Nemko Korea Co., Ltd.

300-2, Osan-Ri, Mohyun-Myun, Yongin-City, Kyungki-Do, KOREA

TEL:+82 31 322 2333 FAX:+82 31 322 2332

Applicant :

Daewoo Electronics Corporation.
M/W Oven Div. R&D Center, 412-2,
Chungchun-Dong, Bupyong-Gu, Incheon,
403-032, Korea
Attn : Mr. Gun-Woo, Ro

Dates of Issue : May 09, 2005
Test Report No. : NK2FE237
Test Site : Nemko Korea Co., Ltd.
EMC site, Korea

FCC ID	***C5F7NF1AMO110N***
Brand Name	***DAEWOO***
Contact Person	**Daewoo Electronics Corporation.** **M/W Oven Div. R&D Center, 412-2,** **Chungchun-Dong, Bupyong-Gu, Incheon,** **403-032, Korea** **Mr. Gun-Woo, Ro** **Telephone No. : +82 32 510 7923**

Applied Standard: Part 18 & 2
Classification : Consumer ISM equipment
EUT Type: Microwave oven

The device bearing the brand name and FCC ID specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in MP-5:1986.
I attest to the accuracy of data and all measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Baek sung khun

Tested By : S. H. Baek
Engineer

Reviewed By : H.H. Kim
Manager & Chief Engineer

TABLE OF CONTENTS

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 under FCC part 18.

Responsible Party :	Daewoo Electronics Corporation.
Contact Person :	Mr. Gun-Woo. Ro
	Tel No.: +82 32 510 7923
Manufacturer :	Daewoo Electronics Corporation. M/W Oven Div. R&D Center, 412-2, Chungchun-Dong, Bupyong-Gu, Incheon, 403-032, Korea
Factory :	1) Daewoo Microwave Oven Co., Ltd. 981-1, Jangduck-Dong, Gwangsan-Gu, Kwangju-Shi, 506-251, Korea 2) Daewoo Electronics Corporation. Detda, Dagang District, Tianjin, Chaina

- FCC ID: C5F7NF1AMO110N
- Model: KOR-1A5A
- Brand Name: DAEWOO
- EUT Type: Microwave Oven
- Applied Standard: FCC Part 18 & Part 2
- Test Procedure(s): MP-5:1986
- Dates of Test: Aril 23, 2005 to April 29,2005
- Place of Tests: Nemko Korea Co., Ltd. EMC Site
- Test Report No.: NK2FE237

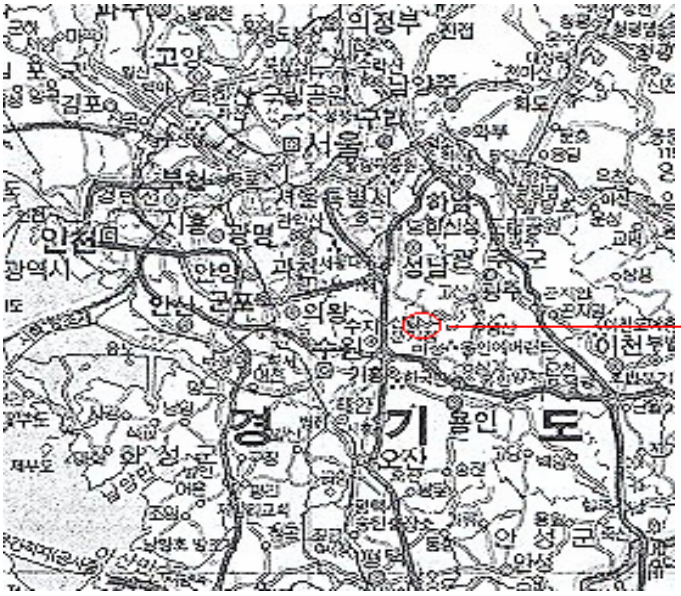
EUT Information

Electric Rating:	120V, 60Hz AC only, 1.5kW
Clock:	4MHz
Magnetron Type:	RM269 / Daewoo Electronics Corp.
Operating Frequency	2.45GHz
Rated Output Power	1100W

INTRODUCTION

The measurement procedure described in MP5:1986 for Methods of Measurement of radiated, powerline conducted radio noise, frequency and power output was used in determining emissions emanating from **Daewoo Electronics Corporation.**
FCC ID : **C5F7NF1AMO110N, Microwave Oven.**

These measurement tests were conducted at ***Nemko Korea Co., Ltd. EMC Laboratory*** .
The site address is 300-2, Osan-Ri, Mohyun-Myun, Yongin-City, Kyungki-Do, KOREA
The area of Nemko Korea Corporation Ltd. EMC Test Site is located in a mountain area at 80 kilometers (48 miles) southeast and Incheon International Airport (Incheon Airport), 30 kilometers (18miles) south-southeast from central Seoul.
It is located in the valley surrounded by mountains in all directions where ambient radio signal conditions are quiet and a favorable area to measure the radio frequency interference on open field test site for the computing and ISM devices manufactures.
The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2003



Nemko Korea Co., Ltd.
OPEN AREA TEST SITE
300-2, Osan-Ri, Mohyun-Myun, Yongin-City Kyungki-Do,KOREA 449-852
Tel) +82-31-322-2333
Fax) +82-31-322-2332

Fig. 1. The map above shows the Seoul in Korea vicinity area.
The map also shows Nemko Korea Corporation Ltd. EMC Lab and Incheon Airport.

DESCRIPTION OF TESTS

Radiation Hazard

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.

Input Power Measurement

The EUT was placed on a wooden table 0.8m at 1m distance Horn antenna.
A 700ml water load was placed in the center of the oven and the oven set to maximum power. A 700ml water load was chosen for its compatibility.
Input power and current were measured using a Power Analyzer.
Manufacturers to determine their input ratings commonly use this procedure.

Output Power Measurement

The Caloric Method was used to determine maximum output power.
The initial temperature of a 1000ml 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.

Frequency measurements

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 tested at 1000, 800, 600, 400, 200ml for the load varied.

DESCRIPTION OF TESTS

Conducted Emissions

The Line conducted emission test facility is located inside a 4 X 7 X 2.5 meter shielded enclosure.
It is manufactured by EM engineering. The shielding effectiveness of the shielded room is in accordance with MIL-STD-285 or NSA 65-6.
A 1m X 1.5m wooden table 0.4m height is placed 0.4m away from the vertical wall and 1.5m away from the side of wall of the shielded room
Kyoritsu (KNW-407) of the 50ohm/50uH Line Impedance Stabilization Network(LISN) is bonded to the shielded room.
The EUT is powered from the Kyoritsu LISN.
Power to the LISN is filtered by high-current high insertion loss Power line filters.
The purpose of filter is to attenuate ambient signal interference and this filter is also bonded to shielded enclosure.
All electrical cables are shielded by tinned copper zipper tubing with inner diameter of 1/2".
If DC power device, power will be derived from the source power supply it normally will be powered from and this supply lines will be connected to the LISN,
All interconnecting cables more than 1 meter were shortened by non inductive bundling (serpentine fashion) to a 1 meter length.
Sufficient time for EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer to determine the frequency producing the maximum EME from the EUT.
The spectrum was scanned from 150kHz to 30MHz with 20msec sweep time.
The frequency producing the maximum level was re-examined using the EMI test receiver. (Rohde & Schwarz ESCS30).
The detector function were set to CISPR quasi-peak mode & average mode.
The bandwidth of receiver was set to 9KHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission.
Each EME reported was calibrated using the R&S signal generator.

