



Issue Date : December 24, 1999
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EMC ~~EMISSION~~ - TEST REPORT

JQA APPLICATION No. : KL8090556

Name of Product : Microwave Oven

Model/Type No. : R-220D

FCC ID : APYDMR0128

Applicant : Sharp Corporation, Reliability Control Group

Address : 22-22, Nagaike-cho, Abeno-ku, Osaka 545-8522, Japan

Manufacturer : Sharp Appliances (Thailand) Ltd.

Address : 64 Moo 5, Tambol Bangsamuk, Amphur Bangpakong
Chachoengsao, Province, Thailand

Final Judgement : **Passed**

TEST RESULTS IN THIS REPORT are obtained in use of equipment that is traceable to Electro-technical Lab. of MITI Japan and Communications Research Lab. of PTT Japan.

THE TEST RESULTS only responds to the test sample. This test report shall not be reproduced except in full.

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TEST REGULATION

FCC Rules and Regulations Part 18 Subpart A, B and C (September 5, 1985)

- - Miscellaneous equipment
- - Medical diathermy
- - Industrial heaters and RF stabilized arc welder
- - Induction cooking ranges
- - ISM Frequency Device
- - Non-ISM Frequency Device

Test procedure:

The test was performed according to the procedures in FCC/OET MP-5 (1985).

GENERAL INFORMATION

Test facility:

- 1) Test Facility located at Kita-Kansai : 1st and 2nd Open Sites (3 m Site)
Test Facility located at Kameoka Open Site (3, 10 and 30 m, on common plane)
FCC filing No. : 31040/SIT 1300F2
- 2) KITA-KANSAI TESTING CENTER is recognized under the National Voluntary Laboratory Accreditation Program for satisfactory compliance established in Title 15, Part 285 Code of Federal Regulations.
NVLAP Lab Code: 200191-0
- 3) Average Measurement Method
FCC filing No. : 950523A 1300F2

Description of the Equipment Under Test (EUT):

- 1) Name : Microwave Oven
- 2) Model/Type No. : R-220D
- 3) Product Type : Prototype
- 4) Category : ISM Frequency Device
- 5) EUT Authorization : ○ - Verification ● - Certification ○ - D.o.C.
- 6) Highest frequency used/generated : 2450 MHz
- 7) Power Rating : AC 120V 60Hz

Definitions for symbols used in this test report:

- - Black box indicates that the listed condition, standard or equipment is applicable for this Report.
- - Blank box indicates that the listed condition, standard or equipment is not applicable for this Report.

TEST CONDITIONS

RF Power Output Measurement

was performed in the following test site.

Test location:

KITA-KANSAI Testing Center

7-7, Ishimaru, 1-Chome, Mino-Shi, Osaka, 562-0027, Japan

☐ - 1st site

☐ - 2nd site

☒ - Shielded room

☐ - Anechoic chamber

KAMEOKA EMC Branch

9-1, Ozaki, Inukanno, Nishibetsuin-Cho, Kameoka-Shi, Kyoto, 621-0126, Japan

☐ - Shielded room

☐ - Open test site

Used test instruments:

Model No.	Assigned C/N	Last Cal. Date	Cal. Interval
☒ - 2533-21	08011090	April, 1999	1 Year
☒ - 245506	Q47097361	April, 1999	1 Year
☒ - SIII-5000	Q47097350	February, 1999	1 Year

Environmental conditions:

Temperature: 23 °C Humidity: 56 %

ISM Frequency Measurement

was performed for line voltage variation from 80 % to 125 % of normal rated voltage, in the following test site.

Test location:

KITA-KANSAI Testing Center

7-7, Ishimaru, 1-Chome, Mino-Shi, Osaka, 562-0027, Japan

- ☐ - 1st site
- ☐ - 2nd site
- ☐ - Shielded room
- ☒ - Anechoic chamber

KAMEOKA EMC Branch

9-1, Ozaki, Inukanno, Nishibetsuin-Cho, Kameoka-Shi, Kyoto, 621-0126, Japan

- ☐ - Shielded room
- ☐ - Open test site

Used test instruments:

Model No.	Device ID	Last Cal. Date	Cal. Interval
☒ - 8566B	A - 13	November, 1999	1 Year
☐ - 8593A	A - 15		
☒ - 8673D	B - 2	April, 1999	1 Year
☒ - TR5212	B - 30	March, 1999	1 Year
☐ - 4T-10	D - 73		
☐ - 4T-10	D - 74		
☐ - WJ-6611-513	A - 23		
☐ - WJ-6882-824	A - 21		
☐ - DBL-0618N515	A - 33		
☐ - 91888-2	C - 41 - 1		
☒ - 91889-2	C - 41 - 2	May, 1999	1 Year
☐ - 94613-1	C - 41 - 3		
☐ - 91891-2	C - 41 - 4		
☐ - 94614-1	C - 41 - 5		
☐ - 2-10	D - 40		
☒ - Cable	C - 40 - 11	May, 1999	1 Year
☐ - Cable	C - 40 - 12		

Environmental conditions:

Temperature: 24 °C Humidity: 38 %

Magnetic Field Radiated Emission Measurement

was performed in the frequency range of 9 kHz - 30 MHz, in the following test site.

Test location:

KITA-KANSAI Testing Center

7-7, Ishimaru, 1-Chome, Mino-Shi, Osaka, 562-0027, Japan

● - 1st site (3 meters)

○ - 2nd site (3 meters)

KAMEOKA EMC Branch

9-1, Ozaki, Inukanno, Nishibetsuin-Cho, Kameoka-Shi, Kyoto, 621-0126, Japan

○ - 3 meters

○ - 10 meters

○ - 30 meters

Used test instruments:

Model No.	Device ID	Last Cal. Date	Cal. Interval
○ - ESH 3	A - 1		
● - ESH 2	A - 2	May, 1999	1 Year
○ - ESH 2	A - 3		
● - HFH2-Z2	C - 2	February, 1999	1 Year
○ - HFH2-Z2	C - 3		

Environmental conditions:

Temperature: 25 °C Humidity: 42 %

Electromagnetic Field Radiated Emission Measurement

was performed in horizontal and vertical polarization, in the frequency range of 30 MHz - 1000 MHz, in the following test site.

