



EMI TEST REPORT

Test Report No. : 32HE0037-HO-A

Customer : Panasonic Corporation Appliances Company
Kitchen Appliances Business Unit
2-3-1-3 Noji-higashi, Kusatsu City, Shiga
525-0058 Japan

Type of Equipment : Commercial Microwave Oven

Model No. : NE-12521

FCC ID : ACLAQ3F01

Test regulation : FCC Part 18 : 2002

Test Result : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.

Date of test: March 26 to May 17, 2012

Representative test engineer:

T. Shimada

Takumi Shimada
Engineer of WiSE Japan,
UL Verification Service

Approved by:

T. Hatakeda

Takahiro Hatakeda
Leader of WiSE Japan,
UL Verification Service

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SECTION 1: Manufacturer information

Company Name : Panasonic Corporation Appliances Company
Kitchen Appliances Business Unit
Address : 1-5-1 Takatsukadai, Nishi-ku, Kobe City 651-2271, Japan
Telephone Number : +81-77-561-3199
Facsimile Number : +81-77-561-4312
Contact Person : Koji Kanzaki

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment : Commercial Microwave Oven
Model No. : NE-12521
Serial No. : Refer to Clause 4.2
Rating : AC 120V/60Hz Output 1200W (By IEC 705)
Receipt Date of Sample : March 22, 2012
Country of Mass-production : Japan
Condition of EUT : Engineering prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No Modification by the test lab

2.2 Product Description

Clock frequency in the system : 8MHz
Operating frequency : 2450MHz
Feature of EUT : The commercial microwave oven using magnetron.
Type of Magnetron : 2M210
Door Seal Type : Choke
Employed mode : Stirrer

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SECTION 3: Test specification, procedures & results

3.1 Test specification

Test Specification : FCC Part 18 2002, final revised on July 10, 2002
Title : FCC 47CFR Part18 Industrial, scientific, and medical equipment

3.2 Procedures and results

Item	Test Procedure & Limits	Deviation	Worst margin	Result
Radiation Hazard Measurement	Section 18.305 FCC/OST MP-5	N/A	-	Complied
Radiated emission	Section 18.305 FCC/OST MP-5 *1)	N/A	9.8dB 7370.920MHz, Vertical, AV	Complied
*Note: UL Japan, Inc.'s EMI Work Procedure 13-EM-W0420 and 13-EM-W0424. *Radiated emission test was only performed according to the customer's request. *1) The limit is decided by the power. Refer to Appendix 4.				

3.3 Addition to standard

Other than above, no addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

EMI

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

Test room (semi-anechoic chamber)	Radiated emission						
	(3m*)(+dB)				(1m*)(+dB)		(0.5m*)(+dB)
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.2dB	5.0dB	5.1dB	4.7dB	5.7dB	4.4dB	4.3dB
No.2	4.1dB	5.2dB	5.1dB	4.8dB	5.6dB	4.3dB	4.2dB
No.3	4.5dB	5.0dB	5.2dB	4.8dB	5.6dB	4.5dB	4.2dB
No.4	4.7dB	5.2dB	5.2dB	4.8dB	5.6dB	5.1dB	4.2dB

*3m/1m/0.5m = Measurement distance

Radiated emission test (3m)

The data listed in this test report has enough margin, more than the site margin.

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3.5 Test Location

UL Japan, Inc. Head Office EMC Lab. *NVLAP Lab. code: 200572-0
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	FCC Registration Number	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	313583	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	134570	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	-	4.0 x 4.5 x 2.7m	4.75 x 5.4 m	-
No.6 measurement room	-	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	-	8.0 x 4.5 x 2.8m	2.0 x 2.0m	-
No.10 measurement room	-	-	2.6 x 2.8 x 2.5m	2.4 x 2.4m	-
No.11 measurement room	-	-	3.1 x 3.4 x 3.0m	2.4 x 3.4m	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Data of EMI, Test instruments, and Test set up

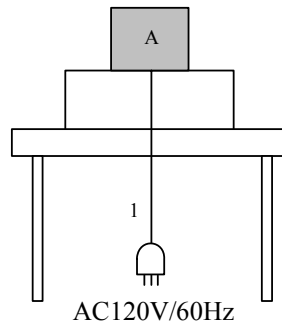
Refer to APPENDIX.

