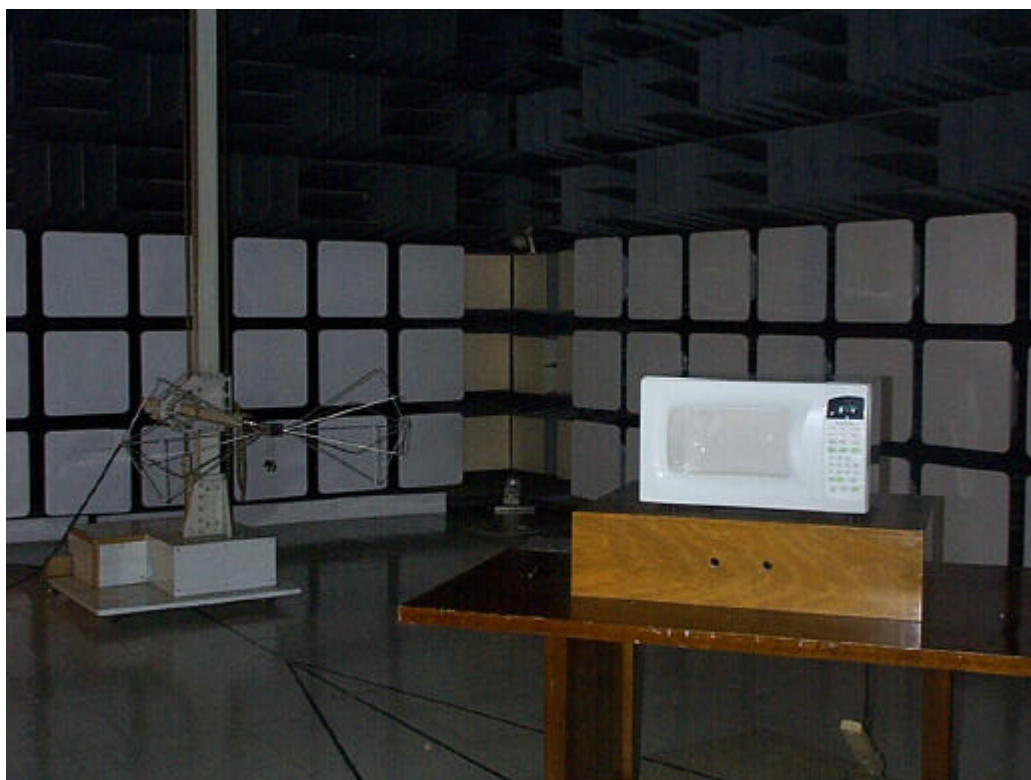
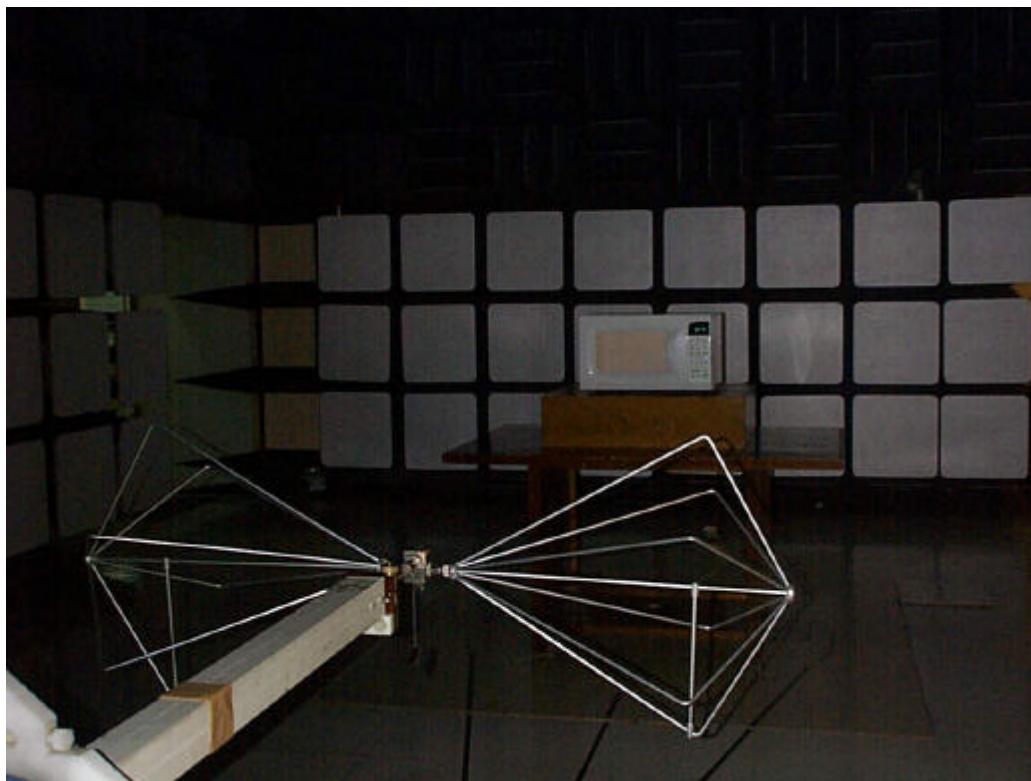


INTERNAL VIEW

FCC ID : BEJS110XF



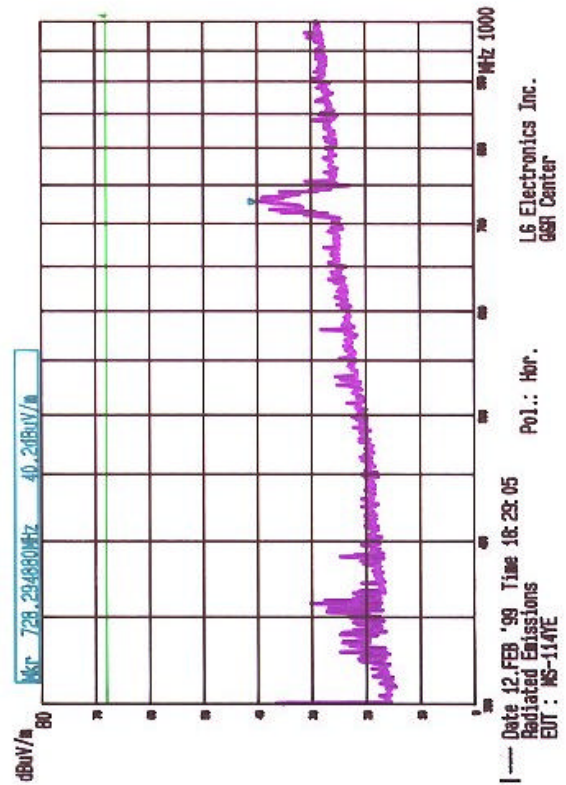