Test location:

KITA-KANSAI Testing Center

7-7, Ishimaru, 1-Chome, Mino-Shi, Osaka, 562-0027, Japan

○ - 1st site (3 meters)

○ - 2nd site (3 meters)

KAMEOKA EMC Branch

9-1, Ozaki, Inukanno, Nishibetsuin-Cho, Kameoka-Shi, Kyoto, 621-0126, Japan

○ - 3 meters

● - 10 meters

○ - 30 meters

Validation of Site Attenuation:

1) Last Confirmed Date : November 19, 1999

2) Interval : 1 Year

Used test instruments:

Model No.	Device ID	Last Cal. Date	Cal. Interval
○ - ESV/ESV-Z3	A - 7 / A - 17	August, 1999	1 Year
○ - ESV/ESV-Z3	A - 6 / A - 18		
● - ESV/ESV-Z3	A - 4 / A - 20		
○ - ESV/ESV-Z3	A - 8 / A - 19		
○ - KBA-511A	C - 12	November, 1999	1 Year
○ - KBA-611	C - 22		
○ - KBA-511A	C - 13		
○ - KBA-611	C - 19		
● - KBA-511A	C - 11	November, 1999	1 Year
● - KBA-611	C - 21	November, 1999	1 Year
○ - Cable	H - 1	November, 1999	1 Year
● - Cable	H - 2		
○ - Cable	H - 5		
○ - Cable	H - 6		

Environmental conditions:

Temperature: 18 °C Humidity: 33 %

Electromagnetic Field Radiated Emission Measurement

was performed in horizontal and vertical polarization, in the frequency range of 1 GHz - 26 GHz, in the following test site.

Test location:

KITA-KANSAI Testing Center

7-7, Ishimaru, 1-Chome, Mino-Shi, Osaka, 562-0027, Japan

● - 1st site (3 meters)

○ - 2nd site (3 meters)

KAMEOKA EMC Branch

9-1, Ozaki, Inukanno, Nishibetsuin-Cho, Kameoka-Shi, Kyoto, 621-0126, Japan

○ - 3 meters

○ - 10 meters

○ - 30 meters

Used test instruments:

Model No.	Device ID	Last Cal. Date	Cal. Interval
● - 8566B	A - 13	November, 1999	1 Year
○ - 8593A	A - 15		
● - ESV	A - 6	December, 1998	1 Year
● - 4T-10	D - 73	May, 1999	1 Year
○ - 4T-10	D - 74		
● - WJ-6611-513	A - 23	May, 1999	1 Year
● - WJ-6882-824	A - 21	May, 1999	1 Year
● - DBL-0618N515	A - 33	October, 1999	1 Year
● - 91888-2	C - 41 - 1	May, 1999	1 Year
● - 91889-2	C - 41 - 2	May, 1999	1 Year
● - 94613-1	C - 41 - 3	May, 1999	1 Year
● - 91891-2	C - 41 - 4	May, 1999	1 Year
● - 94614-1	C - 41 - 5	May, 1999	1 Year
● - 3160-09	C - 48	October, 1999	1 Year
● - 355C	D - 22	March, 1999	1 Year
● - 355D	D - 23	March, 1999	1 Year
○ - 8494H/8595H	D - 76		
● - MZ5010C	D - 81	October, 1999	1 Year
● - Cable	C - 40 - 11	May, 1999	1 Year
● - Cable	C - 40 - 12	May, 1999	1 Year

Environmental conditions:

Temperature: 24 °C Humidity: 38 %

CONFIGURATION OF EUT

The Equipment Under Test (EUT) consists of:

Description	Applicant (Manufacturer)	Model No. (Serial No.)	FCC ID
Microwave Oven	Sharp Corporation (Sharp Appliances (Thailand) Ltd.)	R-220D (--)	APYDMR0128

The measurement was carried out with the following equipment connected:

Description	Grantee/Distributor	Model No. (Serial No.)	FCC ID
None			

Type of Interference Cable(s) and the AC Power Cord used with the EUT:

No.	Cable	Shielded	Ferrite Core	Length
1	AC Power Cord (EUT) with 3-pin plug	NO	NO	1.1 m

Operation - mode of the EUT:

The EUT was operated during the measurement under following load condition according to Sec. 4.1 in FCC/OET MP-5 (1985).

1) RF Power Output Measurement

1000 ml of water, with the beaker located in the center of the removable turntable.

2) ISM Frequency Measurement

1000 ml of water, with the beaker located in the center of the removable turntable.

3) Radiated Emission Measurement (radiation on second and third harmonics)

Two loads, one of 700 ml and the other of 300 ml, of water are used. Each load is tested both with the beaker located in the center of the removable turntable and with it in the right front center.

4) Radiated Emission Measurement (all other radiation)

700 ml of water, with the beaker located in the center of the removable turntable.

Test system:

The EUT is a microwave oven intended for the household use.

There is not any interface port on the EUT.

Either two types of magnetron is applied to the product.

Special accessories:

None

Type of Magnetron:

Type 1 : Cat. No. 2M231AH(L)

(manufactured by Toshiba Corporation)

Type 2 : Cat. No. OM52S

(manufactured by Samsung Electronics)

The used (generated) frequencies in the EUT:

Magnetron : 2450 MHz

CPU : 2 MHz

EUT Modification

- - No modifications were conducted by JQA to achieve compliance to applied levels.
- - To achieve compliance to applied levels, the following change(s) were made by JQA during the compliance test.

The modification(s) will be implemented in all production models of this equipment.

Applicant : N/A Date : N/A
Typed Name : N/A Position : N/A

Responsible Party

Responsible Party of Test Item(Product)

Responsible party :

Contact Person :

Signatory

TEST RESULTS

Type 1: 2M231AH(L) (Toshiba Corporation)

RF Power Output

Measurement Results (Calorimetric method) 653.7 W

Applied Limits of Radiated Emission 28.6 $\mu\text{V/m}$ at 300 m
10.0 $\mu\text{V/m}$ at 1600 m

Remarks: _____

ISM Frequency 2.4 GHz - 2.5 GHz

The requirements are

● - Passed

○ - Not Passed

Worst (lowest/highest) range
against 2.45 GHz $\pm$ 50 MHz

2401.20 MHz - 2472.30 MHz

Uncertainty of measurement results

$\pm$ 0.05 ppm

Remarks: _____

Magnetic Field Radiated Emission 9 kHz - 30 MHz

The requirements are	● - Passed	○ - Not Passed
Min. limit margin	More than <u>79.1</u> dB at <u>30.00</u> MHz	
Max. limit exceeding	<u> </u> dB at <u> </u> MHz	
Uncertainty of measurement results	<u>+ 2.5</u> dB(2σ)	<u>- 2.5</u> dB(2σ)