SECTION 4: Operation of E.U.T. during testing

4.1 Operating mode(s)

The mode is used : High Power mode (P10)

4.2 Configuration and peripherals



*Cabling and setup were taken into consideration and test data was taken under worse case conditions.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Commercial Microwave Oven	NE-12521	001	Panasonic Corporation Appliances Company Kitchen Appliances Business Unit	EUT

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	AC Cable	1.5	Unshielded	Unshielded	-

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SECTION 5: Radiation Hazard Measurement (Safety check)

5.1 Radiation Hazard Measurement

Radiation leakage was measured in the as-received condition with the oven door closed using a microwave leakage meter.

A 1500 ml water load was placed in the center of the oven and the oven was operated at maximum output power.

☒ There was no microwave leakage exceeding a power level of 0.06mW/cm² observed at any point 5cm or more from the external surface of the oven.

A maximum of 1.0mW/cm² is allowed in accordance with the applicable Federal Standards. Hence, microwave leakage in the as-received condition with the oven door closed was below the maximum allowed.

5.2 Input power

120V/60Hz AC 2014.65W (Input Power) 1990W (Rated Input Power)

5.3 RF Output power Measurement

The Caloric method was used to determine maximum RF output power. The initial temperature of the water load was measured. The water load was placed in the center of the oven. The oven was operated at maximum output power for 200 seconds, the temperature of the water was re-measured.

Power development in dummy load

Model	Power	Load[l]	time[min]	start temp.[deg. C]	stop temp.[deg. C]	Power[W]
NE-12521	120V	1.5	3	20.3	46.4	908.28

$\text{Power[W]} = 1.16 \times 60 \times C \times d \times V \times (\text{stop temp.} - \text{start temp.}) / \text{time[min]}$

C: Specific heat kcal/(kg·deg. C)

V: Volume l

d : Density kg/l

1cal=1.163*10⁻⁶ kWh

The measured output power was found to be less than 500watts. Therefore, in accordance with Section 18.305 of Subpart-C, the measured out-of-band emissions were compared with the limit calculated as following:

$$\text{LFS} = 25 \times \text{SQRT} (\text{Power output}/500)$$

$$\text{LFS} = 25 \times \text{SQRT} (911.4/500)$$

$$\text{LFS} \approx 33.75$$

Where: LFS is the maximum allowable field strength for out-of-band emissions in μV/meter at a 300meter measurement distance. Power Output is the measured output power in watts.

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1st Limit

Model	Power	Limit[uV/m]@300m	Limit[dBu V/m]@300m	Limit[dBu V/m]@3m
NE-12521	120V	33.69	30.55	70.55

$$\text{Limit[uV/m]@300m}=25 \times (\text{Power}/500)^{1/2}$$

2nd Limit

Limit[uV/m]@1600m	Limit[dBu V/m]@1600m	Limit[dBu V/m]@3m
10.00	20.00	74.54

5.4 Operating Frequency Measurement

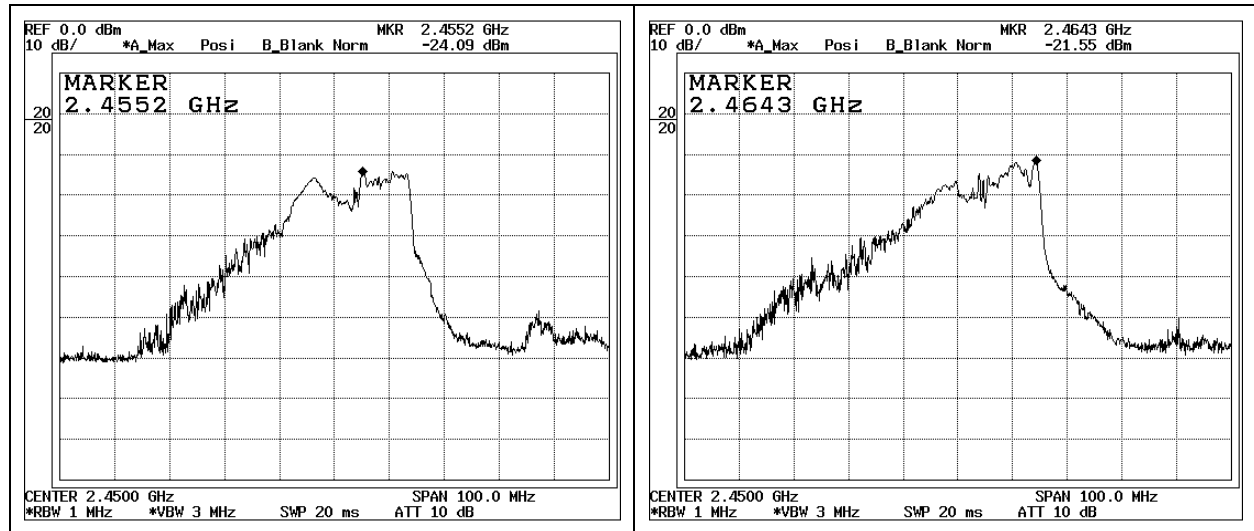
The operating frequency was measured using a spectrum analyzer. Starting with the EUT at room temperature, a 1500ml water load was placed in the center of the oven and the oven was operated at maximum output power. The fundamental operating frequency was monitored until the water load was reduced to 20 percent of the original load.