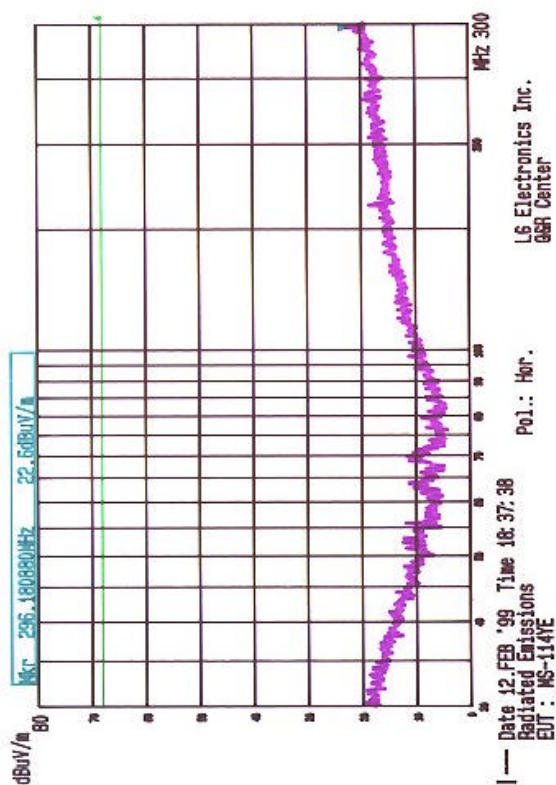
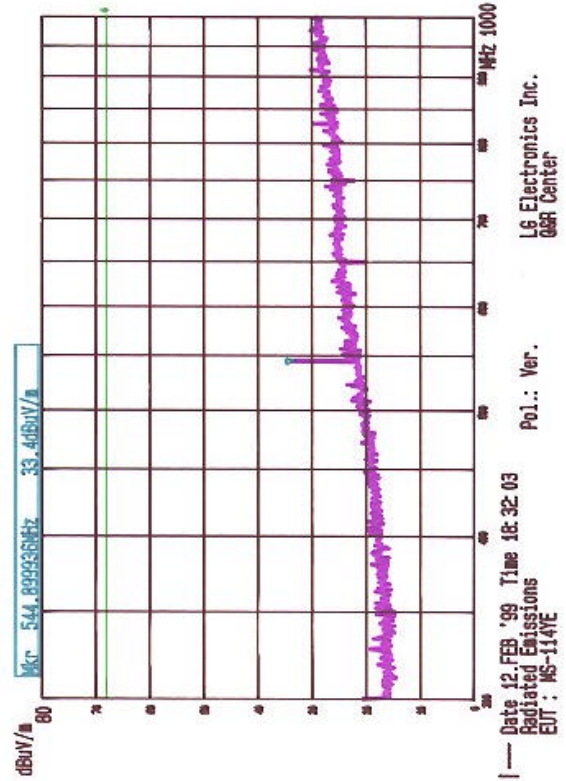
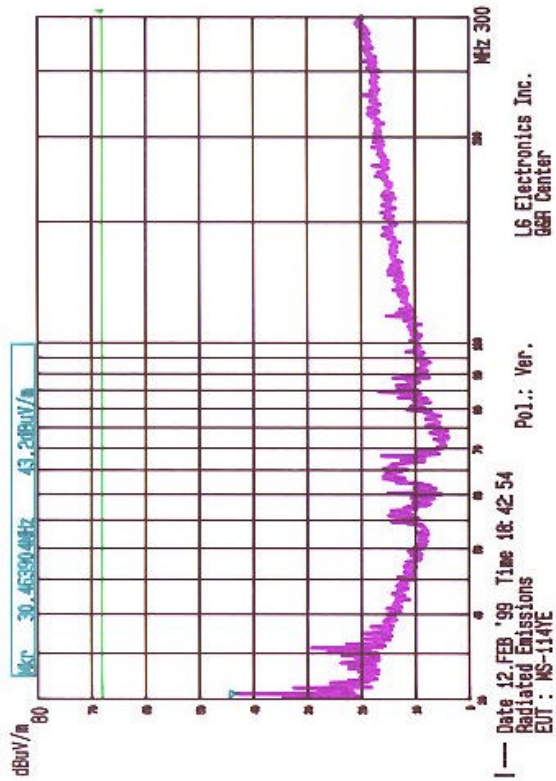
