

Designated by Ministry of International Trade and Industry

KANSAI ELECTRONIC INDUSTRY DEVELOPMENT CENTER

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



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

Corporate Juridical Person

TEST REPORTReport No. A-033-00-C

Date: 29 August 2000

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

FCC Rules and Regulations Part 90 : Private Land Mobile Radio Services.

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 : MATSUSHITA COMMUNICATION INDUSTRIAL CO., LTD
Mailing Address : 600 SAEDO-CHO TUZUKI-KU YOKOHAMA-CITY,
KANAGA WA , 224-8539 JAPAN

2. Identification of Tested Device

Type of Device : Private Land Mobile Radio Services.
Kind of Equipment Authorization : : DoC : Certification : Verification
FCC ID : ACK9TAWX-C1011
Device Name : Center Module
Trade Name : Panasonic
Model Number : WX-C1011P
Serial Number : 070001 : Prototype : Pre-production : Production
Date of Manufacture : July, 2000

3. Test Items and Procedure

: Measurement of RF Power Output (Substitution Method)
: Modulation Characteristics
: Emission Bandwidth
: Measurement of Field Strength of Spurious Radiation
: Measurement of Spurious Emission at Antenna Terminal
: Frequency Stability Measurement

Above all tests were performed under: FCC Part 2 Sec2.1046, Sec2.1047,
Sec2.1049, Sec2.1051, Sec2.1053, Sec2.1055 and Sec2.1057.

: without deviation, : with deviation(details are found inside of this report)

4. Date of Test

Receipt of Test Sample : 26 July 2000
Test Completed on : 23 August 2000

Eizo Hariya
General Manager of Ikoma Testing Laboratory

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1. GENERAL INFORMATION

1.1 Product Description

The Panasonic ModelNo. WX-C1011P(referred as EUT in this report) is the Wireless Communication System that is used for the order take at the fast food drive through.

(1) Technical Specifications

Transmitting Frequency	: 469.0125 ~ 469.3875 MHz
Designation of Emission	: F3E
Channel Bandwidth	: 25 kHz
Type of Circuit	: Superheterodyne 1st IF: 21.8 MHz 2nd IF :455 kHz

(2) Contained Oscillator

Transmitting Frequency	: 469.2125 MHz (at B-1ch)
First Local Frequency	: 486.0125 MHz(at B-1ch)
Second Local Frequency	: 21.345 MHz

(3) Rated Power Supply : AC 120 V, 60 Hz

1.2 Description for Equipment Authorization

(1) Rules Part(s) under which Equipment operated

FCC Rule Part 90 ; Private Land Mobile Radio Services

(2) Kind of Equipment Authorization

Certification Verification

(3) Procedure of Application

Original Equipment Modification

1.3 Test Facility

Name : KANSAI ELECTRONIC INDUSTRY DEVELOPMENT CENTER (KEC)
IKOMA TESTING LABORATORY
Open Test Site No.2

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

This test facility has been filed in FCC under the criteria in ANSI C63.4-1992.
The laboratory has been accredited by the NVLAP(Lab.Code:200207-0) based on
ISO/IEC Guide 25.

2. TESTED SYSTEM

2.1 Test Mode

The compliance tests were performed under the following operation mode.

(1) Measurement of Field Strength of Spurious Radiation :

The EUT was continuously transmitted in DTMF modulation mode.