Maximum frequency variation

Variation of frequency with time, using the Load

2455.2MHz - 2464.3MHz

(1000cc - 200cc / Load)



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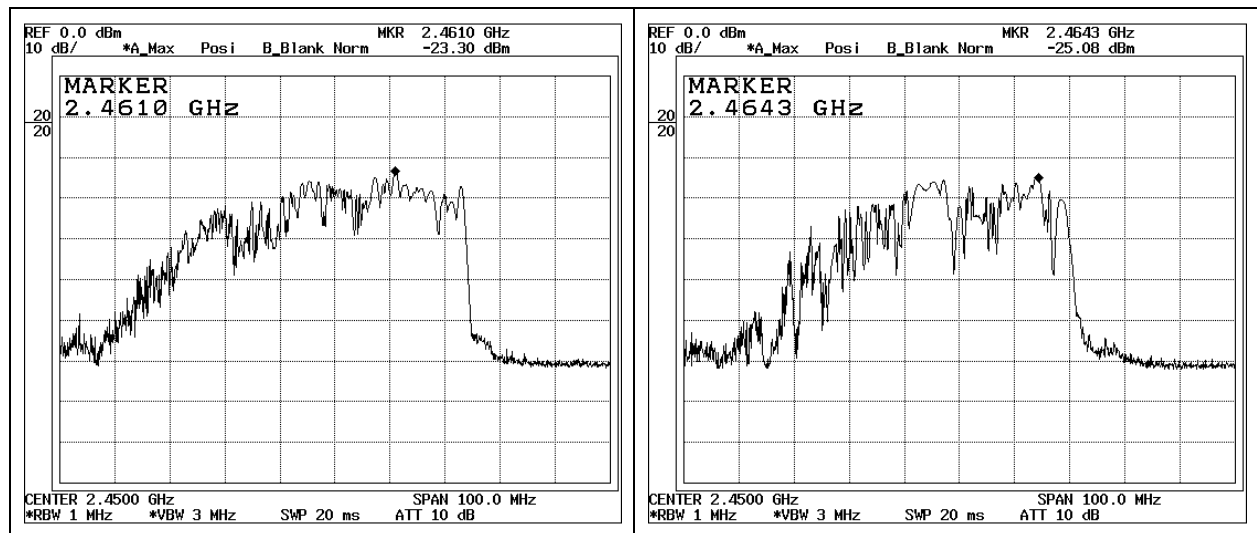
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5.5 Variation in Operating Frequency with Line Voltage

The EUT was operated / warmed by at least 10 minutes of use with a 1500ml water load at room temperature at the beginning of the test. Then the operating frequency was monitored as the input voltage was varied between 80 and 125 percent of the nominal rating.

Variation of frequency for line voltage variation
2461.0MHz - 2464.3MHz
(166V - 260V / 1500cc Load)



Date : May 17, 2012

Test engineer: Tomohisa Nakagawa

SECTION 6: Radiated Emission

6.1 Operating environment

Test place	: See data
Temperature	: See data
Humidity	: See data

6.2 Test configuration

EUT was placed on a urethane platform of nominal size, 1.0m by 1.0m, raised 1.0m above the conducting ground plane. The EUT was set on the center of the tabletop. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength. Photographs of the set up are shown in Appendix 3.