Remarks: _____

Electromagnetic Field Radiated Emission 30 MHz - 1000 MHz

The requirements are	● - Passed	○ - Not Passed
Min. limit margin	More than <u>39.7</u> dB at <u>810.0</u> MHz	
Max. limit exceeding	<u> </u> dB at <u> </u> MHz	
Uncertainty of measurement results	<u>+ 3.8</u> dB(2σ)	<u>- 3.9</u> dB(2σ)

Remarks: _____

Electromagnetic Field Radiated Emission 1 GHz - 26 GHz

The requirements are	● - Passed	○ - Not Passed
Min. limit margin	<u>5.7</u> dB at <u>2400.0</u> MHz	
Max. limit exceeding	<u> </u> dB at <u> </u> MHz	
Uncertainty of measurement results	<u>+ 3.2</u> dB(2σ)	<u>- 3.2</u> dB(2σ)

Remarks: _____

Type 2: OM52S (Samsung Electronics)

RF Power Output

Measurement Results (Calorimetric method) 647.6 W

Applied Limits of Radiated Emission 28.5 $\mu\text{V/m}$ at 300 m
10.0 $\mu\text{V/m}$ at 1600 m

Remarks: _____

ISM Frequency 2.4 GHz - 2.5 GHz

The requirements are

● - Passed

○ - Not Passed

Worst (lowest/highest) range
against 2.45 GHz $\pm$ 50 MHz

2410.90 MHz - 2473.10 MHz

Uncertainty of measurement results

± 0.05 ppm

Remarks: _____

Magnetic Field Radiated Emission 9 kHz - 30 MHz

The requirements are	● - Passed	○ - Not Passed
Min. limit margin	More than <u>79.1</u> dB at <u>30.00</u> MHz	
Max. limit exceeding	<u> </u> dB at <u> </u> MHz	
Uncertainty of measurement results	<u>+ 2.5</u> dB(2σ)	<u>- 2.5</u> dB(2σ)

Remarks: _____

Electromagnetic Field Radiated Emission 30 MHz - 1000 MHz

The requirements are	● - Passed	○ - Not Passed
Min. limit margin	More than <u>37.1</u> dB at <u>920.0</u> MHz	
Max. limit exceeding	<u> </u> dB at <u> </u> MHz	
Uncertainty of measurement results	<u>+ 3.8</u> dB(2σ)	<u>- 3.9</u> dB(2σ)

Remarks: _____

Electromagnetic Field Radiated Emission 1 GHz - 26 GHz

The requirements are	● - Passed	○ - Not Passed
Min. limit margin	<u>4.7</u> dB at <u>2400.0</u> MHz	
Max. limit exceeding	<u> </u> dB at <u> </u> MHz	
Uncertainty of measurement results	<u>+ 3.2</u> dB(2σ)	<u>- 3.2</u> dB(2σ)

Remarks: _____

SUMMARY

GENERAL REMARKS :

The EUT was tested according to the requirements of FCC Rules and Regulations Part 18 Subpart A, B and C (September 5, 1985) under the test configuration, as shown in page 17.

The conclusion for the test items of which are required by the applied regulation is indicated under the final judgement.

FINAL JUDGEMENT :

The "as received" sample;

- - fulfill the test requirements of the regulation mentioned on page 3.
- - fulfill the test requirements of the regulation mentioned on page 3, but with certain qualifications.
- - doesn't fulfill the test regulation mentioned on page 3.

Begin of testing : December 3, 1999

End of testing : December 17, 1999

- JAPAN QUALITY ASSURANCE ORGANIZATION -

Approved Signatory :

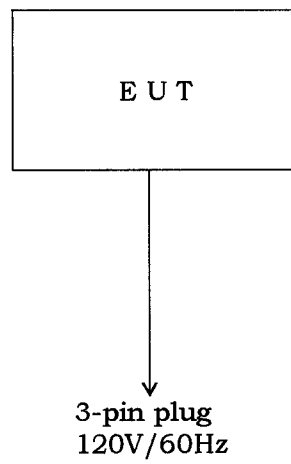


Takashi Yamanaka
Manager
EMC Div.
JQA KITA-KANSAI Testing Center



Akio Hosoda
Project Manager
EMC Div.
JQA KITA-KANSAI Testing Center

Test System-Arrangement (Drawings)



Preliminary Test and Test-setup(Drawings)

Magnetic Field Radiated Emission 9 kHz - 30 MHz:

The preliminary test was performed according to the description of FCC/OET MP-5 (1985) Sec.5.1 (Preliminary Radiated Emissions Tests) and Sec.5.2 (Equipment Configurations).

The preliminary test was carried out to investigate the frequency of the emission that has the highest amplitude relative to the limits within normal operating modes, cable positions, and a typical system configuration. In order to find out to the maximum emission, the preliminary test and a final test were performed in accordance with the following steps.

Step 1: One operation mode of the test system was setting.

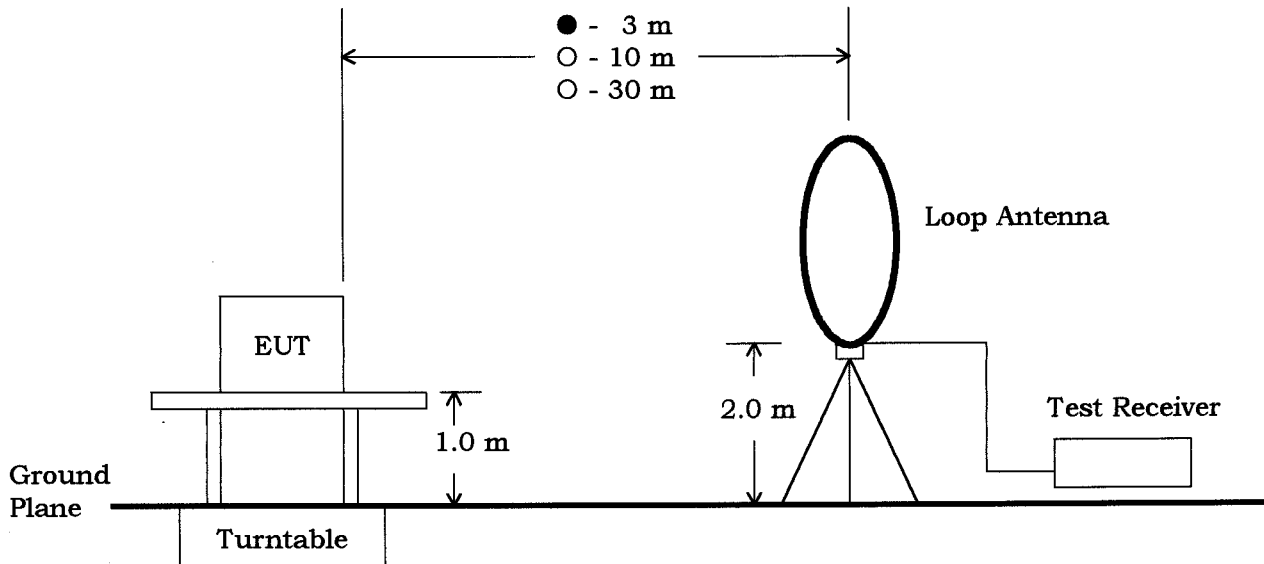
Step 2: In order to investigate the frequencies of maximum emissions, the loop antenna position was approached to the EUT and the significant frequency of the emission's circumstance from the test system were investigated. These data were recorded in the specified frequency band (9 kHz - 30 MHz).