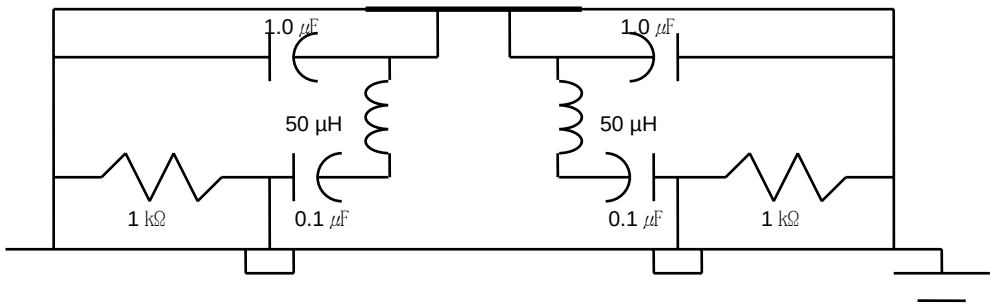


Fig. 2. LISN Schematic Diagram

DESCRIPTION OF TESTS

Radiated Emissions

Preliminary measurement were made indoors at 3 meter using broad band antennas, broadband amplifier, and spectrum analyzer to determine the frequency producing the maximum EME. Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The Technology configuration, clock speed, mode of operation or video resolution, turntable azimuth with respect to the antenna was note for each frequency found. The spectrum was scanned from 30 to 1000MHz using Biconical log Antenna(ARA, LPB-2520/A). Above 1GHz, Doppels Teg Horn antenna (EMCO, DAA-37121) was used.
Final Measurements were made outdoors at 10m using Biconical log Antenna (Schwarzbeck, VULB 9166) for measurement from 30MHz to 1000MHz and made indoors at 3m using Doppels Teg Horn antenna (EMCO, DAA-37121) for measurement from 1GHz to 24GHz.
Each frequency found during pre-scan measurements was reexamined and investigated using EMI test receiver. (ESCS30)
The detector function were set to CISPR quasi-peak and peak mode and the bandwidth of the receiver were set to 120KHz and 1MHz depending on the frequency or type of signal.
The half wave dipole antenna was tuned to the frequency found during preliminary radiated measurements.
The EUT support equipment and interconnecting cables were re configured to the setup producing the maximum emission for the frequency and were placed on top of a 0.8m high non- metallic 1.0X 1.5 meter table.
The EUT, support equipment and interconnecting cables were re-arranged and manipulated to maximize each EME emission.
The EUT is rotated about its vertical axis on the turntable, and the polarization and height of the receiving antenna are varied to obtain the highest field strength on the particular frequency under observation.
Each EME reported was calibrated using the R/S signal generator.

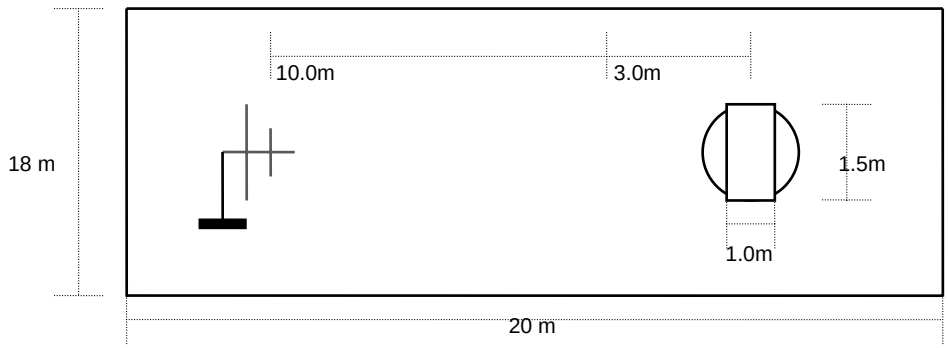


Fig. 3. Dimensions of Outdoor Test Site

TEST DATA

Radiation Hazard

Probe Location	Maximum Leakage [mW/Cm2]	Limit [mW/Cm2]
A	0.09	1.00
B	0.03	1.00
C	0.02	1.00
D	0.02	1.00
All others	0.01	1.00

Input Power Measurement

Operation mode	P rated (W)	P (W)	dP (%)	Required dP (%)
Power Input	1500	1500	0	+5%or-10%

RF Output Power Measurement

Quantity of Water [ml]	Starting Temperature [Centigrade]	Final Temperature [Centigrade]	Elapsed Time [seconds]	RF Power [watts]
1000	10.1	37.4	120	953

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

Baek Sung Hun

Tested by : ***S. H. Baek***

TEST DATA

Operating Frequency measurements

▶Frequency vs Line Voltage Variation Test

[Room Temperature : 22.5℃]

Line Voltage Variation (Vac)	*)Pole	Frequency [MHz]	Allowed Tolerance for the ISM Band
96 (80%)	H	Lower : 2410	Lower : 2400MHz Upper : 2500MHz
	H	Upper : 2452	
	V	Lower : 2401	
	V	Upper : 2453	
108 (90%)	H	Lower : 2424	
	H	Upper : 2453	
	V	Lower : 2403	
	V	Upper : 2453	
132 (110%)	H	Lower : 2429	
	H	Upper : 2454	
	V	Lower : 2420	
	V	Upper : 2454	
150 (125%)	H	Lower : 2424	
	H	Upper : 2472	
	V	Lower : 2429	
	V	Upper : 2472	

NOTE :

1. *Pol. H =Horizontal V=Vertical

2. Initial load : 1000ml of water in the beaker.

3. Line voltage varied from 96Vac to 150Vac.

4. ISM Frequency : 2450MHz, Tolerance : ±50MHz

RESULT : Pass

Baek Sung Hun

Tested by : ***S. H. Baek***

TEST DATA

▶Frequency vs Load Variation Test

[Room Temperature : 22.0℃]

Volume of water (cc)	*)Pole	Frequency [MHz]	Allowed Tolerance for the ISM Band
1000	H	Lower : 2408	Lower : 2400MHz Upper : 2500MHz
	H	Upper : 2465	
	V	Lower : 2413	
	V	Upper : 2460	
800	H	Lower : 2402	
	H	Upper : 2465	
	V	Lower : 2411	
	V	Upper : 2462	
600	H	Lower : 2408	
	H	Upper : 2456	
	V	Lower : 2404	
	V	Upper : 2461	
400	H	Lower : 2420	
	H	Upper : 2451	
	V	Lower : 2420	
	V	Upper : 2450	
200	H	Lower : 2433	
	H	Upper : 2461	
	V	Lower : 2427	
	V	Upper : 2460	

NOTE :

1. *Pol. H =Horizontal V=Vertical

2. Initial load : 1000ml of water in the beaker.

3. Frequency was measured by using nominal voltage (AC120V).

4. ISM Frequency : 2450MHz, Tolerance : ±50MHz

RESULT : Pass

Baek Sung Hun

Tested by : ***S. H. Baek***

TEST DATA

Conducted Emissions

FCC ID : C5F7NF1AMO110N

[Room Temperature : 23.0℃]

Frequency (MHz)	Level(dBμV)		Line	Limit(dBμV)		Margin(dB)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.15	44.4	21.2	N	66.0	56.0	21.6	34.8
0.22	30.5	7.8	N	62.8	52.8	32.3	45.0
0.23	37.9	14.5	L	62.4	52.4	24.5	37.9
0.25	37.2	13.2	L	61.8	51.8	24.6	38.6
0.34	37.4	13.4	L	59.2	49.2	21.8	35.8
0.45	33.0	7.4	N	56.9	46.9	23.9	39.5

) Correction factor was included to Test Level (dBuV)

NOTES:

1. Measurements using CISPR quasi-peak mode & average mode.

2. See attached Plots.

3. LINE : L =Line , N = Neutral

Baek sung hun

Tested by : ***S. H. Baek***

TEST DATA

Radiated Emissions

FCC ID : C5F7NF1AMO110N

▶ **30MHz ~ 1GHz** **[Room Temperature : 23.5℃]**

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	AF+CL+Amp (dB)**	Result(PK) (dBμV/m)	Limit(10m) (dBμV/m)	Margin (dB)
45.52	45.9	V	-21.3	24.6	60.76	36.2
68.80	41.6	V	-21.2	20.4	60.76	40.4
130.88	37.8	V	-15.6	22.2	60.76	38.6
251.16	29.6	V	-12.5	17.1	60.76	43.7
252.13	37.1	H	-12.5	24.6	60.76	36.2
373.38	31.7	V	-9.4	22.3	60.76	38.5
381.14	28.6	H	-9.2	19.4	60.76	41.4
509.18	33.9	H	-6.1	27.8	60.76	33.0
518.88	33.3	V	-5.8	27.5	60.76	33.3

<Radiated Measurements at 10meters>

NOTES:

1. *Pol. H =Horizontal V=Vertical

2. **AF+CL+Amp. = Antenna Factor + Cable Loss + Amplifier.