6.3 Test conditions

Frequency range	: 5MHz-30MHz(Loop antenna) / 30MHz-300MHz (Biconical antenna) / 300MHz-1000MHz (Logperiodic antenna) / 1000MHz - 25000MHz (Horn antenna)
Test distance	: 3m
EUT position	: Table top
EUT operation mode	: See Clause 4.1

6.4 Test procedure

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

Frequency : From 5MHz to 30MHz at distance 3m

The height of antenna was fixed in 2m.

The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for vertical polarization (antenna angle: 0deg., 45deg., 90deg., and 135 deg.) and horizontal polarization.

*Refer to Figure 1 about Direction of the Loop Antenna.

Frequency : From 30MHz to 25GHz at distance 3m

The measuring antenna height varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The typical test procedure of microwave was based on the regulation FCC/OST MP-5.

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The test was made with the detector (RBW/VBW) in the following table.

Frequency	Below 30MHz	30-1000MHz	Above 1GHz
Instrument used	Test Receiver	Test Receiver	Spectrum Analyzer *1)
Detector	AV	AV	PK
IF Bandwidth	BW 9kHz(T/R)	BW 120kHz(T/R)	RBW: 1MHz VBW: 10Hz

*1) When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Distance factor was used the following:

Frequency : From 5MHz to 30MHz

Distance factor = $\text{Result}@3\text{m} + 40 \cdot \log(3/300)$ [dBuV/m]

Frequency : From 30MHz to 1000MHz

Distance factor = $\text{Result}@3\text{m} + 20 \cdot \log(3/300)$ [dBuV/m]

Frequency : From 1GHz to 26GHz

Frequency	Distance factor
1.830GHz	0.0046
2.745GHz	0.0070
3.660GHz	0.0090
4.575GHz	0.0100

For frequencies between those given in the table, the value of Distance factor is determined by linear interpolation.

6.5 Test result

Summary of the test results: Pass

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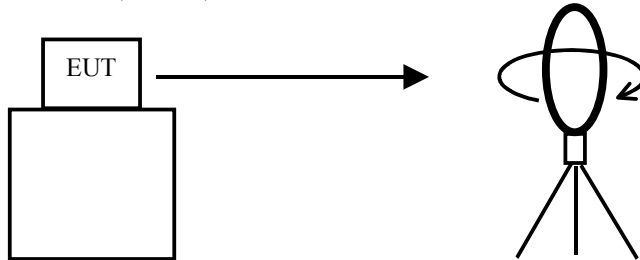
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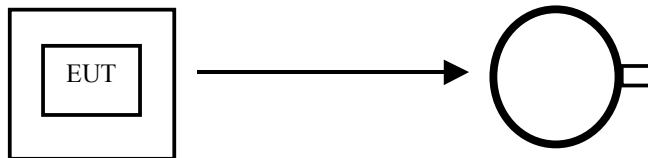
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Figure 1: Direction of the Loop Antenna

Side View (Vertical)

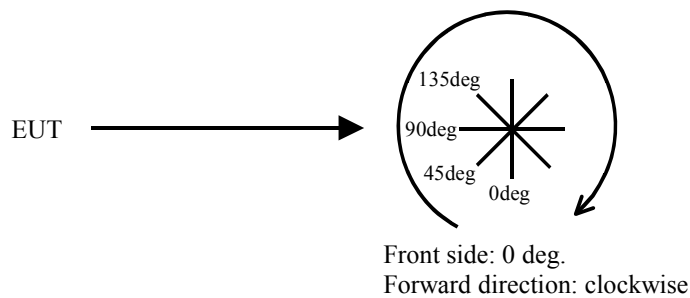


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



APPENDIX 1: Data of EMI test

Radiated Emission

NE-12521(AC120V/60Hz) below 30MHz

Test place : Head Office EMC Lab. No.1 Semi Anechoic Chamber
Report No. : 32HE0037-HO
Date : 04/03/2012
Temperature/ Humidity : 23 deg.C / 30% RH
Engineer : Takumi Shimada
Mode : High Power mode (P10)

