

KANSAI ELECTRONIC INDUSTRY DEVELOPMENT CENTER

HEAD OFFICE
6-8-7 NISHITENMA
KITA-KU OSAKA 530-0047 JAPAN



Corporate Juridical Person

IKOMA TESTING LABORATORY
12128 TAKAYAMA-CHO
IKOMA-CITY NARA 630-0101 JAPAN

TEST REPORT

Report No.A-021-02-C

Date: 13 December 2002

This test report is to certify that the tested device properly complies with the requirements of:

FCC Rules and Regulations Part 18 Subpart C.

The tests necessary to show compliance to the requirements were performed and these results met the specifications of requirement. The results of this report should not be construed to imply compliance of equipment other than that, which was tested. Unless the laboratory permission, this report should not be copied in part.

1. Applicant

Company Name : SANYO Electric Co., Ltd.
Household Appliances Systems Division Engineering Department No.2
Mailing Address : 1-1-1, Seta, Otsu City, Shiga, 520-2198 Japan

2. Identification of Tested Device

Type of Device : INDUSTRIAL, SCIENTIFIC, AND MEDICAL EQUIPMENT
Kind of Equipment Authorization : ☐: DoC ☒: Certification ☐: Verification
FCC ID : AEZA107
Device Name : Microwave Oven
Trade Name : SANYO
Model Number : EM-C1820
Serial Number : Prototype No.1 ☒: Prototype ☐: Pre-production ☐: Production
Date of Manufacture : October, 2002

3. Test Items and Procedure

☒: Measurements of Frequency vs Load Stability
☒: Measurements of Frequency vs Line Voltage Stability
☒: Measurements of Electric Field Strength
Above all tests were performed under: FCC/OET MP-5 (1985)
☒: without deviation, ☐: with deviation (details are found inside of this report)

4. Date of Test

Receipt of Test Sample : 5 December 2002
Condition of Test Sample : ☒: Damage is not found on the set.
☐: Damage is found on the set. (Details are described in this report)
Test Completed on : 8 December 2002

Yasuhiro Yamada
Chief Manager of Ikoma Testing Laboratory

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1. GENERAL INFORMATION

1.1. Product Description

The SANYO Model No. EM-C1820 (referred to as the EUT in this test report) is a Microwave Oven .

(1) Technical Specification

- Magnetron Frequency : 2.45GHz $\pm$ 50MHz
- Microcomputer clock : 4MHz
- RF Power : 2000W
- Rated Power Supply : AC 208V, 60Hz

1.2. Description for Equipment Authorization

- | | |
|--|---|
| (1) Category | : ☒ Consumer ☐ Non-consumer equipment |
| (2) Reference Rule and Specification | : FCC Rule Part 18
☒ Section 18.305 (a), (b) |
| (3) Type of device | : ☐ Ultrasonic equipment
☐ Induction cooking range
☐ RF lighting device
☐ Industrial heater or RF stabilized arc welder
☐ Medical diathermy
☒ Any type unless otherwise specified (miscellaneous) |
| (4) Kind of Equipment Authorization | : ☐ DoC ☒ Certification ☐ Verification |
| (5) Procedure of Application | : ☒ Original Equipment ☐ Modification |
| (6) Highest Frequency used in the Device | : 2.45 GHz |
| (7) Upper Frequency of Radiated Emission Measurement Range | : ☐ 1000 MHz ☐ 2000 MHz ☐ 5000 MHz
☒ The Tenth Harmonic |

1.3. Test Facility

All tests described in this report were performed by:

Name: KANSAI ELECTRONIC INDUSTRY DEVELOPMENT CENTER (KEC)
IKOMA TESTING LABORATORY

Open Area Test Site	☐ No.1	☐ No.3	☐ No.4
Anechoic Chamber	☐ No.1	☒ No.3	
Shielded Room	☐ No.1	☐ No.2	☐ No.4 ☒ No.5

Address: 12128, Takayama-cho Ikoma-city, Nara, 630-0101 Japan

These test facilities have been filed with the FCC under the criteria of ANSI C63.4-1992. The KEC has been accredited by the NVLAP (Lab. Code: 200207-0) based on ISO17025. Also the laboratory has been authorized by TUV Product Service (GER) and TUV Rheinland (GER) based on their criteria for testing laboratory (EN45001).

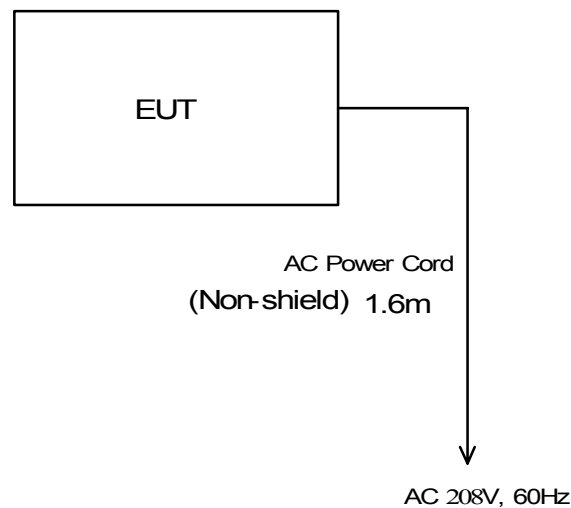
2. TESTED SYSTEM

2.1. Test Mode

The compliance tests were performed under following operation mode.

