LG Electronics Inc.
Quality & Reliability Center

36, Munlae-dong, 6-ga, Youngdungpo-gu, Seoul 150-096, Korea
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CERTIFICATION OF COMPLIANCE

Date of Issue : Nov. 16, 1999 **Test Report No : 00431-4521-F9293**

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
Model No. :	MS-214YE
FCC ID :	BEJS210XF

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.

Kyeom-Soon Kim / 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-F9293

EUT Type :	Microwave oven
Model No. :	MS-214YE
FCC ID :	BEJS210XF
Rule Part :	FCC Part 18
Test Procedure :	MP-5 : 1985
Date of Test :	Nov. 12, 1999 to Nov. 15, 1999
Date of Issue :	Nov. 16, 1999
Test Result :	Positive

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 :

B.S. Kang / Assistant Research Engineer
Quality and Reliability Center

Reviewed by :

J.C. Lee / 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:	+82-551-260-3463
Fax:	+82-551-260-3223

2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT

Equipment:	Microwave oven
Model:	MS-214YE
Brand name:	Goldstar
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:

Component	Type / model	Technical data	Maker
Magnetron	2M248J	2,450MHz	TOSHIBA

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)

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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 scaned

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¡ 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 : ± 4.4dB
Radiated emissions measurements, log-periodic antenna : ± 5.0dB
Radiated emissions measurements, horn antenna : ± 5.0dB

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%.

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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 BBA9106 : Biconical antenna (30 to 300 MHz)
b) Schwarzbeck, Model UHALP9107 : 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 M06954 : 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)

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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)

Quantity of Water	Starting Temperature	Final Temperature	Elapsed Time
1000 ml	20.0 ¡ É	45.5 ¡ É	120 Sec

$$\text{Power (W)} = \frac{4.2 * 1000 * 25.5}{120}$$

Power (W) = 892.5 Watts

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8. TEST DATA

8-1. Radiated emissions (Section 18.305)

8.1.1 Magnetron type : 2M248J (TOSHIBA), RF Power Output : 892.5 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
4894.4	V	46.0	34.0	-19.1	0.01	11.2	33.4
4900.0	V	49.8	34.1	-19.1	0.01	17.4	33.4
4904.3	V	44.2	34.1	-19.1	0.01	9.1	33.4
7360.2	V	42.3	37.2	-17.3	0.01	12.8	33.4

Result : Positive

* Limit (at 300m) = 25 * (RF Power/500)$^{1/2}$ (uV/m)
* Field Strength below 1000 MHz (at 300m) (uV/m) = 10 $^{[(\text{Field strength at 3m(dBuV/m)}-40)/20]}$
* Field Strength above 1000 MHz (at 300m) (uV/m) = K * 10 $^{[\text{Field strength at 3m(dBuV/m)}/20]}$

NOTES:

1. Two representative modes(Full power and defrost) of operation were investigated.
2. A glass beaker was used as the container and the test was made with a shelf in its initial normal position.
3. 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 corner.
4. Load for all other measurements : 700ml of water, with the beaker located in the center of the oven
5. All other emissions are non-significant.
6. AF = Antenna Factor CF = Conversion factor F/S = Field Strength
7. The tests were made with average detector for frequency range of 30 MHz to 18GHz.

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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%)	2454	4
135(112.5%)	2453	3
120(Nominal)	2457	7
108(90%)	2455	5
96(80%)	2453	3

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)
1150	2457	7
920	2454	4
690	2454	4
460	2456	6
230	2454	4

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

Result : Positive

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9. LIST OF INSTRUMENTS USED

Type	Maker	Model	Cal. Date	N Date	Control No.
Test receiver	R&S	ESVP	07/02/99	07/02/00	F0000194AAZL
Test receiver	R&S	ESMI	10/07/99	10/07/00	F0034898AAZL
Pre amplifier	H/P	8449B	06/08/99	06/08/00	F0000239AAZL
Biconical antenna	S/B	BBA9106	05/27/99	05/27/00	F0000477AAZB
Log-periodic antenna	S/B	UHALP9107	05/27/99	05/27/00	F0000476AAZB
Horn antenna	EMCO	3115	02/11/98	02/11/00	F0000391AAZB
Filter	K&L	11SH10	06/02/98	06/02/00	FTE00076AAZA
Attenuator	Anritsu	M06954	05/17/99	05/17/00	-