Step 3: Using a test receiver and a loop antenna, the emission's circumstance from the test system was measured in according with FCC/OET MP-5 (1985) Sec.5.6 (Final Radiated Emissions Tests) at each frequency which was found the higher emission referred to level vs. frequency on the list and which was measured by the loop antenna.

Step 4: Return to step 1, if the other operation mode was possible to be setting.

Step 5: The worst result was reported arranging data of which was obtained and performed by one or plural operation modes as the final test.

At the worst point that has the highest amplitude relative to the limit the repeatability of the level was reconfirmed. The photographs of the tests system setup on the worst point were taken and recorded.



Electromagnetic Field Radiated Emission 30 MHz - 1000 MHz:

The preliminary test was performed according to the description of FCC/OET MP-5 (1985) Sec.5.1 (Preliminary Radiated Emissions Tests) and Sec.5.2 (Equipment Configurations).

The preliminary test was carried out to investigate the frequency of the emission that has the highest amplitude relative to the limits within normal operating modes, cable positions, and a typical system configuration. In order to find out to the maximum emission, the preliminary test and a final test were performed in accordance with the following steps.

Step 1: One operation mode of the test system was setting.

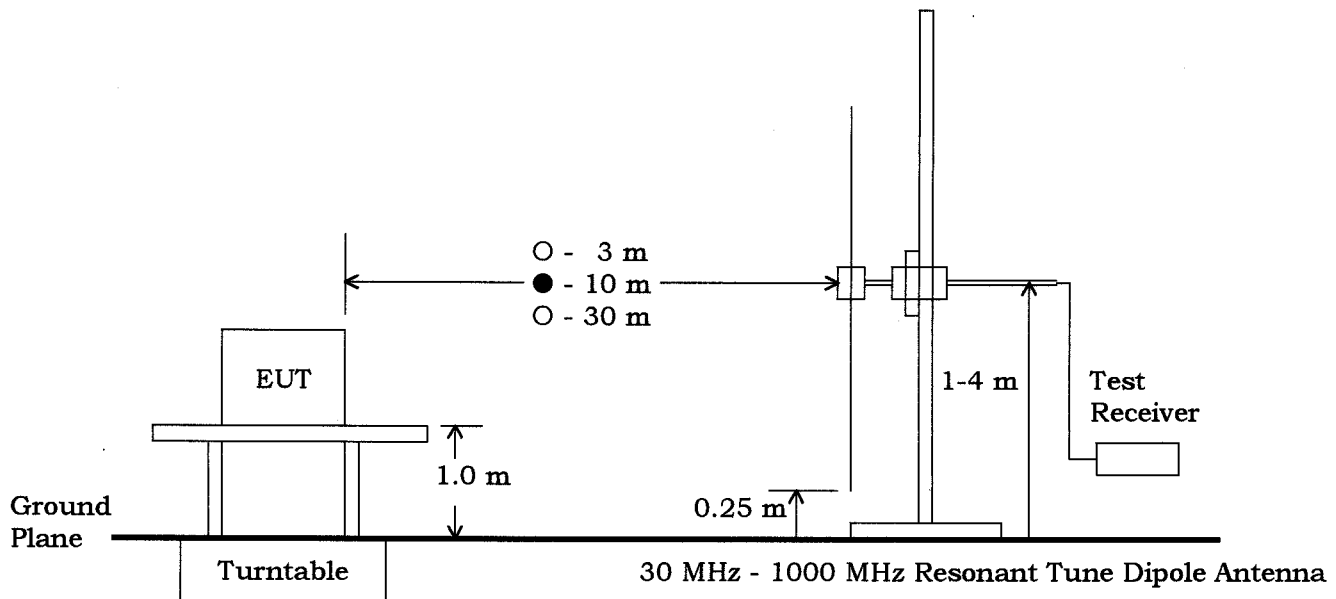
Step 2: Using a test receiver and a test antenna probe, the significant frequency of the emission's circumstance from the test system were investigated. These data were recorded every one of 22 divided bands in the specified frequency band (30 MHz - 1000 MHz).

Step 3: Using a test receiver and a resonant tuned dipole antenna, the emission's circumstance from the test system was measured in according with FCC/OET MP-5 (1985) Sec.5.6 (Final Radiated Emissions Tests) at each frequency which was found the higher emission referred to level vs. frequency on the list and which was measured by the resonant tuned dipole antenna.

Step 4: Return to step 1, if the other operation mode was possible to be setting.

Step 5: The worst result was reported arranging data of which was obtained and performed by one or plural operation modes as the final test.

At the worst point that has the highest amplitude relative to the limit the repeatability of the level was reconfirmed. The photographs of the tests system setup on the the worst point were taken and recorded.



Electromagnetic Field Radiated Emission 1 GHz - 26 GHz:

The preliminary test was performed according to the description of FCC/OET MP-5 (1985) Sec.5.1 (Preliminary Radiated Emissions Tests) and Sec.5.2 (Equipment Configurations).

The preliminary test was carried out to investigate the frequency of the emission that has the highest amplitude relative to the limits within normal operating modes, cable positions, and a typical system configuration. In order to find out to the maximum emission, the preliminary test and a final test were performed in accordance with the following steps.

Step 1: One operation mode of the test system was setting.