APPENDIX B The Photographs of Test Set-up



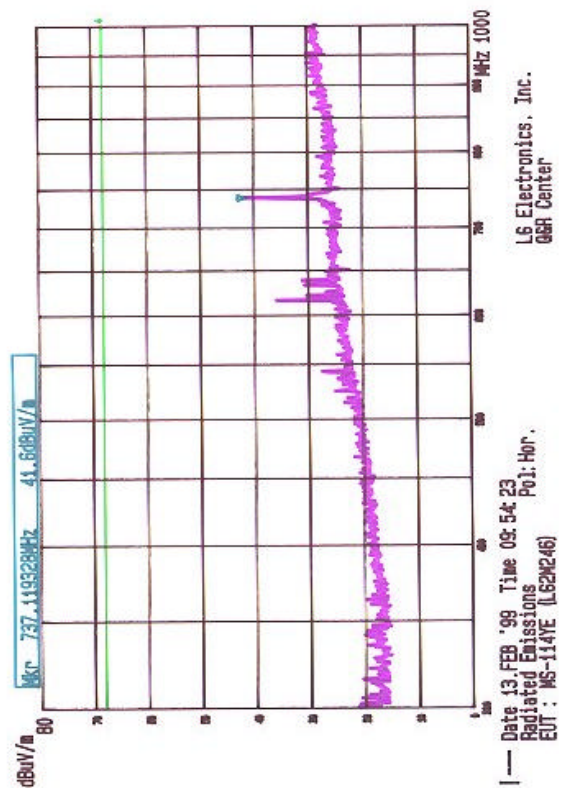
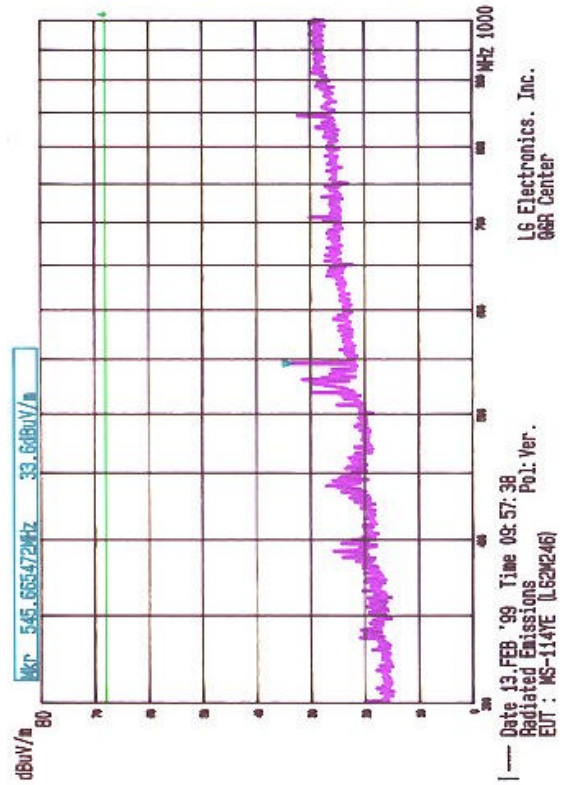
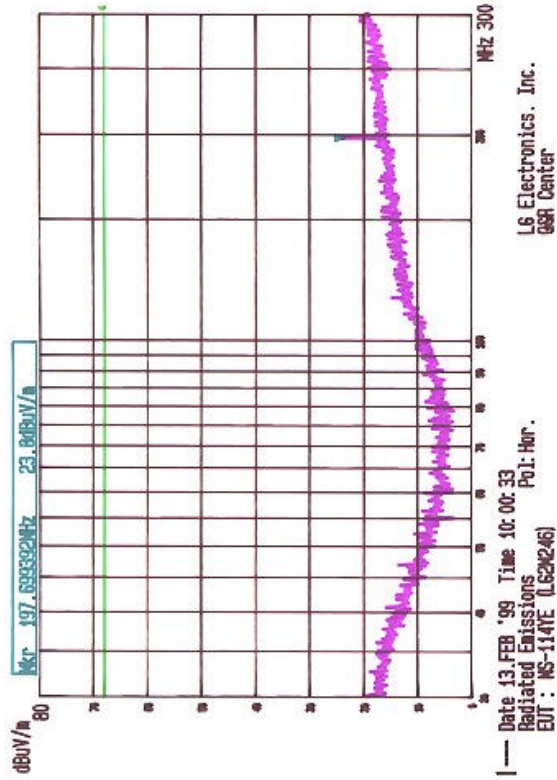