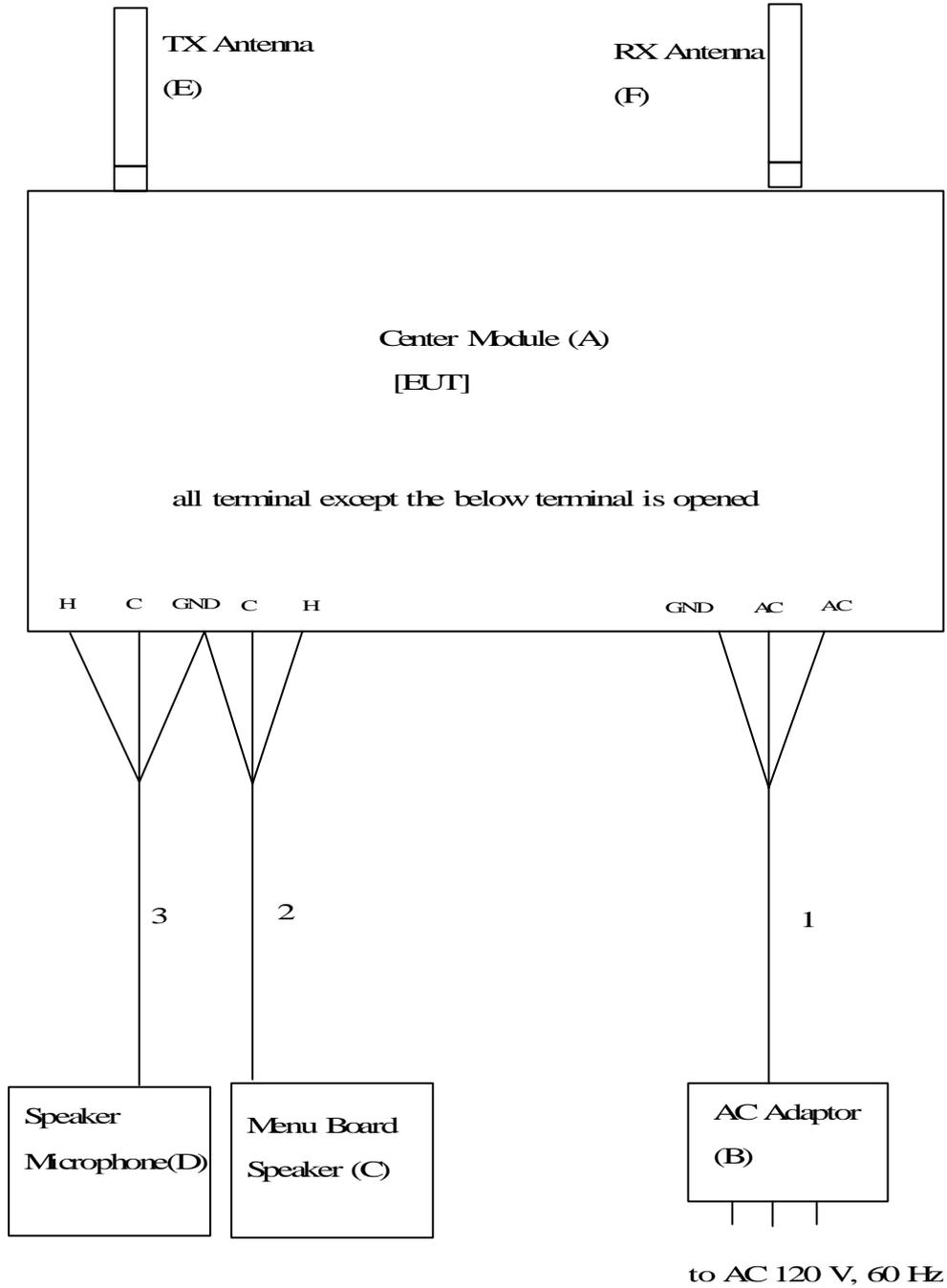
(2) Frequency Stability Measurement :

The EUT was continuously transmitted in non-modulation mode.

(3) Except above two test items :

See the page of each test items.

2.2 Block Diagram of EUT System



[Note]

See 2.3 List of EUT System and 2.4 List of Cables.