Maximum Output Power Operation

2.2. Block Diagram of EUT System



2.3. Operating Procedure for EUT System

- (1) Open the door of EUT.
- (2) Set the load as follows in EUT.
 - Receptacle
 - 1000cc volume Beaker
 - Load for stability test
 - 1000cc water with two beaker
 - Load for the other test
 - 700cc water with two beaker or 600ml water with a beaker
- (3) Close the door of EUT.
- (4) Set the output power to maximum.
- (5) Set the cooking time.
- (6) Push the start pad.
 - Then start the cooking.

3. MEASUREMENT OF FREQUENCY VS LOAD STABILITY

3.1. Reference Rule and Specification

FCC Rule Part 18 Subpart C
FCC OET MP-5 (1985)

3.2. Test Procedure

- (1) Configure the EUT.
[See 3.3. Test arrangement]

[Note]

The EUT power cord is connected to the CVCF placed at outside.

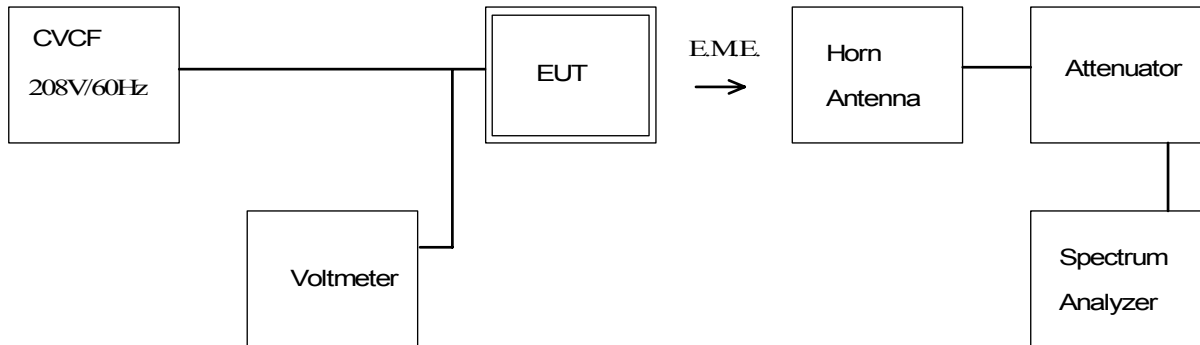
- (2) Operate the EUT.
- (3) Connect the spectrum analyzer to the RF output of the horn antenna using a suitable length of coaxial cable.
- (4) Measure the frequency of maximum emission on the spectrum analyzer* 1 every 10minutes until the water load decrease to 20percent.

[Note]

* 1. Spectrum Analyzer Operation Mode

Frequency Range	: 2.4GHz - 2.5GHz
Resolution Bandwidth	: 1 MHz
Video Bandwidth	: 1 MHz
Detector Function	: Peak Mode
Data Display Mode	: Max Level Hold

3.3. Test Arrangement



3.4. Test Result

AC Power Input Time (Minutes)	Frequency (GHz)	Deviation for ISM Frequency (MHz)
0	2.4808	30.8
10	2.4767	26.7
20	2.4750	25.0
30	2.4647	14.7
40	2.4630	13.0
45	2.4580	8.0

Period of approximately 20percent of the original quantity.

[Note]

Environment Temperature : 20℃ Humidity : 53%

[Sample Calculation]

Frequency : 2.4808 GHz

Deviation for ISM Frequencies Calculated as follows,

$$2.4808 - 2.4500 = 0.0308(\text{GHz}) = +30.8(\text{MHz})$$

Tested Date : 8 December 2002

Signature

Yasunari Kawai

4. MEASUREMENT OF FREQUENCY VS LINE VOLTAGE STABILITY

4.1. Reference Rule and Specification

FCC Rule Part 18 Subpart C
FCC OET MP-5 (1985)

4.2. Test Procedure

- (1) Configure the EUT.
[See 4.3 Test arrangement]

[Note]

The EUT power cord is connected to the CVCF placed at outside.