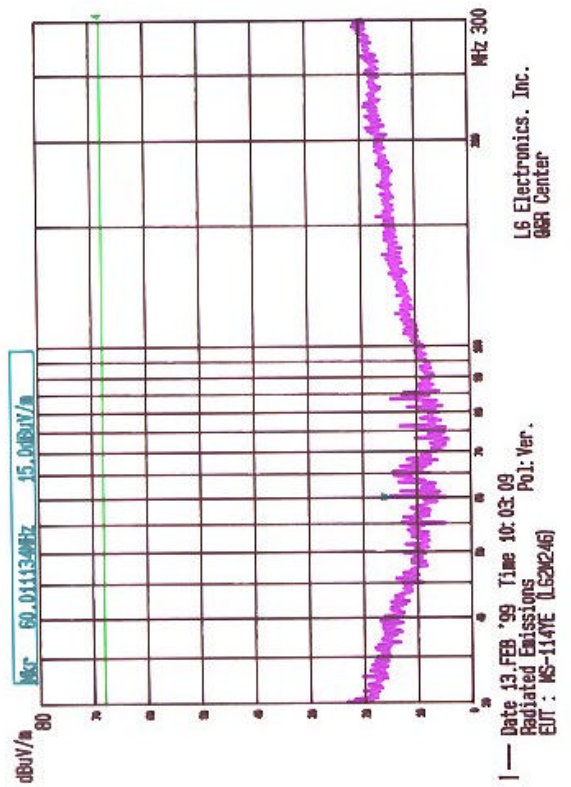
APPENDIX C LABEL

APPENDIX D The Test Graph

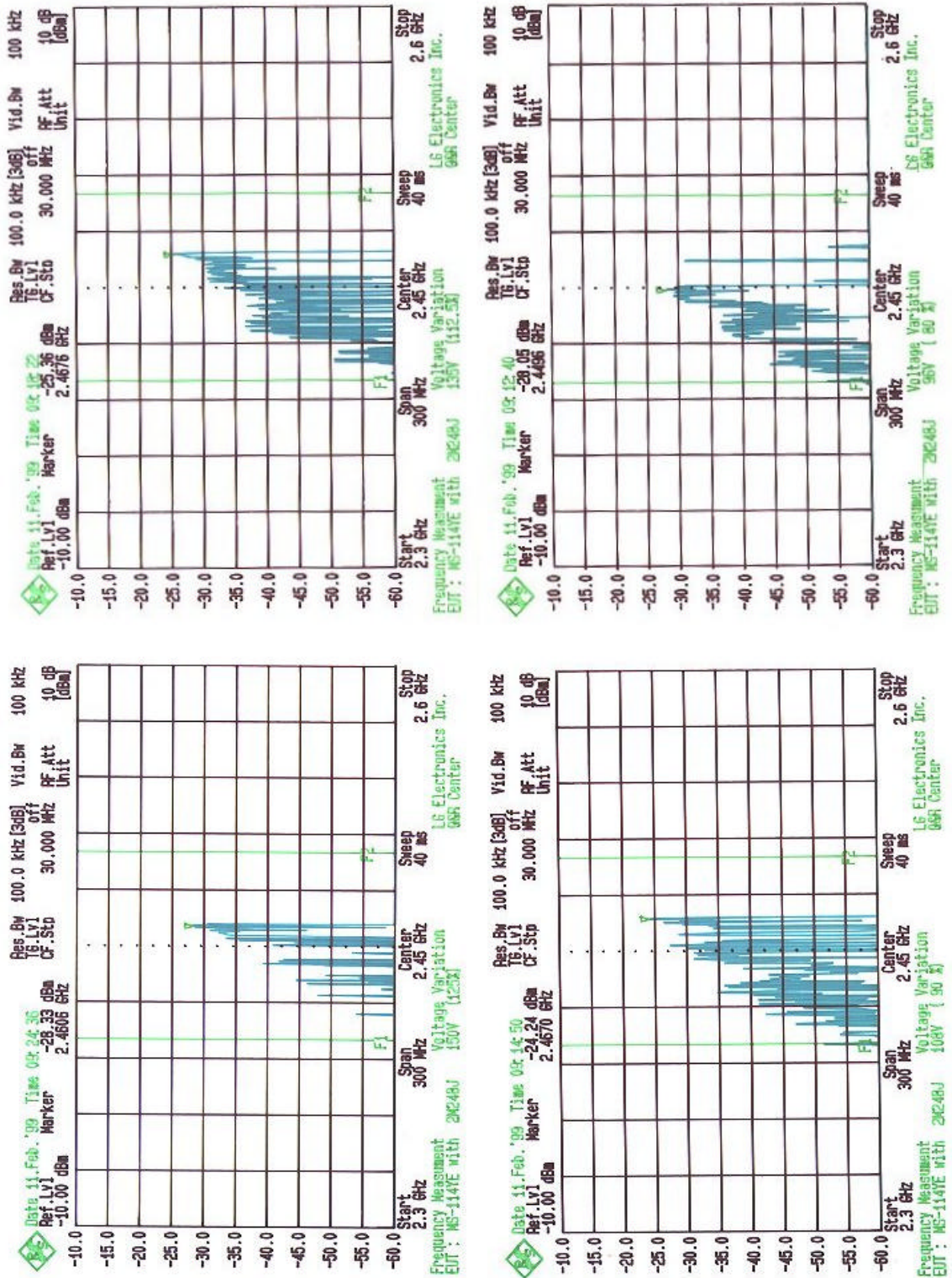