3. Distance Correction factor : 20 * log (300/10) ≒30dBuV/m

4. The limit at 300meters is 20 * LOG (25 * SQRT (RF Power/500))

5. All other emissions were measured while a 700ml load was placed in the center of the oven.

6. If no frequencies are specified in the tables, no measurement for peak & average was necessary.

Baek Sung Hun

Tested by : **S. H. Baek**

TEST DATA

Radiated Emissions

FCC ID : C5F7NF1AMO110N

▶ **1GHz ~ 24GHz** **[Room Temperature : 21.5℃]**

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	AF+CL+Amp (dB)**	K (dB)***	Limit (with K) (dBμV/m)	Results (dBμV/m)	Margin (dB)
4279.00	24.7	V	10.30	40.17	70.93	35.00	35.93
4928.00	32.4	V	10.00	40.00	70.76	42.40	28.36
7332.00	34.4	V	14.30	40.00	70.76	48.70	22.06
8448.00	26.8	H	16.85	40.00	70.76	43.65	27.11
9805.00	29.4	H	18.00	40.00	70.76	47.40	23.36
1466.00	33.2	V	25.05	40.00	70.76	58.25	12.51
1713.00	30.8	V	27.15	40.00	70.76	57.95	12.81

<Radiated Measurements at 3meters>

NOTES:

1. *Pol. H =Horizontal V=Vertical

2. **AF+CL+Amp. = Antenna Factor + Cable Loss + Amplifier.

3. ***Computations to determine compliance

4. Distance Correction factor : 20 * log (300/3)=40dBuV/m

5. The limit at 300meters is 20 * LOG (25 * SQRT (RF Power/500))

6. Load for measurement of radiation on second and third harmonic : Two loads, one of 700ml and the other of 300ml, 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.

7. The test was performed at peak detector mode with RBW 1MHz, VBW 10Hz.

8. All other emissions were measured while a 700ml load was placed in the center of the oven.

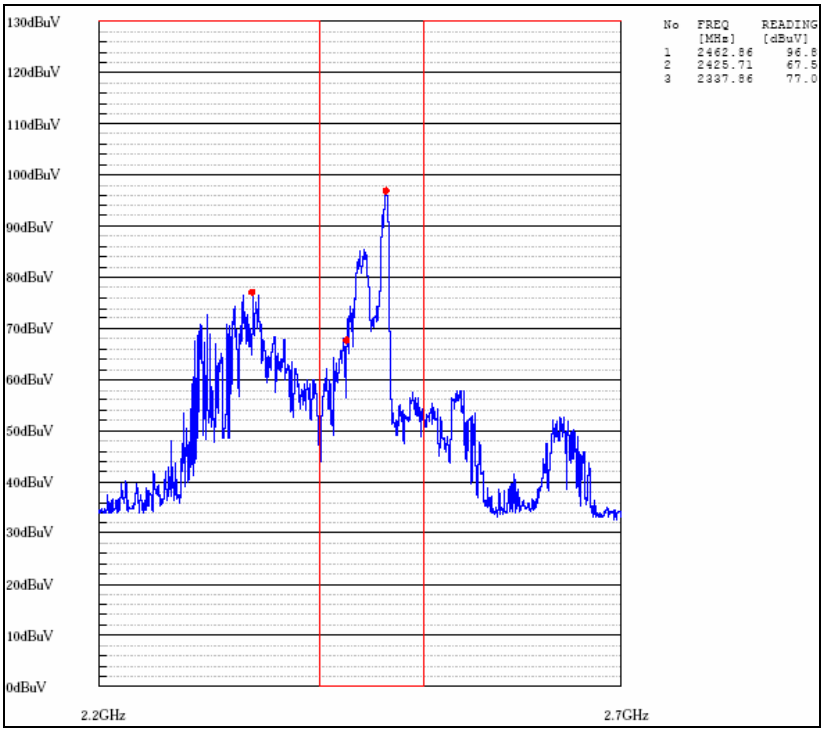
9. If no frequencies are specified in the tables, no measurement for peak with RBW 1MHz & VBW 10Hz.

Baek sung Hun

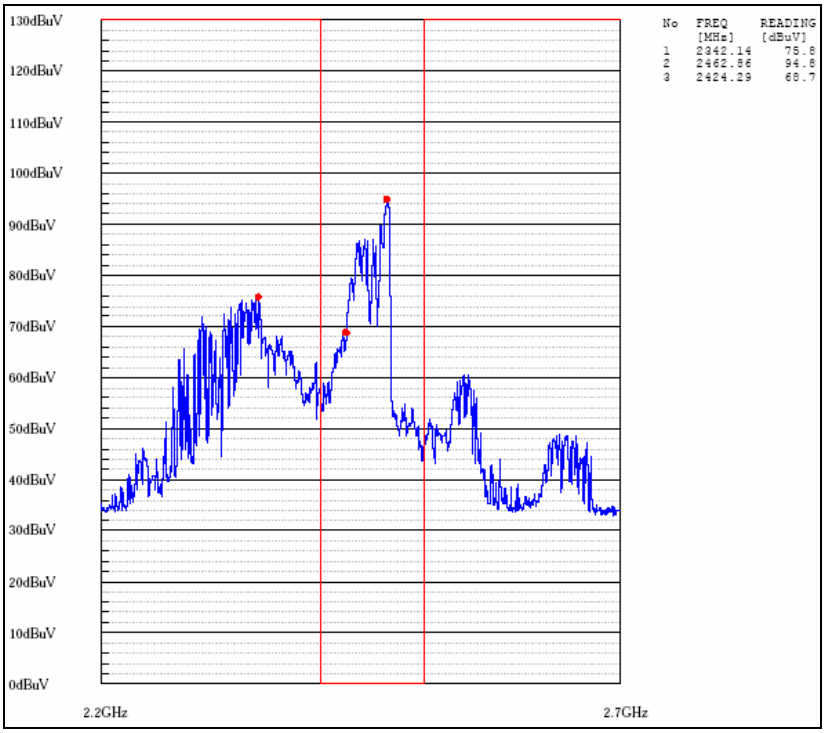
*Tested by : **S. H. Baek***

PLOTS OF EMISSIONS

- ***Frequency vs Line Voltage Variation Test***



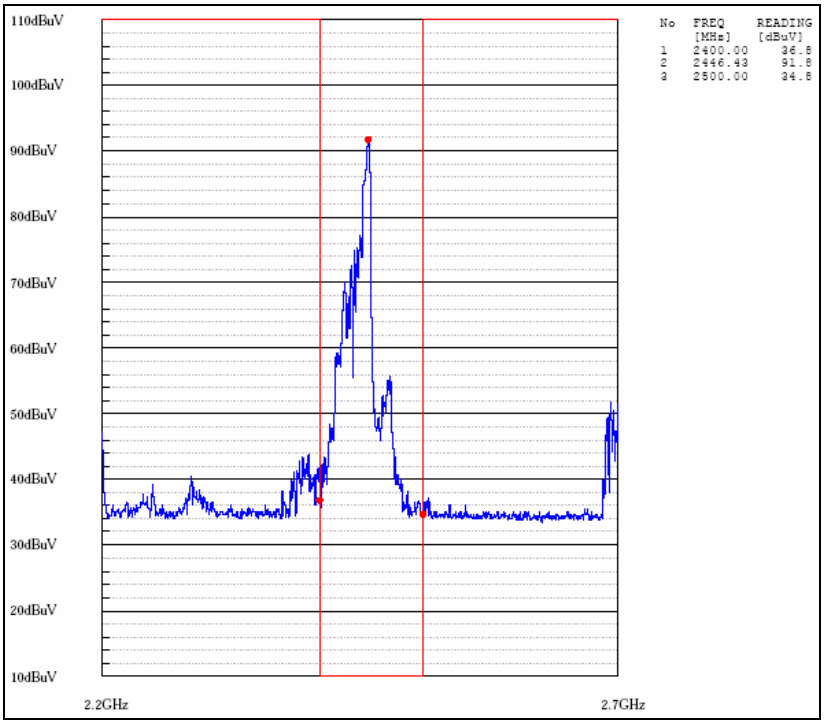
Horizontal (96V, 1000cc)