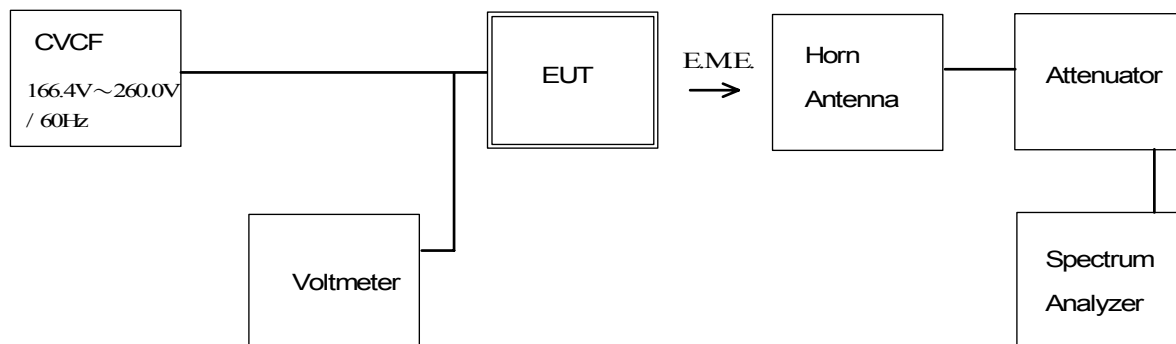
- (2) Operate the EUT.
- (3) Connect the spectrum analyzer to the RF output of the horn antenna using a suitable length of coaxial cable.
- (4) Measure the frequency of maximum emission on the spectrum analyzer* 1 under the different line voltages.

[Note]

* 1. Spectrum Analyzer Operation Mode

Frequency Range	: 2.4GHz - 2.5GHz
Resolution Bandwidth	: 1MHz
Video Bandwidth	: 1MHz
Detector Function	: Peak Mode
Data Display Mode	: Max Level Hold

4.3. Test Arrangement



4.4. Test Result

Line Voltage Variation (Volt)	Frequency (GHz)	Deviation for ISM Frequency (MHz)
166.4 (-20%)	2.4517	+1.7
208 (±0%)	2.4808	+30.8
260 (+25%)	2.4633	+13.3

[Note]

Environment Temperature : 21℃ Humidity : 60%

[Sample Calculation]

Frequency : 2.4517GHz

Deviation for ISM Frequencies Calculated as follows,

$$2.4517 - 2.4500 = 0.0017(\text{GHz}) = +1.7(\text{MHz})$$

Tested Date : 8 December 2002

Signature

Yasunari Kawai

5. MEASUREMENT OF ELECTRIC FIELD STRENGTH

5.1. Reference Rule and Specification

FCC Rule Part 18 Subpart C
FCC OET MP-5 (1985)

5.2. Test Procedure

- (1) Configure the EUT.

[See 5.3 Test arrangement and 5.4 Photograph of EUT System Configuration]

[Note]

The power cords for the EUT are connected through the receptacle with the ground plane to the CVCF placed under the ground plane.

- (2) Operate the EUT.

- (3) To determine the emissions of the EUT, preliminary radiated measurement was performed at a closer distance than that specified for final radiated measurement using the broad band antenna and the spectrum analyzer.

- (4) To search the frequency of maximum emission level on the spectrum analyzer, change the EUT System configuration, move the signal cables and the power cords, change the EUT conditions.

- (5) The spectrum was scanned from 30MHz to 18GHz and collect the emissions on the spectrum analyzer. The emission of fundamental ($2.45\text{GHz} \pm 50\text{MHz}$) was excluded.

- (6) The collected emissions for final test were measured at the specified distance using the broad band antenna(or standard gain horn antenna) and the field strength meter^{*1)}. (or the spectrum analyzer)^{*2)}

[Note]