Loop Antenna [deg.]	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss & Gain [dB]	Result [dBuV/m] at 3m	Result [uV/m] at 3m	Result [uV/m] at 300m	Limit [uV/m] at 300m	Margin [uV/m] at 300m	Margin [dB] at 300m	Angle [deg.]	Remark
135	19.940	AV	24.5	19.4	-24.8	19.1	9.1	0.00	33.69	33.7	122.0	116	*1)
0	20.100	AV	24.1	19.4	-24.7	18.8	8.8	0.00	33.69	33.7	122.3	359	*1)
90	20.160	AV	26.4	19.4	-24.7	21.1	11.4	0.00	33.69	33.7	120.0	267	*1)
45	20.200	AV	26.4	19.4	-24.7	21.1	11.4	0.00	33.69	33.7	120.0	148	*1)
Hori	20.742	AV	23.7	19.5	-24.7	18.5	8.5	0.00	33.69	33.7	122.6	261	*1)

Result[dBuV/m] at 3m = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amplifier)

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

*The test result is rounded off to one or two decimal places, so some differences might be observed.

*1) The Result was below 0.01.

Radiated Emission
NE-12521(AC120V/60Hz) 30M-1GHz

Test place : Head Office EMC Lab. No.3 and 1 Semi Anechoic Chamber
Report No. : 32HE0037-HO
Date : 03/28/2012
Temperature/ Humidity : 20 deg.C / 30% RH
Engineer : Shinya Watanabe
Mode : High Power mode (P10)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss & Gain [dB]	Result [dBuV/m] at 3m	Result [uV/m] at 3m	Result [uV/m] at 300m	Limit [uV/m] at 300m	Margin [uV/m] at 300m	Margin [dB] at 300m	Height [cm]	Angle [deg.]	Remark
Hori	37.040	AV	35.9	16.0	-25.0	26.9	22.2	0.22	33.69	33.5	43.7	100	40	
Hori	59.644	AV	42.4	8.1	-24.6	25.9	19.8	0.20	33.69	33.5	44.7	202	165	
Hori	132.630	AV	33.2	13.9	-23.8	23.3	14.7	0.15	33.69	33.5	47.3	144	267	
Hori	186.599	AV	33.1	16.4	-23.2	26.3	20.7	0.21	33.69	33.5	44.3	130	349	
Hori	253.571	AV	33.6	17.6	-22.5	28.7	27.3	0.27	33.69	33.4	41.9	100	10	
Hori	443.814	AV	22.7	18.0	-21.1	19.6	9.6	0.10	33.69	33.6	51.0	158	146	
Hori	749.742	AV	22.5	21.3	-19.0	24.8	17.4	0.17	33.69	33.5	45.8	158	146	
Vert	37.480	AV	59.0	15.8	-25.0	49.8	309.1	3.09	33.69	30.6	20.8	100	174	
Vert	57.030	AV	53.0	8.9	-24.6	37.3	73.3	0.73	33.69	33.0	33.3	100	172	
Vert	130.210	AV	31.9	13.7	-23.8	21.8	12.4	0.12	33.69	33.6	48.8	100	164	
Vert	185.920	AV	33.0	16.4	-23.2	26.2	20.5	0.20	33.69	33.5	44.4	100	359	
Vert	256.657	AV	32.5	17.7	-22.5	27.7	24.3	0.24	33.69	33.4	42.9	100	274	
Vert	452.832	AV	29.4	18.1	-21.0	26.5	21.2	0.21	33.69	33.5	44.1	100	181	
Vert	759.249	AV	27.1	21.4	-18.9	29.6	30.2	0.30	33.69	33.4	41.0	100	304	

Result[dBuV/m] at 3m = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

*The test result is rounded off to one or two decimal places, so some differences might be observed.