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

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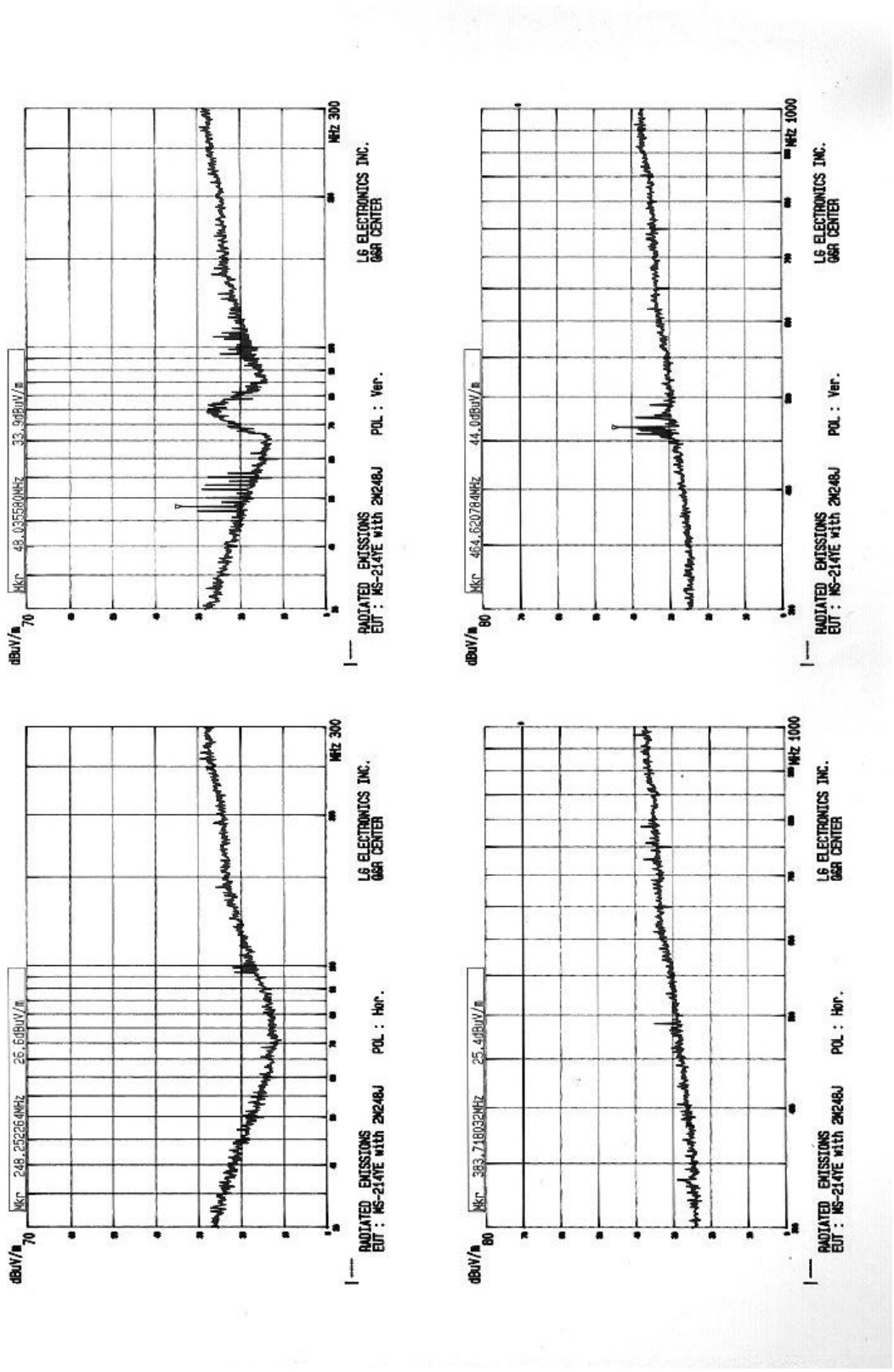
APPENDIX A The Test Graph