*1). Field Strength Meter Operation Mode

Detector Function : Average

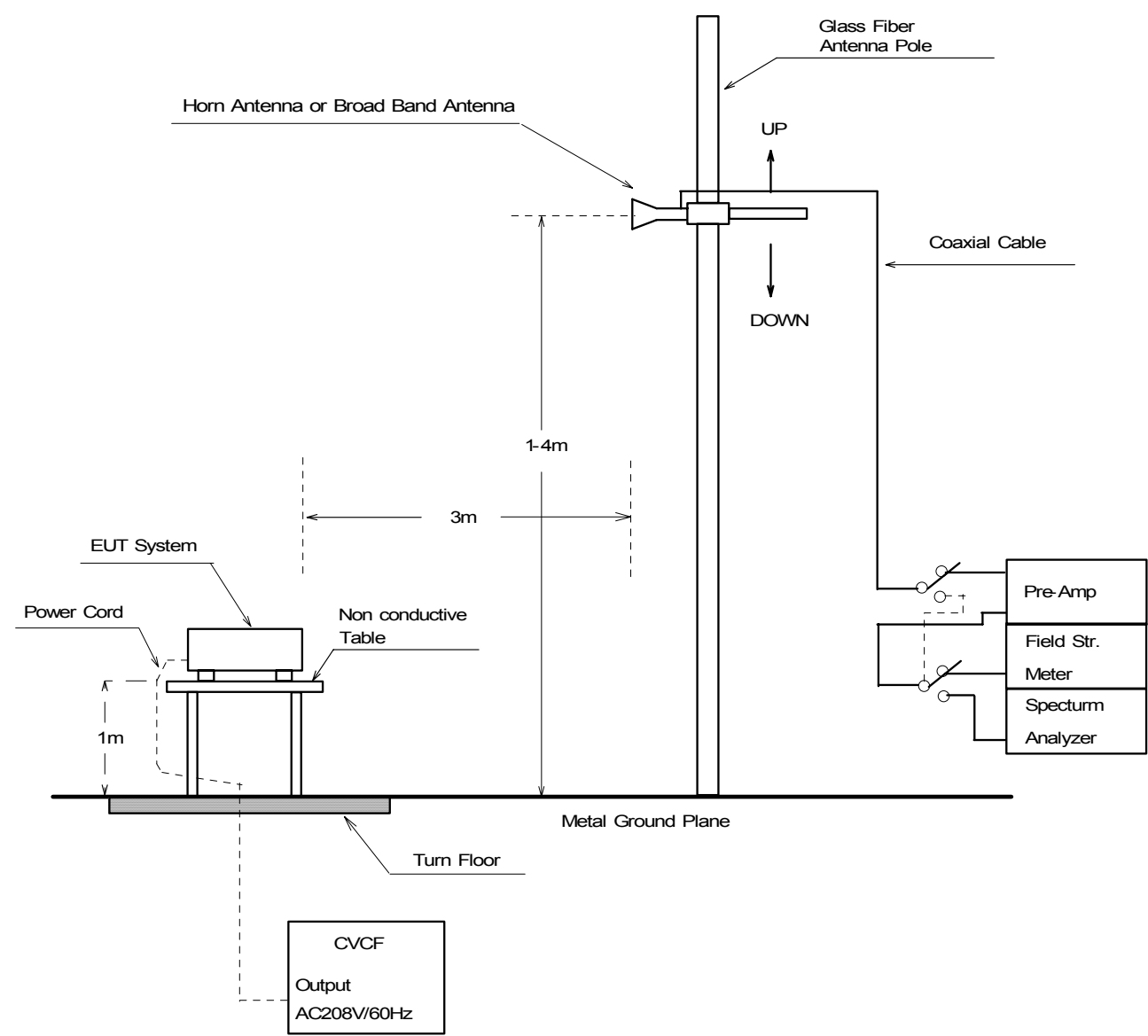
IF Band Width : 120kHz(frequency range 30MHz-1GHz)

*2) Spectrum Analyzer Operation Mode

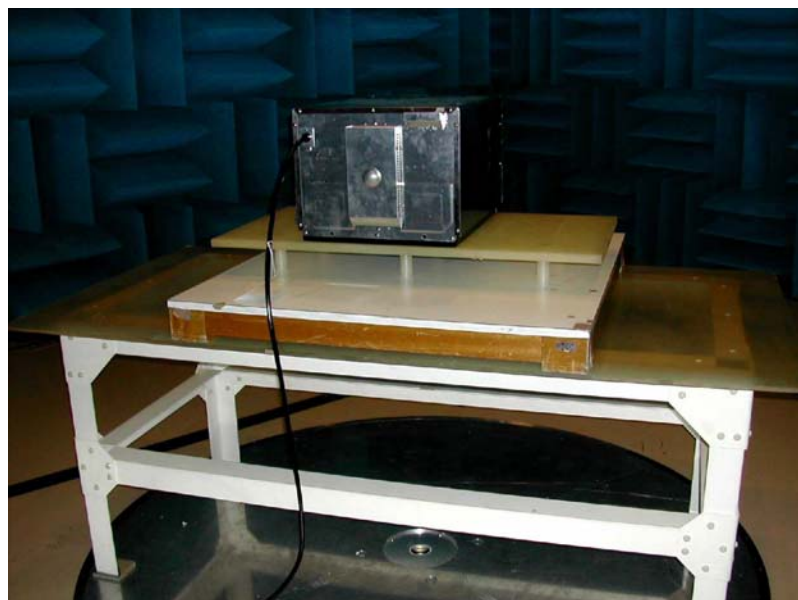
RBW : 1MHz

VBW : 30Hz (above 1GHz)

5.3. Test Arrangement



5.4. Photographs of EUT System Configuration



5.5. Test Result

Note	Measured Frequency (GHz)	Antenna Factor (dB/m)	Amp Gain Correction (dB)	Conversion Factor (dB)	Meter Reading		Maximum Field Strength (dBuV/m)	Limit at 300 m (dBuV/m)	Margin for Limit (dB)
					Horizontal Polarization (dBuV)	Vertical Polarization (dBuV)			
*1	2.400	24.5	-	-44.3	34.5	34.5	14.7	34.0	19.3
*1	2.500	24.4	-	-43.9	<32.0	<32.0	<12.5	34.0	>21.5
*1	4.933	31.7	-34.3	-40.0	42.9	44.5	1.9	34.0	32.1
*2	4.927	31.7	-34.3	-40.0	40.0	41.6	-1.0	34.0	35.0
*3	4.941	31.8	-34.3	-40.0	41.2	43.9	1.4	34.0	32.6
*4	4.931	31.7	-34.3	-40.0	45.4	46.6	4.0	34.0	30.0
*1	7.399	33.0	-34.6	-40.0	43.1	44.8	3.2	34.0	30.8
*2	7.412	33.0	-34.6	-40.0	40.6	42.3	0.7	34.0	33.3
*3	7.401	33.0	-34.6	-40.0	39.0	41.9	0.3	34.0	33.7
*4	7.406	33.0	-34.6	-40.0	45.8	45.4	4.2	34.0	29.8
*1	9.862	36.8	-35.1	-40.0	34.4	36.1	-2.2	34.0	36.2
*1	12.355	39.7	-33.6	-40.0	34.9	36.3	2.4	34.0	31.6
*1	14.798	40.4	-32.9	-40.0	31.8	30.5	-0.7	34.0	34.7
*1	17.263	42.2	-32.9	-40.0	<30.0	31.1	0.4	34.0	33.6