Radiated Emission

NE-12521(AC120V/60Hz) 1-25GHz

Test place Head Office EMC Lab. No.3 and 1 Semi Anechoic Chamber
Report No. 32HE0037-HO
Date 03/26/2012 03/26/2012 04/04/2012
Temperature/ Humidity 21 deg.C / 40% RH 21 deg.C / 40% RH 22 deg.C / 34% RH
Engineer Shinya Watanabe Kazuya Yoshioka Takumi Shimada
(1-10GHz) (1-10GHz) (10-25GHz)
Mode High Power mode (P10)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m] at 3m	Result [uV/m] at 3m	Distance factor K	Result [uV/m] at 300m	Limit [uV/m] at 300m	Margin [uV/m] at 300m	Margin [dB] at 300m	Height [cm]	Angle [deg.]	Remark
Hori	2199.170	AV	29.2	26.1	2.1	0.0	57.4	741.4	0.0056	4.15	33.69	29.5	18.2	162	295	
Hori	2400.000	AV	24.7	26.4	2.2	0.0	53.3	462.4	0.0061	2.82	33.69	30.9	21.5	211	23	
Hori	2500.000	AV	28.4	26.5	2.3	0.0	57.2	724.5	0.0064	4.64	33.69	29.1	17.2	211	23	
Hori	2720.580	AV	28.4	27.1	2.4	0.0	57.9	785.3	0.0070	5.50	33.69	28.2	15.7	212	309	
Hori	4914.750	AV	45.2	30.5	3.9	31.9	47.7	242.7	0.0100	2.43	33.69	31.3	22.8	127	280	1050ml Load Right Front
Hori	4916.000	AV	41.2	30.5	3.9	31.9	43.7	153.2	0.0100	1.53	33.69	32.2	26.8	127	280	1050ml Load Center
Hori	4918.000	AV	45.8	30.5	3.9	31.9	48.3	260.1	0.0100	2.60	33.69	31.1	22.2	131	289	450ml Load Right Front
Hori	4918.080	AV	40.0	30.5	3.9	31.9	42.5	133.4	0.0100	1.33	33.69	32.4	28.0	121	284	450ml Load Center
Hori	7369.750	AV	42.4	35.2	4.6	32.4	49.8	309.1	0.0100	3.09	33.69	30.6	20.7	132	128	1050ml Load Right Front
Hori	7369.750	AV	47.1	35.2	4.6	32.4	54.5	530.9	0.0100	5.31	33.69	28.4	16.1	132	128	1050ml Load Center
Hori	7369.750	AV	48.3	35.2	4.6	32.4	55.7	609.6	0.0100	6.10	33.69	27.6	14.9	132	128	450ml Load Center
Hori	7369.750	AV	46.1	35.2	4.6	32.4	53.5	473.2	0.0100	4.73	33.69	29.0	17.1	132	128	450ml Load Right Front
Hori	11102.580	AV	40.5	40.2	-3.8	33.9	43.0	141.3	0.0100	1.41	33.69	32.3	27.5	100	180	
Hori	12300.620	AV	43.6	39.2	-3.4	33.5	45.9	197.3	0.0100	1.97	33.69	31.7	24.6	100	180	
Hori	17300.030	AV	32.4	42.9	-2.1	32.6	40.6	107.2	0.0100	1.07	33.69	32.6	29.9	100	180	
Hori	24500.000	AV	36.1	40.7	-1.7	32.3	42.8	138.1	0.0100	1.38	33.69	32.3	27.7	100	180	
Vert	2187.670	AV	31.4	26.1	2.1	0.0	59.6	955.0	0.0056	5.35	33.69	28.3	16.0	119	329	
Vert	2400.000	AV	25.5	26.4	2.2	0.0	54.1	507.0	0.0061	3.09	33.69	30.6	20.7	100	0	
Vert	2500.000	AV	26.6	26.5	2.3	0.0	55.4	588.9	0.0064	3.77	33.69	29.9	19.0	100	0	
Vert	2713.500	AV	26.1	27.1	2.4	0.0	55.6	602.6	0.0070	4.22	33.69	29.5	18.0	100	301	
Vert	4900.080	AV	41.9	30.5	3.8	31.9	44.3	164.1	0.0100	1.64	33.69	32.1	26.2	144	0	450ml Load Center
Vert	4910.750	AV	45.2	30.5	3.9	31.9	47.7	242.7	0.0100	2.43	33.69	31.3	22.8	156	355	1050ml Load Right Front
Vert	4912.900	AV	42.7	30.5	3.9	31.9	45.2	182.0	0.0100	1.82	33.69	31.9	25.3	144	0	450ml Load Right Front
Vert	4914.500	AV	40.7	30.5	3.9	31.9	43.2	144.6	0.0100	1.45	33.69	32.2	27.3	161	0	1050ml Load Center
Vert	7370.920	AV	53.4	35.2	4.6	32.4	60.8	1096.5	0.0100	10.97	33.69	22.7	9.8	100	273	450ml Load Right Front
Vert	7370.920	AV	48.8	35.2	4.6	32.4	56.2	645.7	0.0100	6.46	33.69	27.2	14.4	100	273	450ml Load Center
Vert	7370.920	AV	45.2	35.2	4.6	32.4	52.6	426.6	0.0100	4.27	33.69	29.4	18.0	100	273	1050ml Load Right Front
Vert	7370.920	AV	46.8	35.2	4.6	32.4	54.2	512.9	0.0100	5.13	33.69	28.6	16.4	100	273	1050ml Load Center
Vert	11092.230	AV	44.5	40.2	-3.8	33.9	47.0	223.9	0.0100	2.24	33.69	31.5	23.6	100	180	
Vert	12288.250	AV	46.4	39.2	-3.4	33.5	48.7	272.3	0.0100	2.72	33.69	31.0	21.9	100	180	
Vert	17293.360	AV	35.6	42.8	-2.1	32.6	43.7	153.2	0.0100	1.53	33.69	32.2	26.8	100	180	
Vert	24500.000	AV	38.0	40.7	-1.7	32.3	44.7	171.8	0.0100	1.72	33.69	32.0	25.9	100	180	