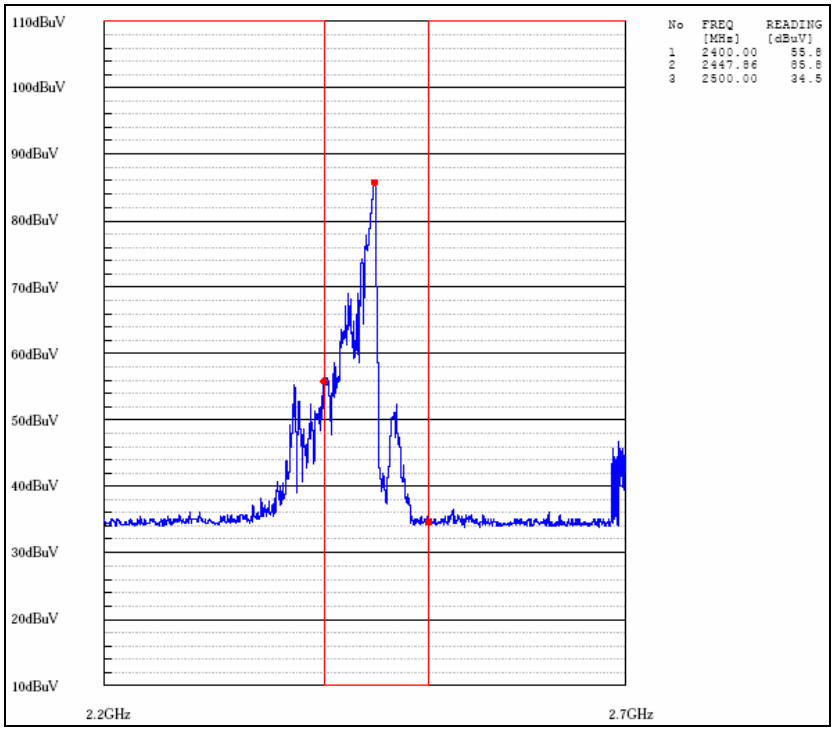
Vertical (96V, 1000cc)

PLOTS OF EMISSIONS

- ***Frequency vs Line Voltage Variation Test***



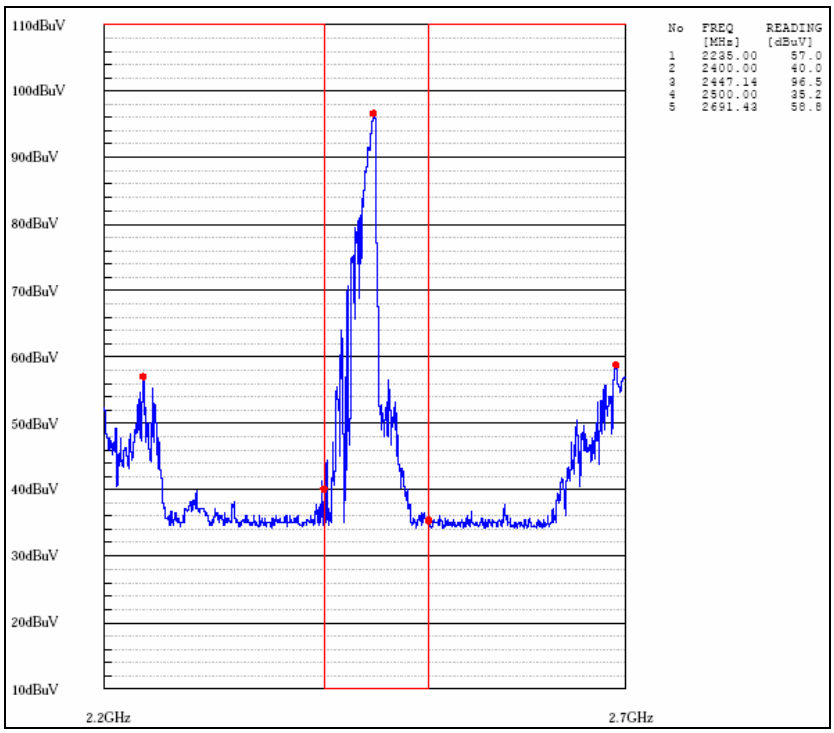
Horizontal (108V, 1000cc)



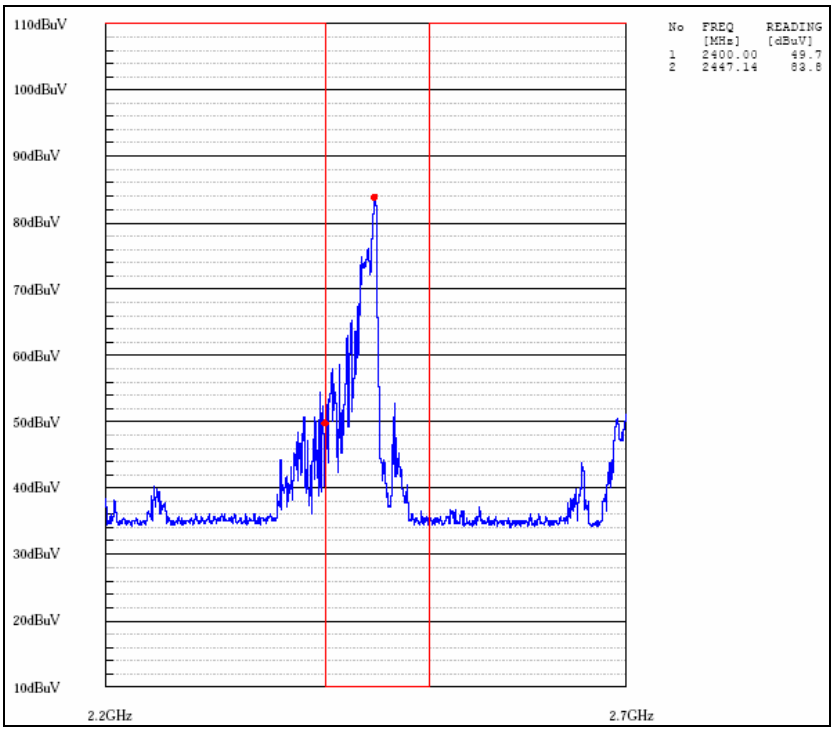
Vertical (108V, 1000cc)

PLOTS OF EMISSIONS

- ***Frequency vs Line Voltage Variation Test***



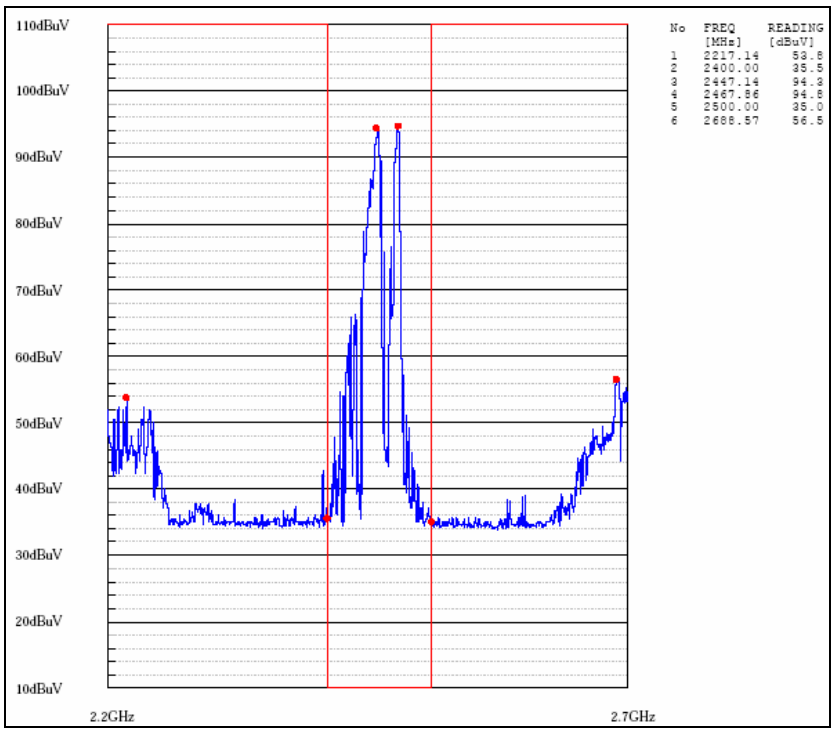
Horizontal (132V, 1000cc)