[Note]

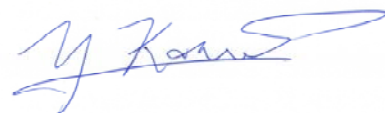
Environment : Temperature : 20℃ Humidity : 55%
 Measured Distance : 3m
 Antenna Factor : Antenna Factor and Cable Loss
 Conversion Factor : distance correction from 3m to 300m (K factor written in MP-5 (4.6.1) is used)

Limit at 300m : $20 \times \log(25 \sqrt{\frac{2000}{500}}) = 34.0(\text{dB } \mu \text{ V/m})$

Test Condition : *1) 700ml water load $\times 2$, at the center
 *2) 700ml water load $\times 2$, at the right / front corner
 *3) 600ml water load, at the center
 *4) 600ml water load, at the right / front corner

[Calculation Method]

Maximum Field Strength (dB μ V/m) = Max Meter Reading (dB μ V) + Antenna Factor (dB/m)
 + Amp Gain Correction (dB) + Conversion Factor (dB)



Tested Date : 8 December 2002

Signature

Yasunari Kawai

- Continued -

Measured Frequency (MHz)	Antenna Factor (dB/m)	Conversion Factor (dB)	Meter Reading		Maximum Field Strength (dBuV/m)	Limit at 300 m (dBuV/m)	Margin for Limit (dB)
			Horizontal Polarization (dBuV)	Vertical Polarization (dBuV)			
54.70	11.0	-40.0	<-8.0	-6.0	-35.0	34.0	69.0
224.40	19.7	-40.0	<-8.0	<-8.0	<-28.3	34.0	>62.3
405.00	19.5	-40.0	<-8.0	<-8.0	<-28.5	34.0	>62.5
417.00	19.7	-40.0	<-8.0	<-8.0	<-28.3	34.0	>62.3
525.40	21.8	-40.0	<-7.0	<-7.0	<-25.2	34.0	>59.2
703.20	24.8	-40.0	-6.0	<-7.0	-21.2	34.0	55.2
826.00	26.5	-40.0	<-7.0	-5.0	-18.5	34.0	52.5

[Note]

Environment : Temperature : 20°C Humidity : 55%

Measured Distance : 3m

Antenna Factor : Antenna Factor and Cable Loss

Conversion Factor : -40dB(from 3m to 300m)

Limit at 300m : $20 \times \log(25 \sqrt{\frac{2000}{500}}) = 34.0 (dB \mu V/m)$ Test Condition : 700ml water load $\times 2$, at the center.

[Calculation Method]

Maximum Field Strength (dB μ V/m) = Max Meter Reading (dB μ V) + Antenna Factor (dB/m)
+ Conversion Factor (dB)

Tested Date : 8 December 2002

Signature

Yasunari Kawai

- Continued -

Radiation Pattern

Second Harmonic (Measured Frequency : 4.933 GHz)

Orientation (Deg)	Antenna Factor (dB/m)	Amp Gain Correctio (dB)	Conversion Factor (dB)	Meter Reading		Maximum Field Strength (dBuV/m)	Limit at 300 m (dBuV/m)	Margin for Limit (dB)
				Horizontal Polarization (dBuV)	Vertical Polarization (dBuV)			
0	31.7	-34.3	-40.0	37.3	39.5	-3.1	34.0	37.1
20	31.7	-34.3	-40.0	38.1	41.3	-1.3	34.0	35.3
40	31.7	-34.3	-40.0	37.6	42.0	-0.6	34.0	34.6
60	31.7	-34.3	-40.0	38.6	40.1	-2.5	34.0	36.5
80	31.7	-34.3	-40.0	38.0	43.3	0.7	34.0	33.3
100	31.7	-34.3	-40.0	40.1	39.2	-2.5	34.0	36.5
120	31.7	-34.3	-40.0	37.3	40.4	-2.2	34.0	36.2
140	31.7	-34.3	-40.0	39.3	38.3	-3.3	34.0	37.3
160	31.7	-34.3	-40.0	36.5	37.7	-4.9	34.0	38.9
180	31.7	-34.3	-40.0	38.2	38.6	-4.0	34.0	38.0
200	31.7	-34.3	-40.0	40.7	35.8	-1.9	34.0	35.9
220	31.7	-34.3	-40.0	39.2	36.0	-3.4	34.0	37.4
240	31.7	-34.3	-40.0	40.1	38.8	-2.5	34.0	36.5
260	31.7	-34.3	-40.0	40.7	44.5	1.9	34.0	32.1
280	31.7	-34.3	-40.0	38.3	36.3	-4.3	34.0	38.3
300	31.7	-34.3	-40.0	36.0	40.2	-2.4	34.0	36.4
320	31.7	-34.3	-40.0	42.9	39.3	0.3	34.0	33.7
340	31.7	-34.3	-40.0	40.0	37.7	-2.6	34.0	36.6