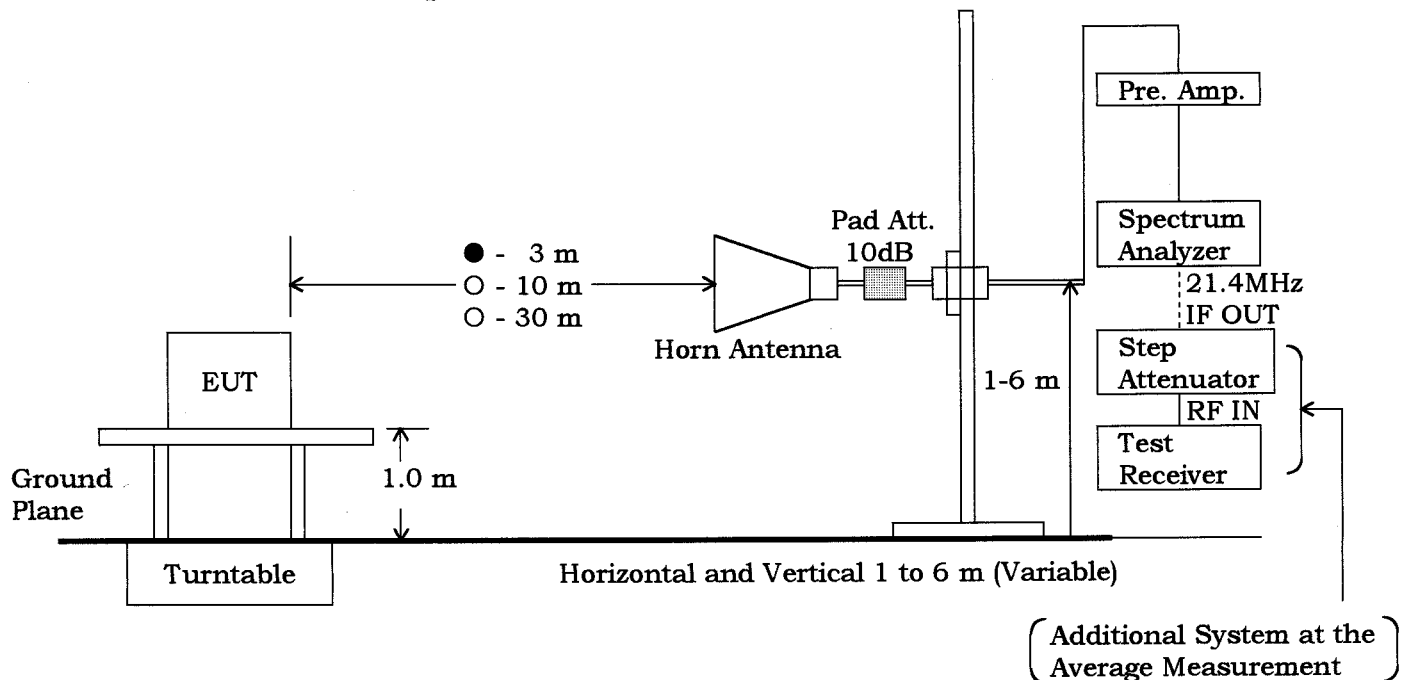
Step 2: In order to investigate the frequencies of maximum emissions, the horn antenna position was approached to the EUT and the significant frequency of the emission's circumstance from the test system were investigated. These data were recorded in the specified frequency band (1 GHz - 26 GHz).

Step 3: The emission's circumstance from the test system was measured in accordance with FCC/OET MP-5 (1985) Sec.5.6 (Final Radiated Emissions Tests) at each frequency which was found higher emission referred to level vs. frequency on the list and which was measured in the specified distance using the horn antenna.

Step 4: Return to step 1, if the other operation mode was possible to be setting.

Step 5: The worst result was reported arranging data of which was obtained and performed by one or plural operation modes as the final test.

At the worst point that has the highest amplitude relative to the limit the repeatability of the level was reconfirmed. The photographs of the tests system setup on the worst point were taken and recorded.



Spectrum Analyzer Setting:

Detector	Peak	*)Average
RES BW	1 MHz	3 MHz
VIDEO BW	1 MHz	3 MHz
SPAN	0 Hz	0 Hz

Test Receiver Setting:

SCALE	LINEAR
I.F.B.W.	1 MHz
Detector	Average

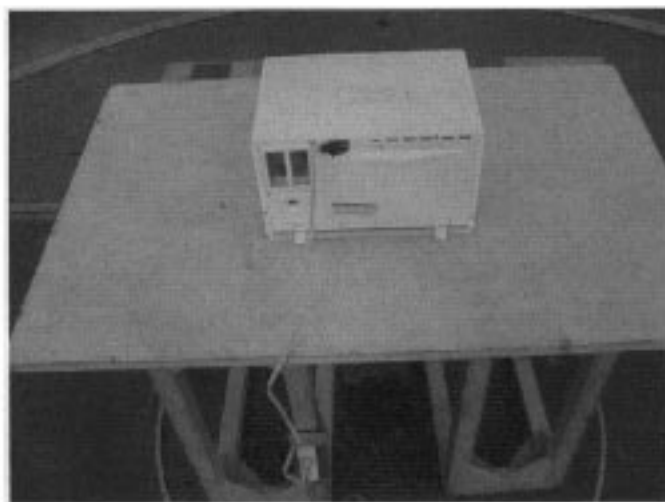
*) For the average measurement, it is made using a test receiver and a step attenuator.

Test-Setup (Photographs) at worst case

Radiated Emission 9 kHz - 26 GHz:



Front View



Rear View

RF Power Output Measurement ISM Frequency Device

Test Date: December 7, 1999
Temp.: 23 °C; Humi.: 56 %

The power output was measured by the calorimetric method, computing the power output from the observed temperature rise of the load over a period of time.

Type 1: 2M231AH(L) (Toshiba Corporation)

Results of RF output power : 653.7 W

The limit of the radiated emission at 300 m : $25 \times \sqrt{653.7/500} = 28.6 \text{ } [\mu\text{V/m}]$

Type 2: OM52S (Samsung Electronics)

Results of RF output power : 647.6 W

The limit of the radiated emission at 300 m : $25 \times \sqrt{647.6/500} = 28.5 \text{ } [\mu\text{V/m}]$

Tester Signature : A. Hosoda
Type Name : Akio Hosoda

JQA Application No. : KL8090556
Model No. : R-220D
FCC ID : APYDMR0128

Regulation : CFR 47 FCC Rules Part 18
Issue Date : December 24, 1999

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ISM Frequency Measurement

ISM Frequency Device

Test Date: December 16, 1999

Temp.: 24 °C; Humi.: 38 %

Type 1: 2M231AH(L) (Toshiba Corporation)

The maximum frequency deviation was measured at -26dB with respect to the maximum level.