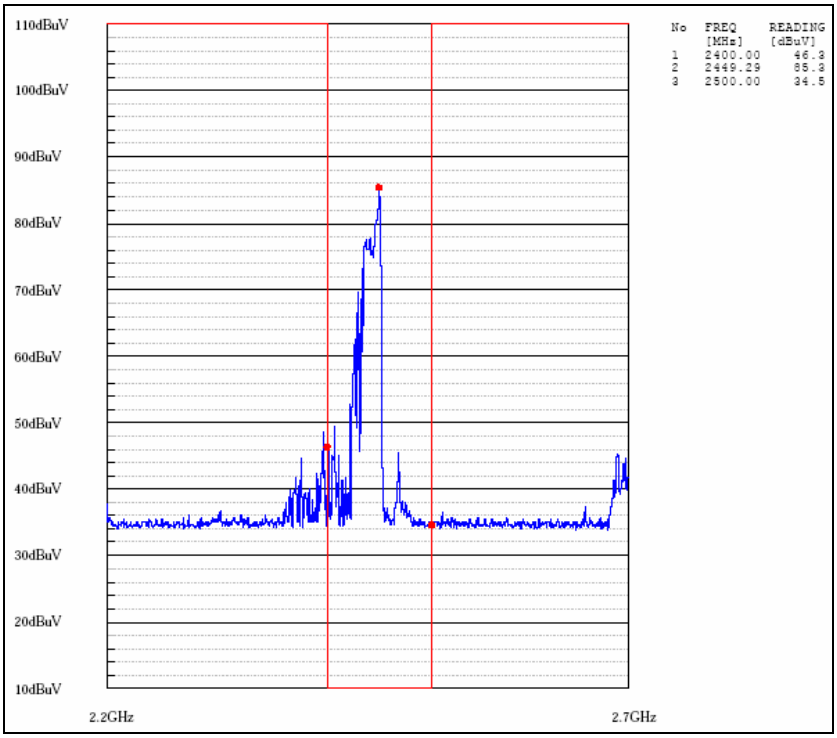
Vertical (132V, 1000cc)

PLOTS OF EMISSIONS

- ***Frequency vs Line Voltage Variation Test***



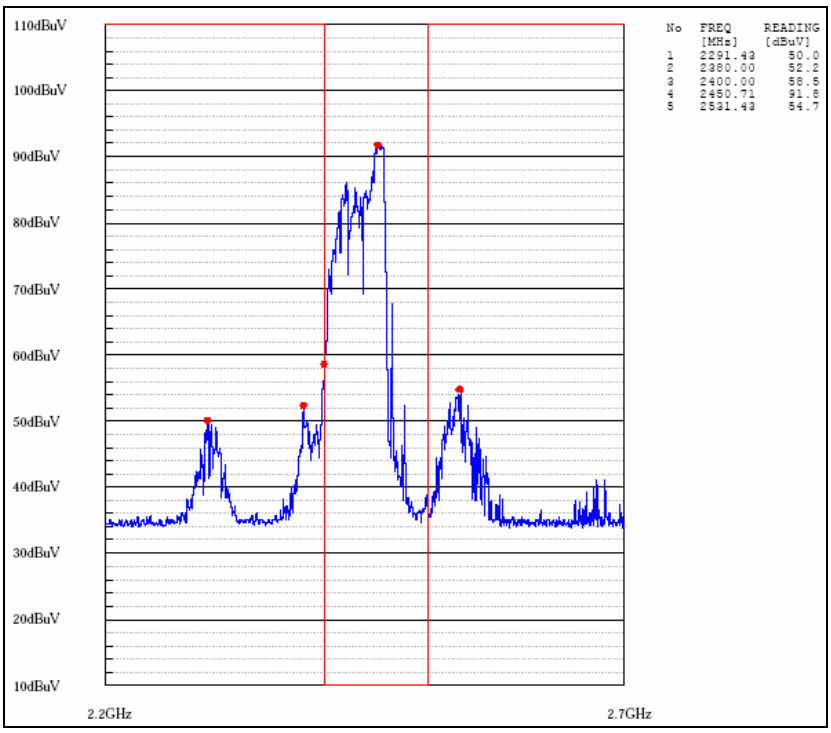
Horizontal (150V, 1000cc)



Vertical (150V, 1000cc)

PLOTS OF EMISSIONS

- ***Frequency vs Load Variation Test***



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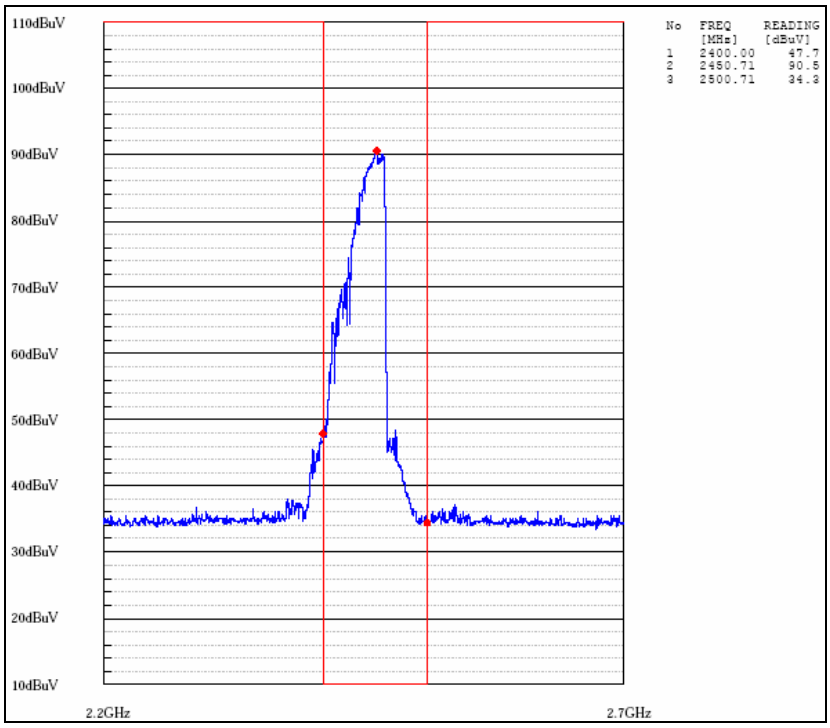
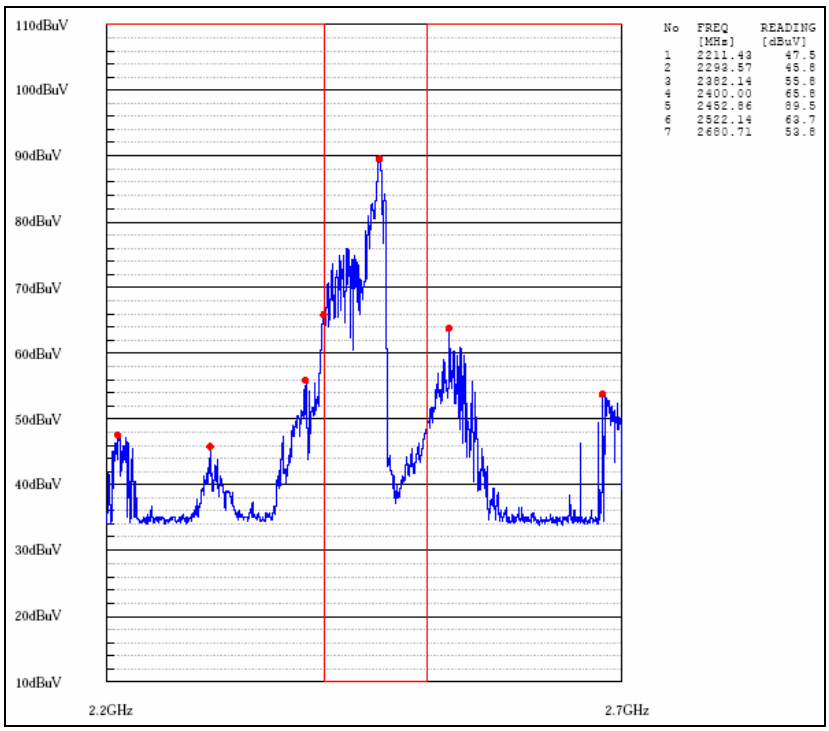