[Note]

Environment : Temperature : 20°C Humidity : 55%
 Measured Distance : 3m
 Antenna Factor : Antenna Factor and Cable Loss
 Conversion Factor : distance correction from 3m to 300m (K factor written in MP-5 (4.6.1) is used)

Limit at 300m : $20 \times \log(25 \sqrt{\frac{2000}{500}}) = 34.0(\text{dB } \mu \text{ V/m})$

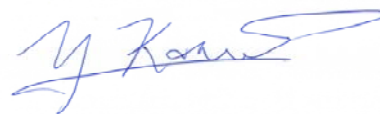
Test Condition : 700ml water load $\times 2$, at the center.

[Calculation Method]

Maximum Field Strength (dB μ V/m) = Max Meter Reading (dB μ V) + Antenna Factor (dB/m)
 + Amp Gain Correction (dB) + Conversion Factor (dB)

Tested Date : 8 December 2002

Signature

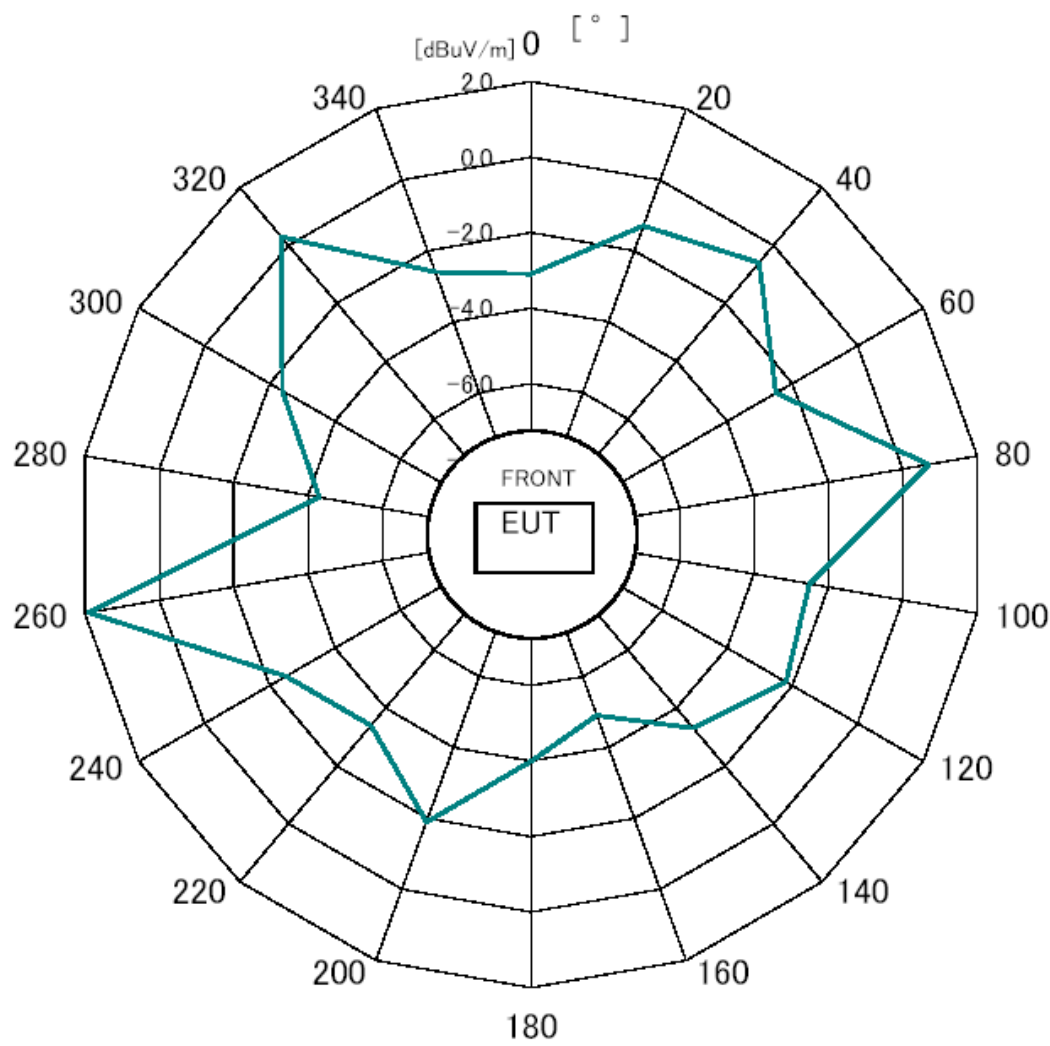


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- Continued -

Radiation Pattern

Second Harmonic (Measured Frequency : 4.933 GHz)