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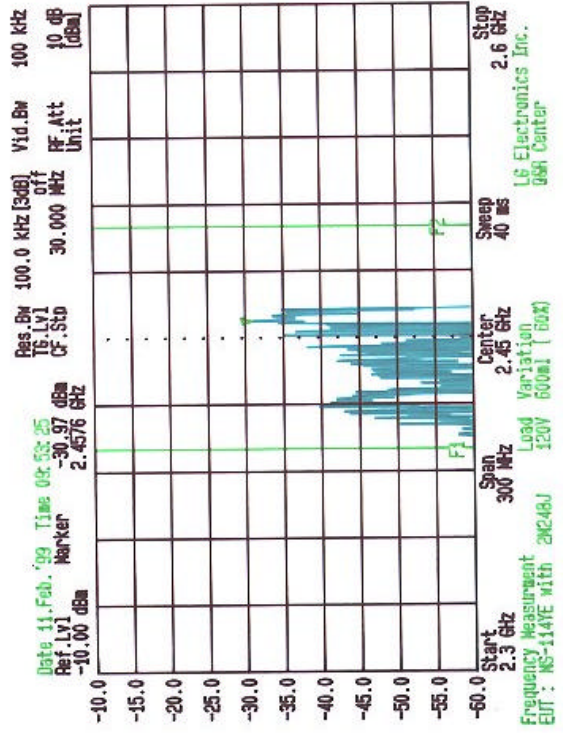
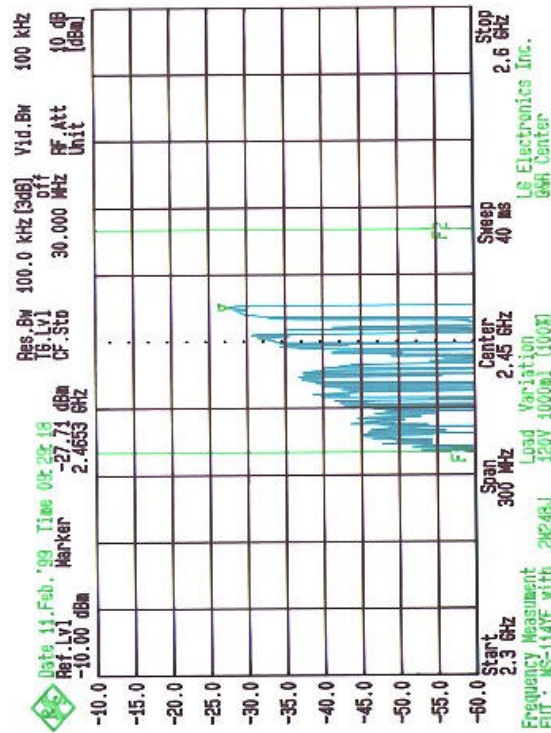
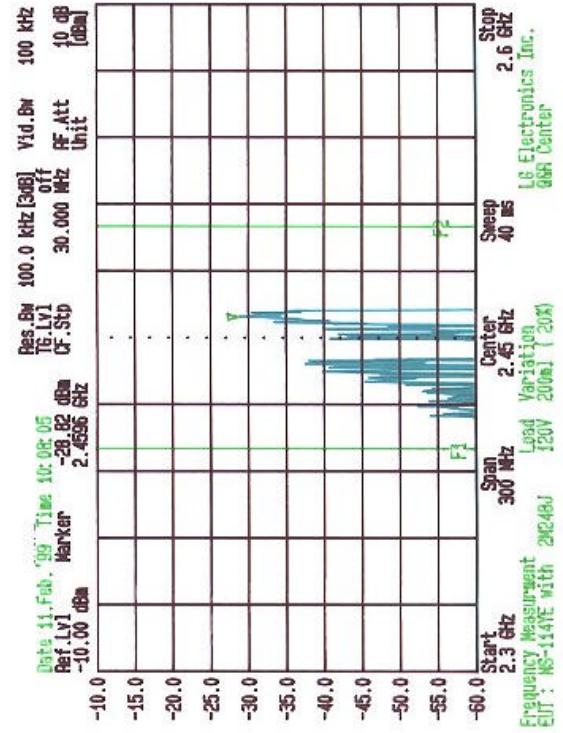