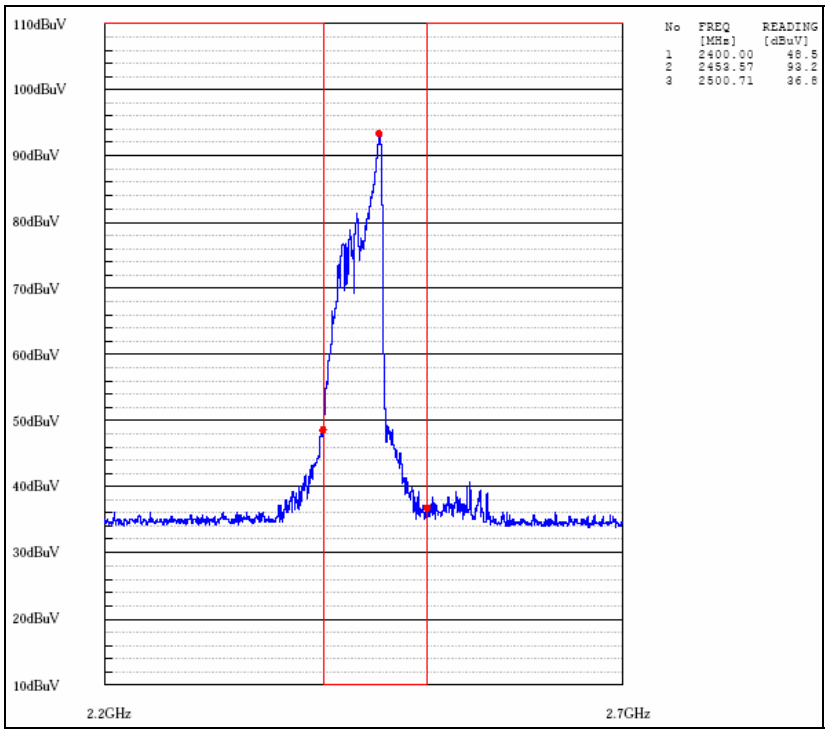
Vertical (120V, 1000cc)

PLOTS OF EMISSIONS

- ***Frequency vs Load Variation Test***



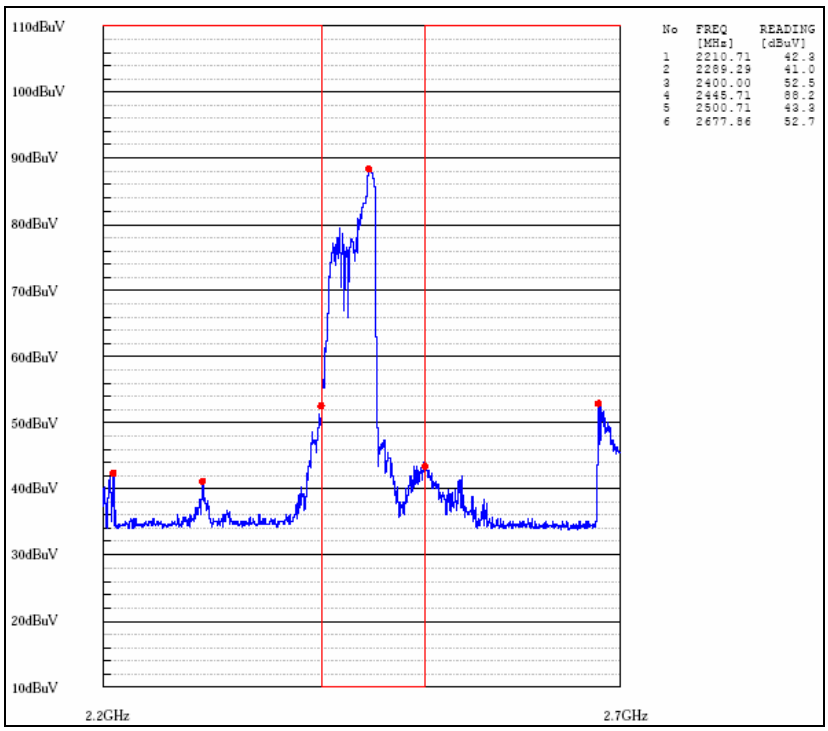
Horizontal (120V, 800cc)



Vertical (120V, 800cc)

PLOTS OF EMISSIONS

- ***Frequency vs Load Variation Test***



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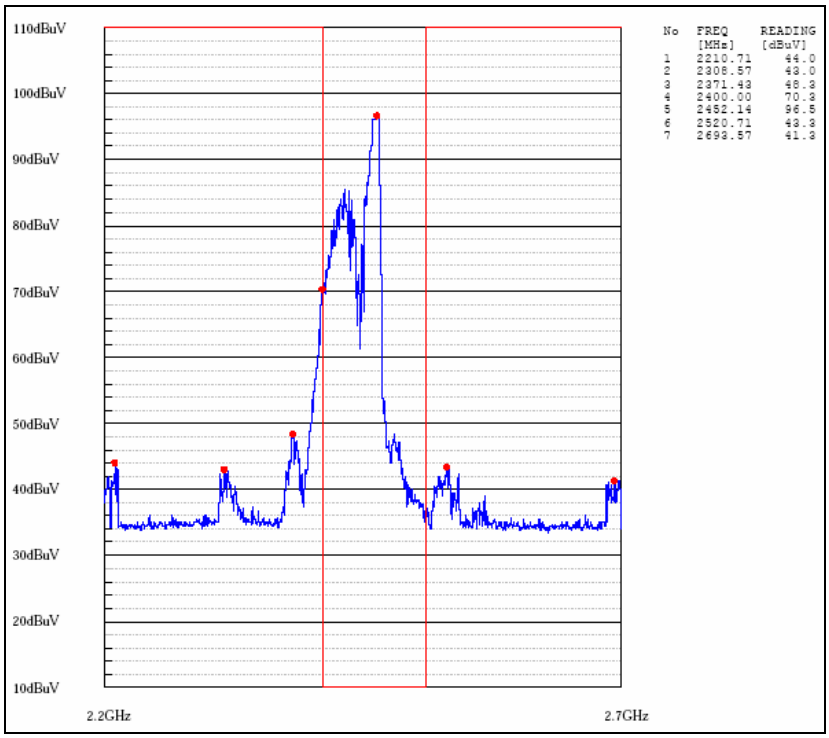
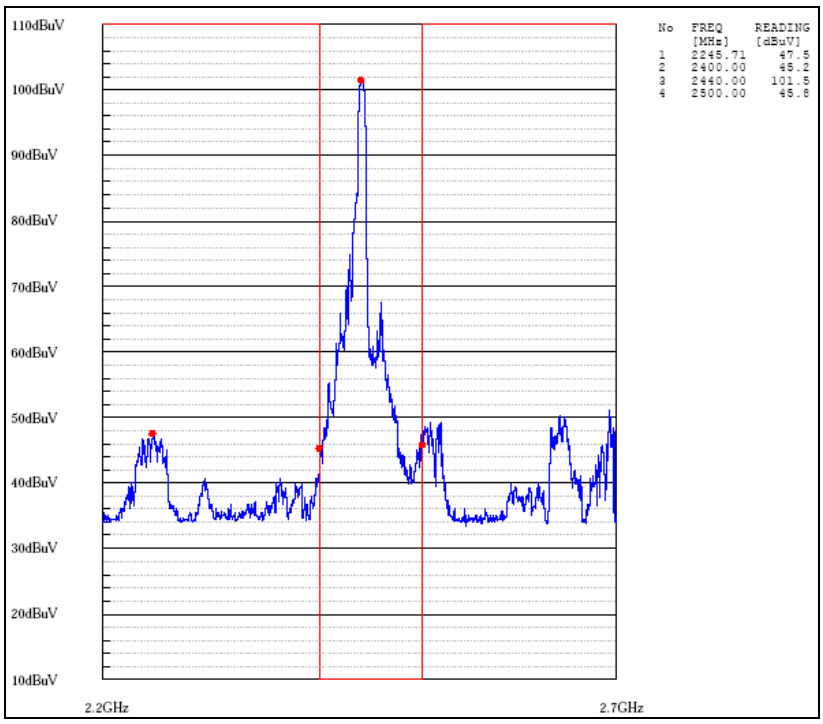