2.3 List of EUT System

No	Device Name	Model Number (Serial Number)	FCC ID (Trade Name)	Note	Remark
A	Center Module	WX-C1011P (070001)	ACK9TAWX-C1011 (Panasonic)		(1)
B	AC Adaptor	403ADT-262 (9821)	- (ENG)	Input AC 120 V,60 Hz Output AC 12 V,1600mA	(2)
C	Menu Board Speaker	WX-C1050	-	Impedance :8 ohms	(2)
D	Speaker Microphone	WX-C550 (0Y0022)	-	Impedance :8 ohms	(2)
E	TX Antenna	-	-	Connector Type:BNC Length:15 cm	(3)
F	RX Antenna	-	-	Connector Type:BNC Length:15 cm	(3)

[Remark]

(1) : EUT

(2) : Option of EUT

(3) : Accessory of EUT

2.4 List of Cables

No	Cable Name	Shielded (Y/N)	Length (m)	Note	Remark
1	AC Adaptor Cable	Y	3.0	3-wires type	(1)
2	Menu Board Speaker Cable	Y	33.0	3-wires type	(1)
3	Speaker Microphone Cable	Y	28.3	3-wires type	(1)

[Remark]

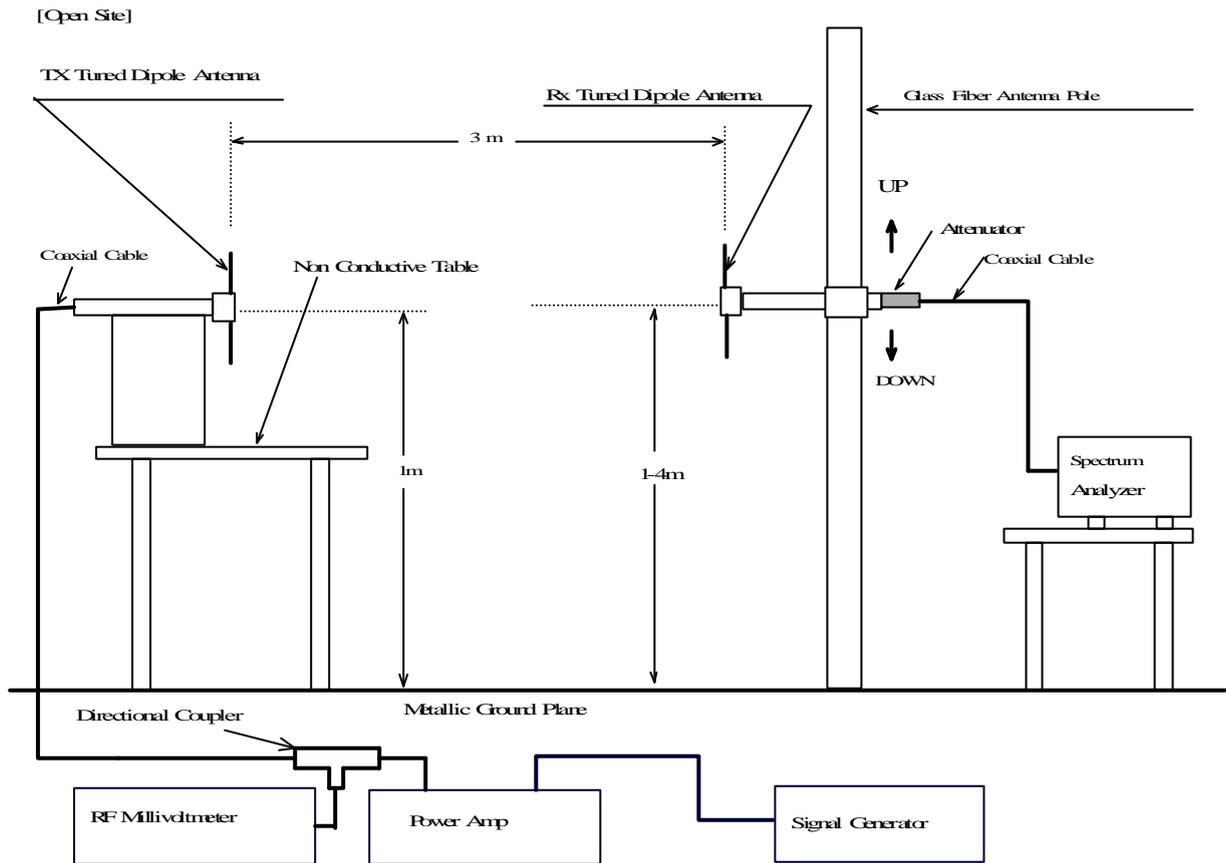
(1) : Option of EUT

3. RF POWER OUTPUT

3.1 Reference Rule and Specification

FCC Rule Part 90 [Section90.217] and Part 2 Subpart J [Section2.1046],[Section2.1053]