- Continued -

Radiation Pattern

Third Harmonic (Measured Frequency : 7.399GHz)

Orientation (Deg)	Antenna Factor (dB/m)	Amp Gain Correctio (dB)	Conversion Factor (dB)	Meter Reading		Maximum Field Strength (dBuV/m)	Limit at 300 m (dBuV/m)	Margin for Limit (dB)
				Horizontal Polarization (dBuV)	Vertical Polarization (dBuV)			
0	33.0	-34.6	-40.0	34.5	40.5	-1.1	34.0	35.1
20	33.0	-34.6	-40.0	37.8	39.7	-1.9	34.0	35.9
40	33.0	-34.6	-40.0	40.6	37.3	-1.0	34.0	35.0
60	33.0	-34.6	-40.0	36.8	42.3	0.7	34.0	33.3
80	33.0	-34.6	-40.0	39.9	39.1	-1.7	34.0	35.7
100	33.0	-34.6	-40.0	36.3	36.4	-5.2	34.0	39.2
120	33.0	-34.6	-40.0	37.8	38.8	-2.8	34.0	36.8
140	33.0	-34.6	-40.0	37.7	40.9	-0.7	34.0	34.7
160	33.0	-34.6	-40.0	40.6	43.0	1.4	34.0	32.6
180	33.0	-34.6	-40.0	33.3	41.6	0.0	34.0	34.0
200	33.0	-34.6	-40.0	39.3	38.8	-2.3	34.0	36.3
220	33.0	-34.6	-40.0	43.1	36.2	1.5	34.0	32.5
240	33.0	-34.6	-40.0	38.1	44.3	2.7	34.0	31.3
260	33.0	-34.6	-40.0	38.0	40.6	-1.0	34.0	35.0
280	33.0	-34.6	-40.0	34.2	40.8	-0.8	34.0	34.8
300	33.0	-34.6	-40.0	41.2	44.8	3.2	34.0	30.8
320	33.0	-34.6	-40.0	37.6	42.1	0.5	34.0	33.5
340	33.0	-34.6	-40.0	35.0	38.1	-3.5	34.0	37.5

[Note]

Environment : Temperature : 20℃ Humidity : 55%
 Measured Distance : 3m
 Antenna Factor : Antenna Factor and Cable Loss
 Conversion Factor : distance correction from 3m to 300m (K factor written in MP-5 (4.6.1) is used)

Limit at 300m : $20 \times \log(25 \sqrt{\frac{2000}{500}}) = 34.0(\text{dB } \mu \text{ V/m})$

Test Condition : 700ml water load $\times 2$, at the center.

[Calculation Method]

Maximum Field Strength (dB μ V/m) = Max Meter Reading (dB μ V) + Antenna Factor (dB/m)
 + Amp Gain Correction (dB) + Conversion Factor (dB)