1) 30 ~ 1000 MHz (Magnetron type : 2M248J)



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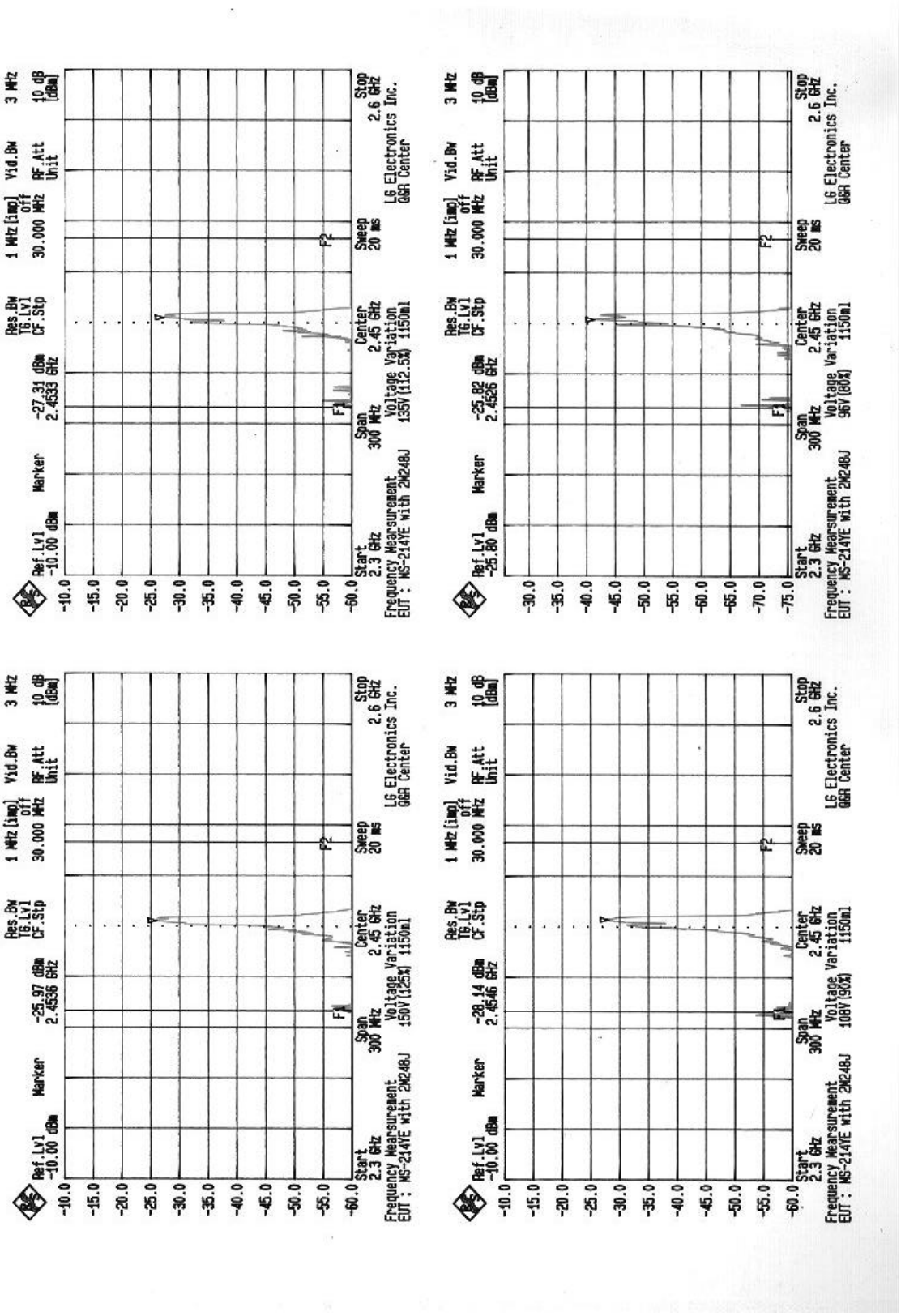
2) Voltage Variation (Magnetron type : 2M248J)