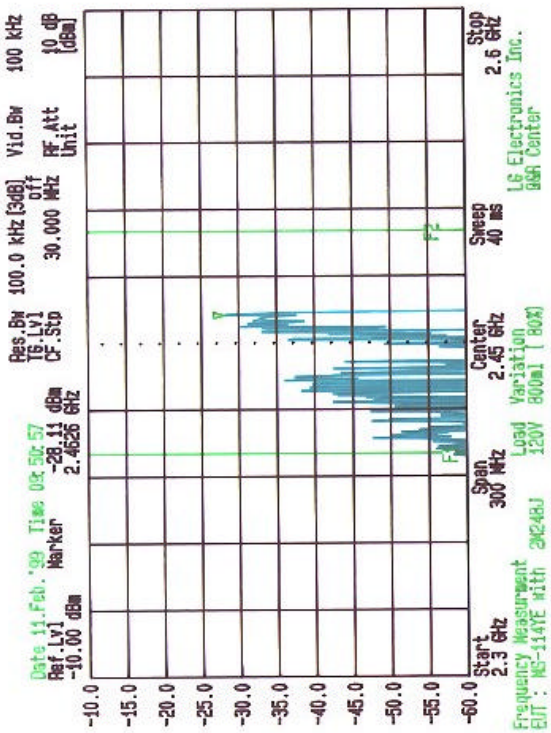
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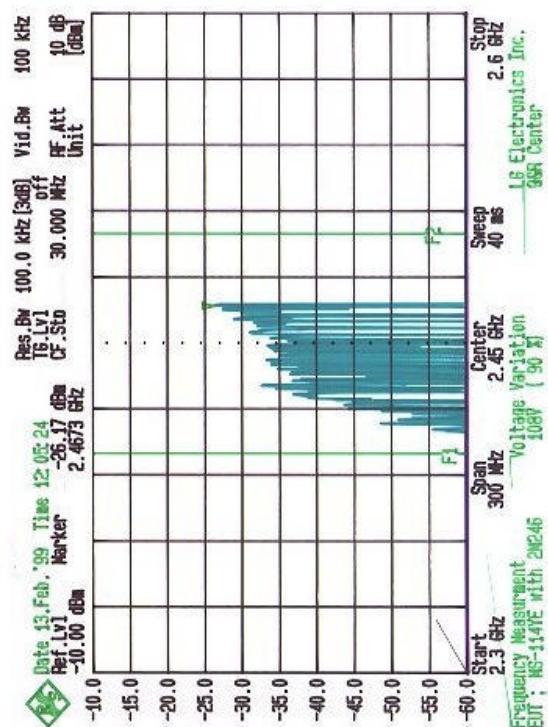