Maximum Frequency Deviation [MHz]		Voltage Variation	Remarks (Note 2)
Lower Frequency	Upper Frequency		
2412.60	2471.80	96 V (80 %)	A
2401.20	2472.30	120 V (100 %)	A
2407.80	2471.30	150 V (125 %)	A

The point shown on "____" is the Minimum Margin Point.

The results were within 2450 MHz $\pm$ 50 MHz.

Remarks:

Note 2	Detector Function	RES. B.W	V.B.W	Sweep Time	Span
A	Peak	10 kHz	10 kHz	20 msec	100 MHz

Tester Signature : A. Hosoda

Type Name : Akio Hosoda

ISM Frequency Measurement
ISM Frequency Device

Test Date: December 16, 1999
Temp.: 24 °C; Humi.: 38 %

Type 2: OM52S (Samsung Electronics)

The maximum frequency deviation was measured at -26dB with respect to the maximum level.

Maximum Frequency Deviation [MHz]		Voltage Variation	Remarks (Note 2)
Lower Frequency	Upper Frequency		
2413.80	2476.80	96 V (80 %)	A
2410.90	2473.10	120 V (100 %)	A
2419.00	2474.50	150 V (125 %)	A

The point shown on "____" is the Minimum Margin Point.

The results were within 2450 MHz $\pm$ 50 MHz.

Remarks:

Note 2	Detector Function	RES. B.W	V.B.W	Sweep Time	Span
A	Peak	10 kHz	10 kHz	20 msec	100 MHz

Tester Signature : A. Hosoda
Type Name : Akio Hosoda

Magnetic Field Radiated Emission Measurement

ISM Frequency Device

Type 1: 2M231AH(L) (Toshiba Corporation)

Test Date: December 17, 1999

Temp.: 25 °C ; Humi.: 42 %

Frequency [MHz]	Correction Factor [dB(1/m)]	Meter Readings at 3 m [dB(μV)]	Limits [μV/m]		Results [μV/m]		Margin [dB]	Remarks (Note 2)
			300 m	1600 m	300 m	1600 m		
0.01	0.0	<30.0	28.6	10.0	$<3.16 \times 10^{-3}$	$<0.11 \times 10^{-3}$	>+79.1	A
0.05	0.0	<30.0	28.6	10.0	$<3.16 \times 10^{-3}$	$<0.11 \times 10^{-3}$	>+79.1	A
0.10	0.0	<30.0	28.6	10.0	$<3.16 \times 10^{-3}$	$<0.11 \times 10^{-3}$	>+79.1	A
0.15	0.0	<30.0	28.6	10.0	$<3.16 \times 10^{-3}$	$<0.11 \times 10^{-3}$	>+79.1	B
1.00	0.0	<30.0	28.6	10.0	$<3.16 \times 10^{-3}$	$<0.11 \times 10^{-3}$	>+79.1	B
3.00	0.0	<30.0	28.6	10.0	$<3.16 \times 10^{-3}$	$<0.11 \times 10^{-3}$	>+79.1	B
5.00	0.0	<30.0	28.6	10.0	$<3.16 \times 10^{-3}$	$<0.11 \times 10^{-3}$	>+79.1	B
10.00	0.0	<30.0	28.6	10.0	$<3.16 \times 10^{-3}$	$<0.11 \times 10^{-3}$	>+79.1	B
20.00	0.0	<30.0	28.6	10.0	$<3.16 \times 10^{-3}$	$<0.11 \times 10^{-3}$	>+79.1	B
30.00	0.0	<30.0	28.6	10.0	$<3.16 \times 10^{-3}$	$<0.11 \times 10^{-3}$	>+79.1	B

Sample of calculated result at 30.00 MHz, as the Minimum Margin point:

Correction Factor = -0.0 dB(1/m)

Conversion Factor = -80.0 dB (40 dB/decade)

+ Meter Reading = <30.0 dB(μV)

Result = <-50.0 dB(μV/m) at 300 m

Minimum Margin : $20\log(28.6/10^{-50.0/20}) = 20\log(28.6/<3.16 \times 10^{-3}) = >79.1$ (dB)

The point shown on "____" is the Minimum Margin Point.

Note 1:

1)The highest frequency generated or used in the EUT: 2450 MHz

2)The upper frequency of measurement range : 24.5 GHz

3)The meter reading includes the antenna factor of 20 dB because of the correction by the test receiver.

Remarks:

Note 2	Detector Function	IF Bandwidth
A	Average	200 Hz
B	Average	10 kHz

Tester Signature : A. Hosoda
 Type Name : Akio Hosoda

Magnetic Field Radiated Emission Measurement

ISM Frequency Device

Test Date: December 17, 1999

Temp.: 25 °C ; Humi.: 42 %

Type 2: OM52S (Samsung Electronics)

Frequency [MHz]	Correction Factor [dB(1/m)]	Meter Readings at 3 m [dB(μV)]	Limits [μV/m]		Results [μV/m]		Margin [dB]	Remarks (Note 2)
			300 m	1600 m	300 m	1600 m		
0.01	0.0	<30.0	28.5	10.0	$<3.16 \times 10^{-3}$	$<0.11 \times 10^{-3}$	>+79.1	A
0.05	0.0	<30.0	28.5	10.0	$<3.16 \times 10^{-3}$	$<0.11 \times 10^{-3}$	>+79.1	A
0.10	0.0	<30.0	28.5	10.0	$<3.16 \times 10^{-3}$	$<0.11 \times 10^{-3}$	>+79.1	A
0.15	0.0	<30.0	28.5	10.0	$<3.16 \times 10^{-3}$	$<0.11 \times 10^{-3}$	>+79.1	B
1.00	0.0	<30.0	28.5	10.0	$<3.16 \times 10^{-3}$	$<0.11 \times 10^{-3}$	>+79.1	B
3.00	0.0	<30.0	28.5	10.0	$<3.16 \times 10^{-3}$	$<0.11 \times 10^{-3}$	>+79.1	B
5.00	0.0	<30.0	28.5	10.0	$<3.16 \times 10^{-3}$	$<0.11 \times 10^{-3}$	>+79.1	B
10.00	0.0	<30.0	28.5	10.0	$<3.16 \times 10^{-3}$	$<0.11 \times 10^{-3}$	>+79.1	B
20.00	0.0	<30.0	28.5	10.0	$<3.16 \times 10^{-3}$	$<0.11 \times 10^{-3}$	>+79.1	B
30.00	0.0	<30.0	28.5	10.0	$<3.16 \times 10^{-3}$	$<0.11 \times 10^{-3}$	>+79.1	B

Sample of calculated result at 30.00 MHz, as the Minimum Margin point:

Correction Factor = -0.0 dB(1/m)

Conversion Factor = -80.0 dB (40 dB/decade)

+ Meter Reading = <30.0 dB(μV)

Result = <-50.0 dB(μV/m) at 300 m

Minimum Margin : $20\log(28.5/10^{-50.0/20}) = 20\log(28.5/<3.16 \times 10^{-3}) = >79.1$ (dB)

The point shown on "____" is the Minimum Margin Point.