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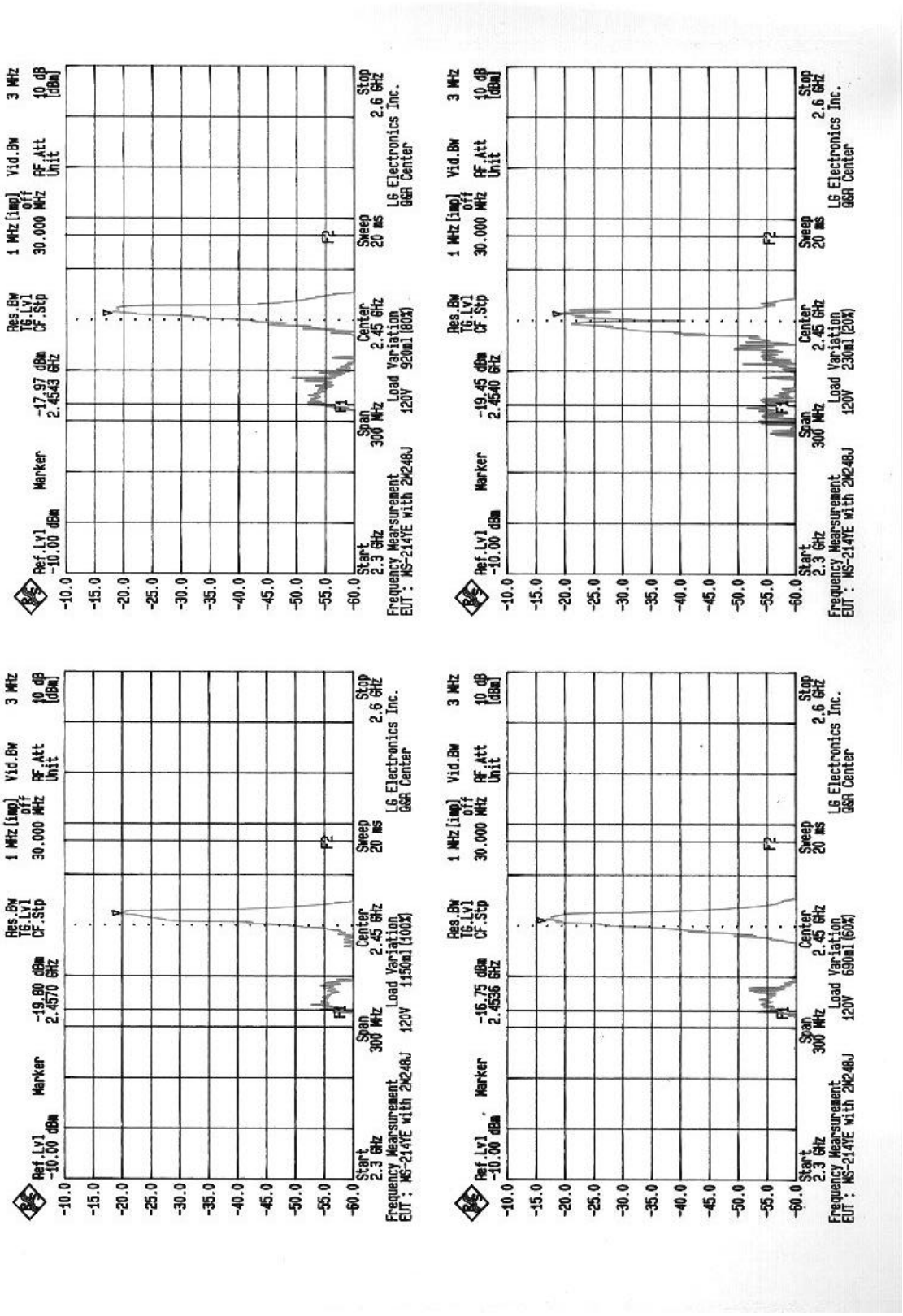
3) Load Variation (Magnetron type : 2M248J)



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APPENDIX B The Photographs of Test Set-up

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