Result[dBuV/m] at 3m = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

Result[uV/m] at 300m = Result[uV/m] at 3m * Distance factor K

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

*The test result is rounded off to one or two decimal places, so some differences might be observed.

APPENDIX 2: Test instruments

EMI Test Instruments[1/2]

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2012/02/24 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	-	RE	2012/02/06 * 12
MJM-06	Measure	PROMART	SEN1955	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2011/04/08 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2011/05/23 * 12
MCC-132	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336161/4(1m) / 340639(5m)	RE	2011/09/06 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2012/03/29 * 12
MHF-06	High Pass Filter 3.5-24GHz	TOKIMEC	TF323DCA	601	RE	2011/05/16 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2011/08/11 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2012/03/16 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2011/07/15 * 12
MAT-09	Attenuator(6dB)	Weinschel Corp	2	BK7973	RE	2011/11/02 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2011/10/15 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2011/10/15 * 12
MHF-19	High Pass Filter 3.5-18.0GHz	TOKIMEC	TF323DCA	602	RE	2011/09/07 * 12
MCC-76	Microwave Cable 1G-26.5GHz	Suhner	SUCOFLEX104	278967/4	RE	2011/12/08 * 12
MTH-01	Thermometer	FLUKE	52II	89210031	Power	2011/07/29 * 12
MAEC-01	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	RE	2011/07/10 * 12
MOS-27	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q26	RE	2012/02/08 * 12
MJM-01	Measure	KDS	ES19-55	-	RE	-
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2011/10/19 * 12
MCC-31	Coaxial cable	UL Japan	-	-	RE	2011/07/28 * 12
MCC-03	Coaxial Cable	Fujikura/Suhner/TSJ	5D-2W(20m)/3D-2W(7.5m)/RG400u(1.5m) /RFM-E421(Switcher)	- /01068(Switcher)	RE	2012/01/22 * 12
MAT-08	Attenuator(6dB)	Weinschel Corp	2	BK7971	RE	2011/11/02 * 12
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2011/11/23 * 12
MCC-133	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336164/4(1m) / 340640(5m)	RE	2011/09/07 * 12
MHA-05	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	253	RE	2011/06/19 * 12
MHA-01	Horn Antenna 18-26.5GHz	EMCO	3160-09	1266	RE	2011/06/20 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2012/01/25 * 12
MHF-06	High Pass Filter 3.5-24GHz	TOKIMEC	TF323DCA	601	RE	2011/05/16 * 12

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EMI Test Instruments[2/2]

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MSA-05	Spectrum Analyzer	Advantest	R3273	160400285	RE	2011/11/23 * 12
MOS-23	Thermo-Hygrometer	Custom	CTH-201	0004	RE	2011/12/09 * 12
MRIN-01	Reference Impedance Network	California Instruments	REF-IMP3S	S010	Power	2011/12/26 * 12
COTS-MHF-02	Harmonics / Voltage fluctuations and flicker test program	California Instruments	CTS30	-	Power	-

The expiration date of the calibration is the end of the expired month.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

Test Item:

RE: Radiated emission

Power: Limit calculation table

<Reference>

*The following test instruments are used for Radiation Hazard Measurement (Safety check), and they are owned by the customer.