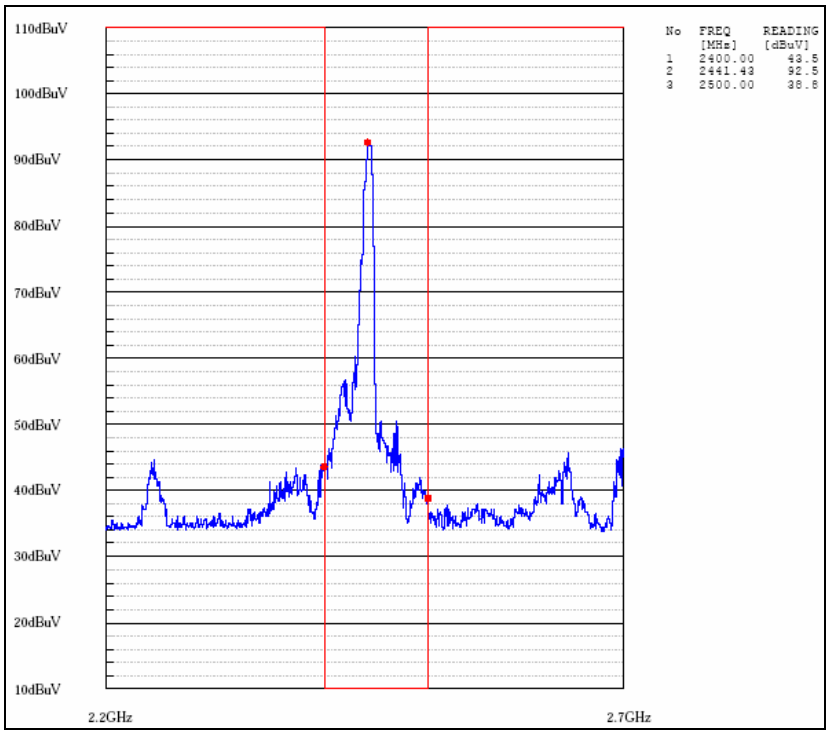
Vertical (120V, 600cc)

PLOTS OF EMISSIONS

- ***Frequency vs Load Variation Test***



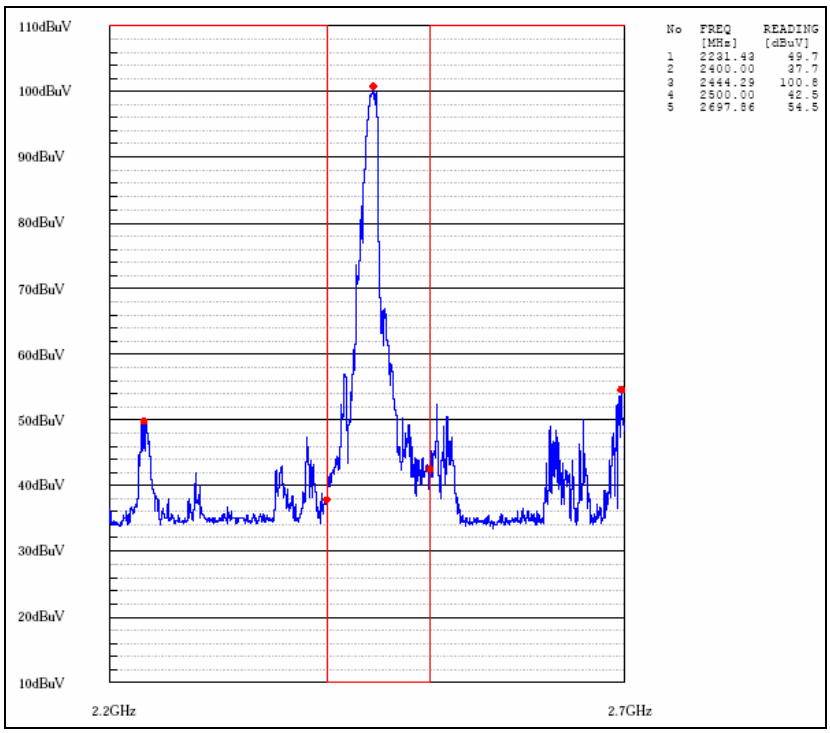
Horizontal (120V, 400cc)



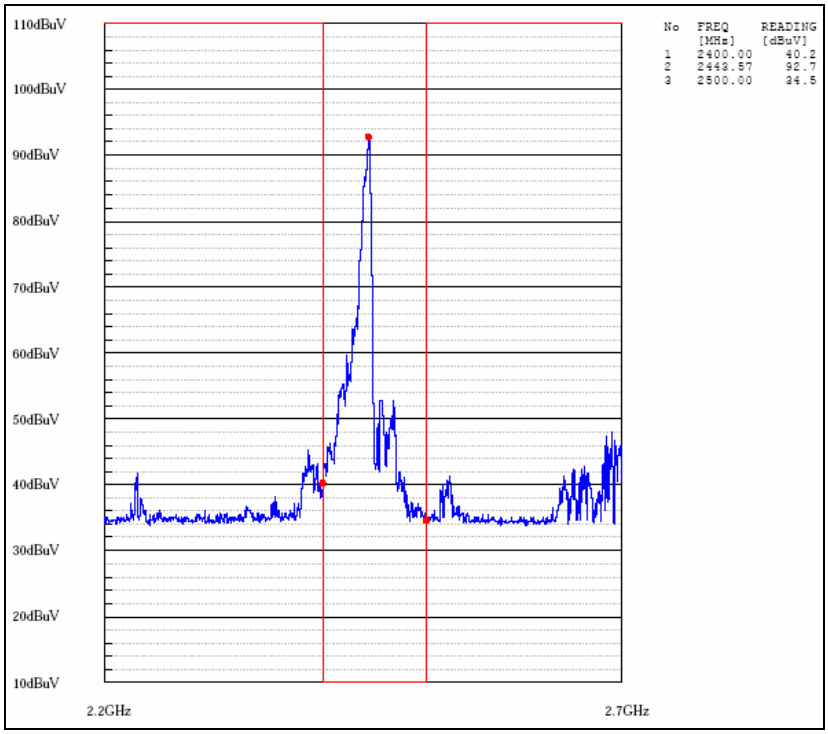
Vertical (120V, 400cc)

PLOTS OF EMISSIONS

- ***Frequency vs Load Variation Test***



Horizontal (120V, 200cc)



Vertical (120V, 200cc)

PLOTS OF EMISSIONS

- ***Conducted Emission at the Mains port (Line)***

NEMKO KOREA (NK-2E-E-237) 02 May 2005 13:46

Conducted Emissions

EUT:	Microwave Oven
Manuf:	Daewoo Electronics Corporation
Op Cond:	AC 120V , 60Hz
Operator:	Baek
Test Spec:	
Comment:	M/N: KOR-1A5A
	LINE : LINE
Result File:	774-2.dat : New Measurement

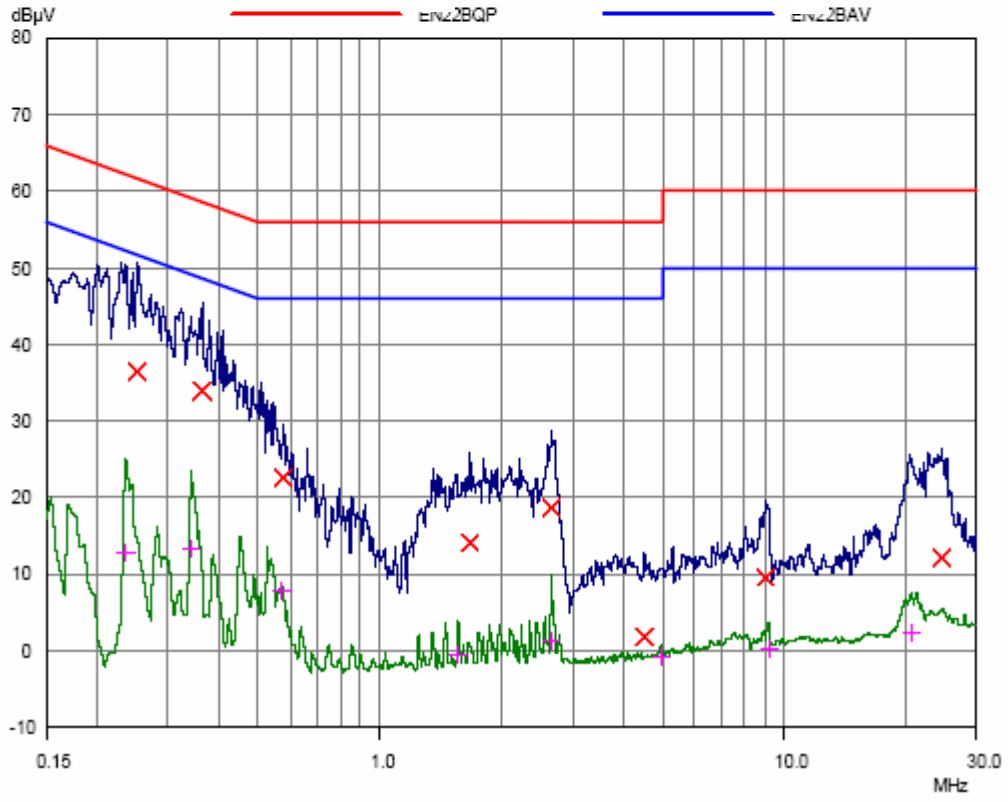
Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	3.9063kHz	9kHz	PK+AV	20msec	10 dB	OFF	60dB