3.2 Test Configuration



3.3 Test Procedure

- (1) Tune-up the transmitter.
- (2) The receiving antenna is adjusted to the correct length for the carrier frequency.
- (3) Raise and lower the receiving antenna to obtain a maximum reading on the Spectrum Analyzer with the antenna at horizontal polarity. Then the turntable is rotated to further increase this maximum reading. Repeat this procedure of raising and lower the antenna and rotating the turntable until the highest possible signal has been obtain. Record this maximum reading.
- (4) Repeat step3 with the antenna polarized vertically.
- (5) Remove the transmitter and replace it with the half-wave antenna. The center of these antennas are approximately at the same location as the center of the transmitter.
- (6) Feed the half-wave antenna at the transmitter end with a signal generator connected to the antenna by means of a non-radiating cable.
With the antennas at both ends horizontally polarized and with the signal generator tuned to the carrier frequency, raise and lower the receiver antenna to obtain a maximum reading at the Spectrum Analyzer. Adjust the level of the signal generator output until the previous recording maximum reading for this set of conditions its obtained.
- (7) Repeat step6 with both antennas vertically polarized.

3.4 Test Results

CARRIER FREQUENCY [MHz]	SPECTRUM ANALYZER READING [dBV]		RF METER READING [dBm]		CABLE LOSS [dB]	RF OUTPUT POWER [mW]	LIMIT [mW]
	Horiz.	Vert.	Horiz.	Vert.			
	469.2125	78.8	83.7	10.0			

The RF Power Output can be calculated from following formula:

$$\text{RF Power (mW)} = \frac{(\text{Mr} - \text{Lo}) \div 10}{10}$$

where,

Mr: RF Meter Reading (dBm)

Lo: Loss of Cable (dB)

[Environment]

Temperature : 26 °C Humidity : 62 %

[Summary of Test Results]

Above data shows that the test device complies with the requirements.

Minimum margin was 9.3 dB, vertical polarization.