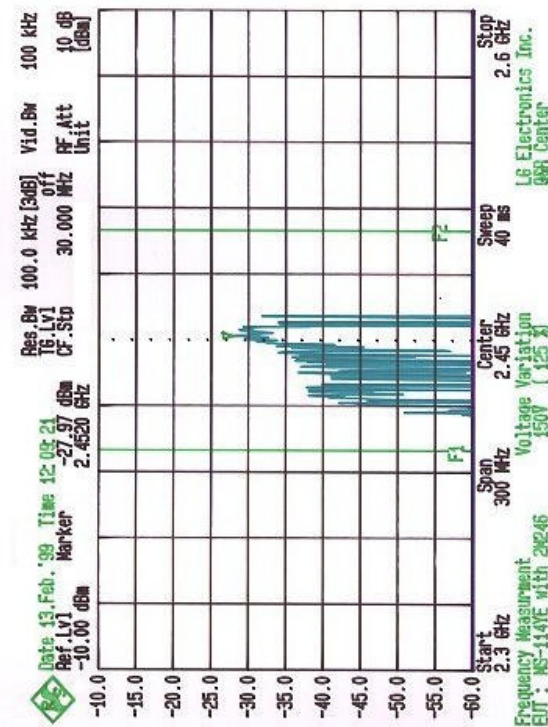
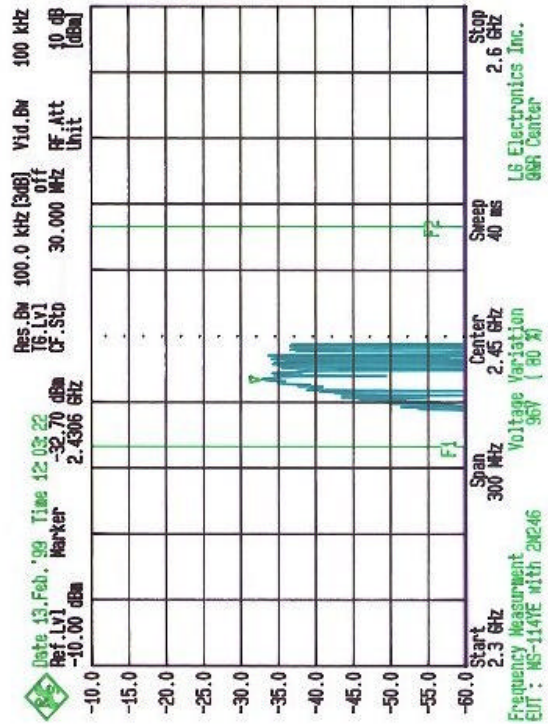
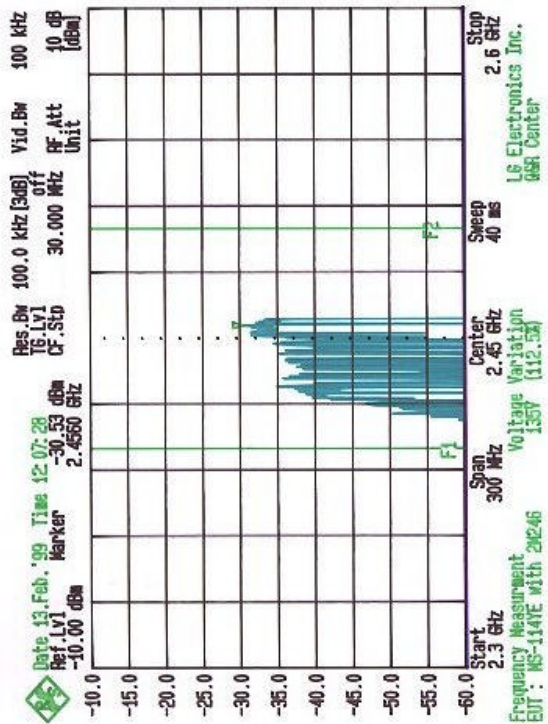
3) Voltage Variation (Magnetron type : 2M248J)



4) Load Variation (Magnetron type : 2M248J)



5) Voltage Variation (Magnetron type : 2M246)



6) Load Variation (Magnetron type : 2M246)