Note 1:

1)The highest frequency generated or used in the EUT: 2450 MHz

2)The upper frequency of measurement range : 24.5 GHz

3)The meter reading includes the antenna factor of 20 dB because of the correction by the test receiver.

Remarks:

Note 2	Detector Function	IF Bandwidth
A	Average	200 Hz
B	Average	10 kHz

Tester Signature : A. Hosoda
 Type Name : Akio Hosoda

Electromagnetic Field Radiated Emission Measurement

ISM Frequency Device

Type 1: 2M231AH(L) (Toshiba Corporation)

Test Date: December 3, 1999

Temp.: 18 °C; Humi.: 33 %

Frequency [MHz]	Antenna Factor [dB(1/m)]	Cable Loss [dB]	Meter Readings at 10 m [dB(μV)]		Limits [μV/m]		Results (Highest) [μV/m]		Margin [dB]	Remarks (Note 2)
			Hori.	Vert.	300 m	1600 m	300 m	1600 m		
33.0	-0.3	0.6	< 3.0	12.0	28.6	10.0	0.14	0.03	+46.3	B
80.0	7.0	1.0	<-5.0	<-5.0	28.6	10.0	<0.05	<0.01	>+55.6	B
117.0	10.3	1.3	<-5.0	<-5.0	28.6	10.0	<0.07	<0.01	>+52.0	B
160.0	13.0	1.5	<-5.0	<-5.0	28.6	10.0	<0.10	<0.02	>+49.1	B
200.0	14.9	1.7	<-5.0	<-5.0	28.6	10.0	<0.13	<0.02	>+47.0	B
270.0	17.5	2.0	<-5.0	<-5.0	28.6	10.0	<0.18	<0.03	>+44.1	B
500.0	23.3	2.9	<-15.0	<-15.0	28.6	10.0	<0.12	<0.02	>+47.4	B
620.0	25.3	3.4	<-15.0	<-15.0	28.6	10.0	<0.16	<0.03	>+44.9	B
740.0	27.0	3.8	<-15.0	<-15.0	28.6	10.0	<0.21	<0.04	>+42.8	B
810.0	27.9	4.0	<-13.0	<-13.0	28.6	10.0	<0.30	<0.05	>+39.7	B

Sample of calculated result at 810.0 MHz, as the Minimum Margin point:

Antenna Factor = 27.9 dB(1/m)

Cable Loss = 4.0 dB

Conversion Factor = -29.5 dB (20 dB/decade)

+ Meter Reading = <-13.0 dB(μV)

Result = <-10.6 dB(μV/m) at 300 m

Minimum Margin : $20\log(28.6/10^{<-10.6/20}) = 20\log(28.6/<0.30) = >39.7$ (dB)

The point shown on "____" is the Minimum Margin Point.

Note 1:

1)The highest frequency generated or used in the EUT: 2450 MHz

2)The upper frequency of measurement range : 24.5 GHz

Remarks:

Note 2	Detector Function	IF Bandwidth
A	Average	1 MHz
B	Average	120 kHz
C	Average	12 kHz
D	Average	7.5 kHz

Tester Signature :



Type Name

: Masaharu Urano

Electromagnetic Field Radiated Emission Measurement ISM Frequency Device

Test Date: December 3, 1999

Temp.: 18 °C ; Humi.: 33 %

Type 2: OM52S (Samsung Electronics)

Frequency [MHz]	Antenna Factor [dB(1/m)]	Cable Loss [dB]	Meter Readings at 10 m [dB(μV)]		Limits [μV/m]		Results (Highest) [μV/m]		Margin [dB]	Remarks (Note 2)
			Hori.	Vert.	300 m	1600 m	300 m	1600 m		
33.0	-0.3	0.6	< 3.0	7.0	28.5	10.0	0.08	0.01	+51.3	B
200.0	14.9	1.7	<-5.0	<-5.0	28.5	10.0	<0.13	<0.02	>+47.0	B
246.0	16.7	1.9	<-5.0	<-5.0	28.5	10.0	<0.16	<0.03	>+45.0	B
300.0	18.4	2.1	<-6.0	<-6.0	28.5	10.0	<0.18	<0.03	>+44.1	B
480.0	22.9	2.9	<-7.0	<-7.0	28.5	10.0	<0.29	<0.05	>+39.8	B
570.0	24.5	3.2	<-15.0	<-15.0	28.5	10.0	<0.14	<0.03	>+45.9	B
680.0	26.2	3.6	<-15.0	<-15.0	28.5	10.0	<0.18	<0.03	>+43.8	B
780.0	27.5	3.9	<-15.0	<-15.0	28.5	10.0	<0.22	<0.04	>+42.2	B
870.0	28.6	4.2	<-12.0	<-12.0	28.5	10.0	<0.37	<0.07	>+37.8	B
920.0	29.1	4.4	<-12.0	<-12.0	28.5	10.0	<0.40	<0.07	>+37.1	B

Sample of calculated result at 920.0 MHz, as the Minimum Margin point:

Antenna Factor = 29.1 dB(1/m)

Cable Loss = 4.4 dB

Conversion Factor = -29.5 dB (20 dB/decade)

+ Meter Reading = <-12.0 dB(μV)

Result = <-8.0 dB(μV/m) at 300 m

Minimum Margin : $20\log(28.5/10^{-8.0/20}) = 20\log(28.5/<0.40) = >37.1$ (dB)

The point shown on "____" is the Minimum Margin Point.