Tested Date : 8 December 2002

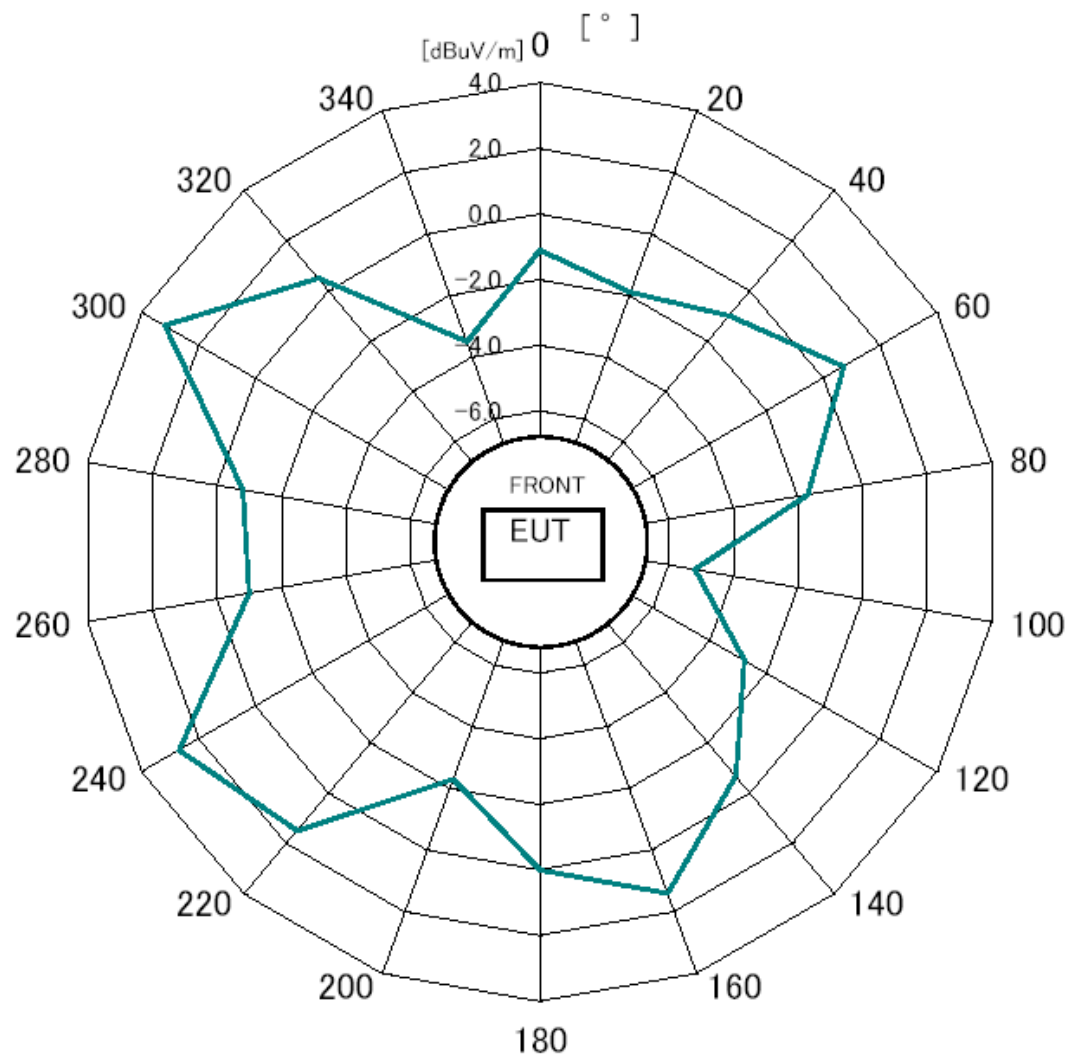
Signature

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- Continued -

Radiation Pattern

Third Harmonic (Measured Frequency : 7.399 GHz)



6. USED TEST EQUIPMENTS AND CALIBRATION STATUS

Equipment	Manufacturer	Model No.	Specifications	KEC Control No.	Test Item (*)	Last Cal.	Next Cal.
Test Receiver	Rohde & Schwarz	ESHS10	Frequency Range 9kHz-30MHz	FS-88	N/A	2002/11	2003/11
		ESVS10	Frequency Range 20MHz-1000MHz	FS-81	2	2001/12	2002/12
Spectrum Analyzer	Anritsu	MS8608A	Frequency Range 9kHz-7.8GHz	SA-46	N/A	2002/7	2003/7
	Advantest	TR4172	Frequency Range 50 Hz – 1.8GHz	FS-44-2	N/A	2002/4	2003/4
		R3261B	Frequency Range 9kHz – 3.6GHz	SA-32	2	2002/6	2003/6
	Hewlett Packard	HP8564E	Frequency Range 9 kHz to 40 GHz	SA-39	3	2002/2	2003/2
Biconical Antenna	Schwarzbeck	BBA9106	Frequency Range 30MHz-300MHz	AN-94	2	2002/3	2003/3
Log-Periodic Antenna	Schwarzbeck	UHALP9108A	Frequency Range 300MHz-1GHz	AN-217	2	2002/3	2003/3
Coaxial Cable	Suhner	SUCOFLEX 104	Length : 1m [SMA(p)-SMA(p)]	CL-42	3	2002/2	2003/2
			Length : 10m [SMA(p)-SMA(p)]	CL-45	3	2002/2	2003/2
				CL-46	N/A	2002/2	2003/2
Horn Antenna	Raven	91888-2	Frequency Range 1 GHz - 2 GHz	AN-167	3	2001/4	2003/4
				AN-211	N/A	2001/8	2003/8
		91889-2	Frequency Range 2 GHz - 5 GHz	AN-168	3	2001/4	2003/4
				AN-212	N/A	2001/8	2003/8
	Scientific Atlanta Raven	12-3.9	Frequency Range 3.95GHz - 5.85 GHz	AN-103	N/A	2001/8	2003/8
				AN-231	3	2001/4	2003/4
		12-5.8	Frequency Range 5.85 GHz - 8.2 GHz	AN-62	N/A	2001/8	2003/8
				AN-143	3	2001/4	2003/4
		12-8.2	Frequency Range 8.2 GHz - 12.4 GHz	AN-144	3	2001/4	2003/4
		12-12.0	Frequency Range 12.4GHz - 18.0 GHz	AN-105	3	2001/4	2003/4

- Continued -

[Note]

Test Item (*): 1: Conducted Emission Measurement
2: Radiated Emission Measurement (30 MHz – 1 GHz)
3: Radiated Emission Measurement (1 GHz <)
N/A: Not Applicable

The overall program of calibration and verification of equipment is designed and operated so as to ensure that measurements made by KEC are traceable to national standards of measurement or equivalent abroad.