Model No.	Instrument	Manufacturer	Serial No	Expiration of Calibration
HI-1710A	Microwave Survey meter	ETS LINDGREN	00102488	N/A
HI-2623	Microwave leakage probe	ETS LINDGREN	00109098	2013/03

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APPENDIX 3: Photographs of test setup

Radiated Emission

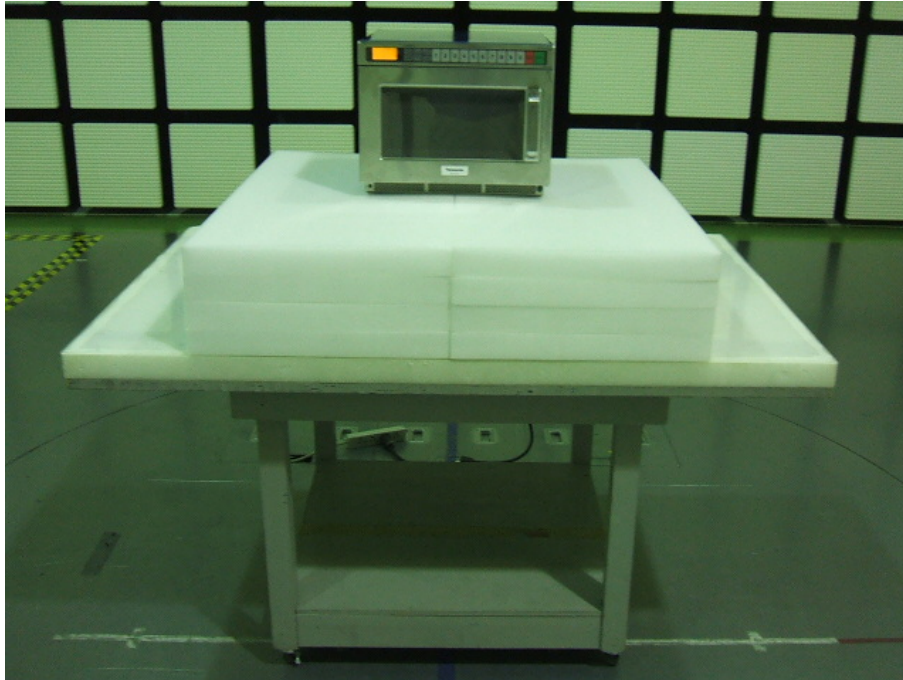


Photo 1

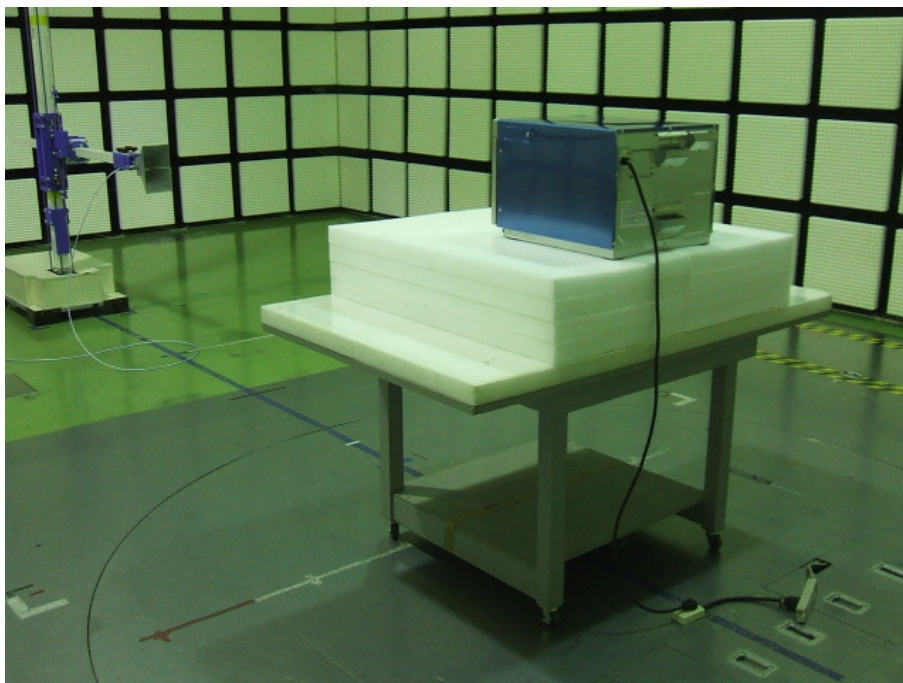


Photo 2