Transducer	No.	Start	Stop	Name
	1	150kHz	30MHz	CE_LINE

Final Measurement:

Detectors:	X QP / + AV
Meas Time:	1sec
Subranges:	8
Acc Margin:	60 dB



PLOTS OF EMISSIONS

- ***Conducted Emission at the Mains port (Neutral)***

NEMKO KOREA (NK-2E-E-237) 02 May 2005 13:37

Conducted Emissions

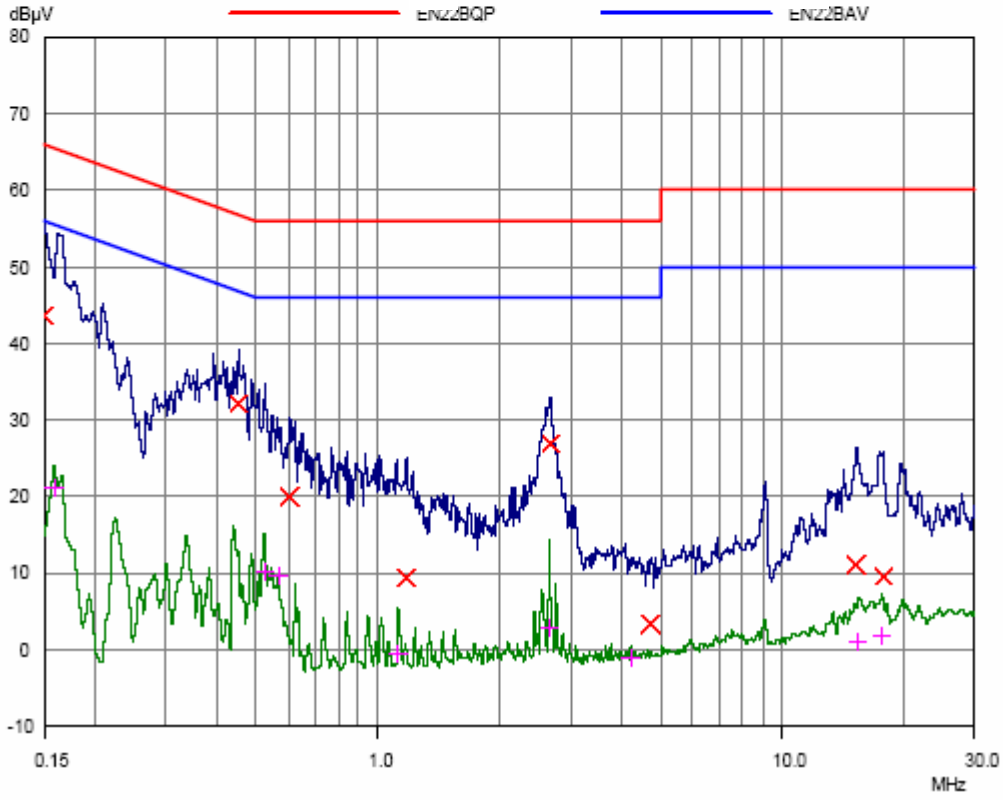
EUT:	Microwave Oven
Manuf:	Daewoo Electronics Corporation
Op Cond:	AC 120V , 60Hz
Operator:	Baek
Test Spec:	
Comment:	M/N: KOR-1A5A LINE : NEUTRAL
Result File:	774-2.dat : New Measurement

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	3.9063kHz	9kHz	PK+AV	20msec	10 dB	OFF	60dB

Transducer	No.	Start	Stop	Name
	1	150kHz	30MHz	CE_LINE

Final Measurement:		
	Detectors:	X QP / + AV
	Meas Time:	1sec
	Subranges:	8
	Acc Margin:	60 dB



ACCURACY OF MEASUREMENT

The Measurement Uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 with the confidence level of 95%

1. Radiation Uncertainty Calculation

Contribution	***Probability Distribution***	***Uncertainty(+/-dB)***
Antenna Factor	Normal (k=2)	± 0.5
Cable Loss	Normal (k=2)	± 0.04
Receiver Specification	Rectangular	± 2.0
Antenna directivity	Rectangular	± 1.0
Antenna Factor variation with Height		
Antenna Phase Center Variation		
Antenna Factor Frequency Interpolation		
Measurement Distance Variation		
Site Inperfections	Rectangular	± 2.0
Mismatch:Receiver VRC ri=0.3 Antenna VRC rR=0.1(Bi)0.4(Lp) Uncertainty Limits 20Log(1+/-ri rR)	U-Shaped	+ 0.25 / - 0.26
System Repeatibilty	Std.deviation	± 0.05
Repeatability of EUT	-	-
Combined Standard Uncertainty	Normal	± 1.77
Expended Uncertainty U	Normal (k=2)	± 3.5

2. Conducted Uncertainty Calculation

Contribution	***Probability Distribution***	***Uncertainty(+/-dB)***
Receiver Specification	Normal (k=2)	± 2.0
LISN coupling spec.	Normal (k=2)	± 0.4
Cable and input attenuator cal.	Rectangular	± 0.4
Mismatch:Receiver VRC ri=0.3 LISN vrc rg=0.1 Uncertainty Limits 20Log(1+/-ri rR)	U-Shaped	± 0.26
System Repeatibilty	Std.deviation	± 0.68
Repeatability of EUT	-	-
Combined Standard Uncertainty	Normal	± 1.18
Expended Uncertainty U	Normal (k=2)	± 2.4

LIST OF TEST EQUIPMENT

No.	Instrument	Manufacturer	Model	Calibration Date
1	*Test Receiver	R & S	ESCS 30	2004.08
2	*Test Receiver	R & S	ESCS 30	2004.12
3	Amplifier	HP	8447F	2004.07
4	*Amplifier	HP	8447F	2005.01
5	Amplifier	HP	8447F	2004.10
6	*Amplifier	HP	8449B	2005.03
7	*Spectrum Analyzer	HP	8566B	2005.03
8	Spectrum Analyzer	HP	8568B	2004.10
9	*Spectrum Analyzer	Anritsu	MS2668C	2004.12
10	*Logbicon Super Antenna	Schwarzbeck	VULB9166	2004.05
11	*Doppels Teg Horn	EMCO	DAA-37121	2004.10
12	*Biconical Log Antenna	ARA	LPB-2520/A	2005.01
13	High Voltage Probe	R & S	ESH2-Z3	2004.06
14	*Microwave Survey Meter	Holaday Industries	H1-1801	2004.07
15	Signal Generater	R & S	SMP02	2005.03
16	*LISN	R & S	ESH3-Z5	2004.10
17	*LISN	Kyoritsu	KNW-407	2005.03
18	LISN	Kyoritsu	KNW-408	2004.12
19	*Position Controller	EM Eng.	N/A	N/A
20	*Turn Table	EM Eng.	N/A	N/A
21	*Antenna Mast	EM Eng.	N/A	N/A
22	*Anechoic Chamber	EM Eng.	N/A	N/A
23	*Shielded Room	EM Eng.	N/A	N/A
24	*Position Controller	Seo-Young EMC	N/A	N/A
25	*Turn Table	Seo-Young EMC	N/A	N/A
26	*Antenna Mast	Seo-Young EMC	N/A	N/A
27	*Anechoic Chamber	Seo-Young EMC	N/A	N/A
28	*Shielded Room	Seo-Young EMC	N/A	N/A

) Test equipment used during the test

APPENDIX D – SCHEMATIC DIAGRAM

APPENDIX E – USER'S MANUAL

APPENDIX F – BLOCK DIAGRAM