Note 1:

1)The highest frequency generated or used in the EUT: 2450 MHz

2)The upper frequency of measurement range : 24.5 GHz

Remarks:

Note 2	Detector Function	IF Bandwidth
A	Average	1 MHz
B	Average	120 kHz
C	Average	12 kHz
D	Average	7.5 kHz

Tester Signature :



Type Name : Masaharu Urano

Electromagnetic Field Radiated Emission Measurement

ISM Frequency Device

Test Date: December 16, 1999

Temp.: 24 °C ; Humi.: 38 %

Type 1: 2M231AH(L) (Toshiba Corporation)

Frequency [MHz]	Antenna Factor [dB(1/m)]	Corr. Factor [dB]	Meter Readings at 3 m [dB(μV)]		Limits [μV/m]		Results (Highest) [μV/m]		Margin [dB]	Remarks (Note 2)
			Hori.	Vert.	300 m	1600 m	300 m	1600 m		
2400.0	21.6	0.8	40.0	41.0	28.6	10.0	14.79	2.79	+ 5.7	B
2520.0	21.2	0.8	<27.0	<27.0	28.6	10.0	<2.82	<0.53	>+20.1	B
7375.0	37.0	-29.5	47.0	45.0	28.6	10.0	5.31	1.00	+14.6	B
9840.0	39.4	-27.3	42.0	43.0	28.6	10.0	5.69	1.07	+14.0	B
12300.0	43.8	-26.6	<36.0	<36.0	28.6	10.0	<4.57	<0.86	>+15.9	B
14760.0	45.2	-26.4	43.0	43.0	28.6	10.0	12.30	2.32	+ 7.3	B
17200.0	44.2	-26.5	42.0	42.0	28.6	10.0	9.66	1.82	+ 9.4	B
19600.0	40.2	-19.1	<36.0	<36.0	28.6	10.0	<7.16	<1.35	>+12.0	B
22050.0	40.4	-19.4	<36.0	<36.0	28.6	10.0	<7.08	<1.33	>+12.1	B
24500.0	40.4	-20.0	<36.0	<36.0	28.6	10.0	<6.61	<1.24	>+12.7	B

Sample of calculated result at 2400.0 MHz, as the Minimum Margin point:

Antenna Factor = 21.6 dB(1/m)
Corr. Factor = 0.8 dB
Conversion Factor = -40.0 dB (20 dB/decade)
+) Meter Reading = 41.0 dB(μV)
Result = 23.4 dB(μV/m) at 300 m

Minimum Margin : $20\log(28.6/10^{23.4/20}) = 20\log(28.6/14.79) = 5.7$ (dB)

The point shown on "____" is the Minimum Margin Point.

Note 1:

- 1)The highest frequency generated or used in the EUT : 2450 MHz
- 2)The upper frequency of measurement range : 24500 MHz
- 3)Corr. Factor (≤ 3.6 GHz) = Cable Loss [dB]
Corr. Factor (3.6 GHz - 18 GHz) = Cable Loss + 10 dB Pad Attenuator - Amp. Gain [dB]
Corr. Factor (≥ 18 GHz) = Cable Loss + 10 dB Pad Attenuator - Amp. Gain + Mixer Conversion Loss [dB]

Remarks:

Note 2	Detector Function	RES. B.W	V.B.W	Sweep T	Span
A	Peak (SP)	1 MHz	1 MHz	20 msec	0 Hz
*) B	Average (ESV)	1 MHz (3 MHz)	3 MHz	20 msec	0 Hz

():Setting of test receiver

*)For the average measurement method, it is made measurement using a test receiver, a step attenuator and a spectrum analyzer(950523A).

Tester Signature : A. Hosoda
Type Name : Akio Hosoda

Electromagnetic Field Radiated Emission Measurement

ISM Frequency Device

Test Date: December 16, 1999

Temp.: 24 °C ; Humi.: 38 %

Type 2: OM52S (Samsung Electronics)

Frequency [MHz]	Antenna Factor [dB(1/m)]	Corr. Factor [dB]	Meter Readings at 3 m [dB(μV)]		Limits [μV/m]		Results (Highest) [μV/m]		Margin [dB]	Remarks (Note 2)
			Hori.	Vert.	300 m	1600 m	300 m	1600 m		
2400.0	21.6	0.8	37.0	42.0	28.5	10.0	16.60	3.13	+ 4.7	B
2500.0	21.3	0.8	32.0	29.0	28.5	10.0	5.07	0.95	+15.0	B
12300.0	43.8	-26.6	<36.0	<36.0	28.5	10.0	<4.57	<0.86	>+15.9	B
12800.0	44.5	-26.3	<40.0	<40.0	28.5	10.0	<8.13	<1.53	>+10.9	B
14770.0	45.2	-26.4	<40.0	<40.0	28.5	10.0	<8.71	<1.64	>+10.3	B
15300.0	45.1	-26.5	<40.0	<40.0	28.5	10.0	<8.51	<1.60	>+10.5	B
17250.0	44.2	-26.5	42.0	42.0	28.5	10.0	9.66	1.82	+ 9.4	B
19600.0	40.2	-19.1	<36.0	<36.0	28.5	10.0	<7.16	<1.35	>+12.0	B
22050.0	40.4	-19.4	<36.0	<36.0	28.5	10.0	<7.08	<1.33	>+12.1	B
24500.0	40.4	-20.0	<36.0	<36.0	28.5	10.0	<6.61	<1.24	>+12.7	B

Sample of calculated result at 2400.0 MHz, as the Minimum Margin point:

Antenna Factor = 21.6 dB(1/m)
 Corr. Factor = 0.8 dB
 Conversion Factor = -40.0 dB (20 dB/decade)
 +) Meter Reading = 42.0 dB(μV)

Result = 24.4 dB(μV/m) at 300 m

Minimum Margin : $20\log(28.5/10^{24.4/20}) = 20\log(28.5/16.60) = 4.7$ (dB)

The point shown on "____" is the Minimum Margin Point.

Note 1:

- 1) The highest frequency generated or used in the EUT : 2450 MHz
- 2) The upper frequency of measurement range : 24500 MHz
- 3) Corr. Factor (≤ 3.6 GHz) = Cable Loss [dB]
 Corr. Factor (3.6 GHz - 18 GHz) = Cable Loss + 10 dB Pad Attenuator - Amp. Gain [dB]
 Corr. Factor (≥ 18 GHz) = Cable Loss + 10 dB Pad Attenuator - Amp. Gain + Mixer Conversion Loss [dB]

Remarks:

Note 2	Detector Function	RES. B.W	V.B.W	Sweep T	Span
A	Peak (SP)	1 MHz	1 MHz	20 msec	0 Hz
*) B	Average (ESV)	1 MHz (3 MHz)	3 MHz	20 msec	0 Hz

(): Setting of test receiver

*) For the average measurement method, it is made measurement using a test receiver, a step attenuator and a spectrum analyzer(950523A).

Tester Signature : A. Hosoda

Type Name : Akio Hosoda