Tested Date : 27 July 2000

Tester Signature

Yasunari Kawai

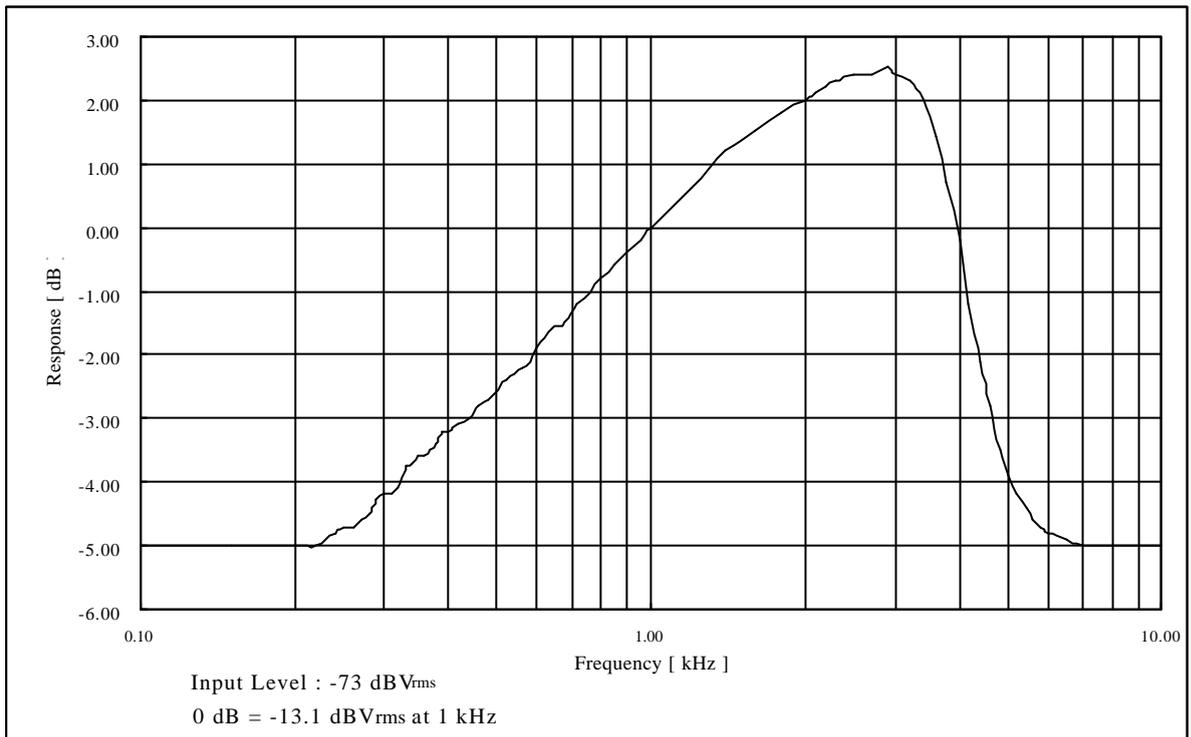
4. MODULATION CHARACTERISTICS

4.1 Reference Rule and Specification

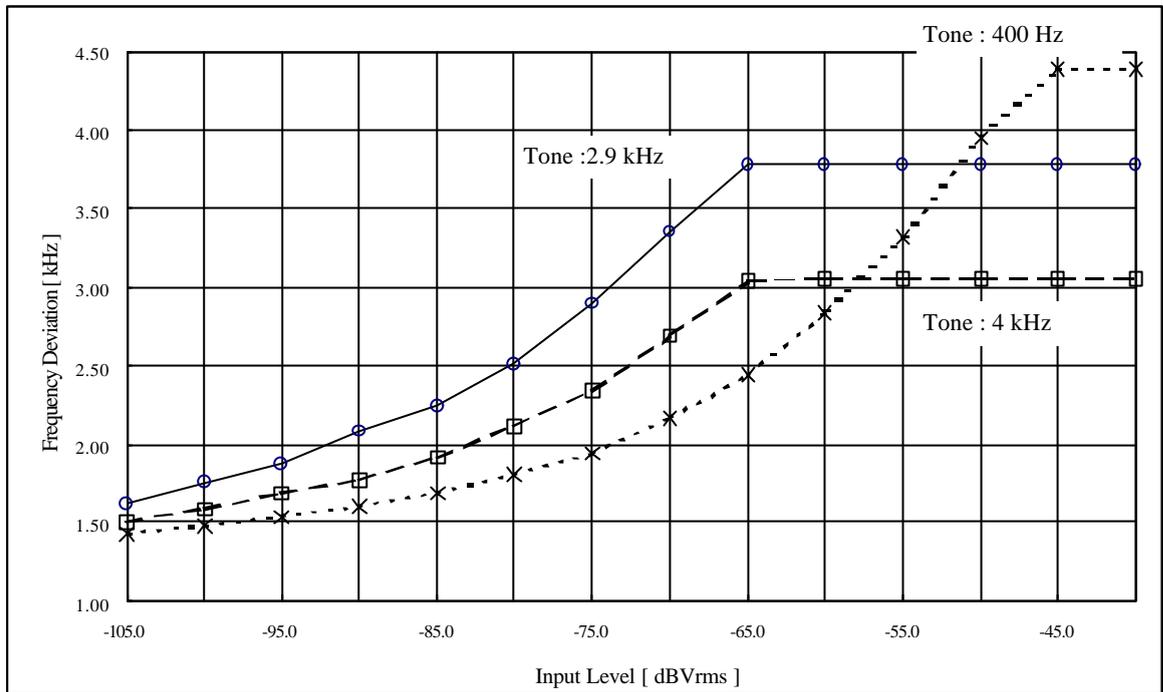
FCC Rule Part 2 Subpart J [Section2.1047 (a), (b)]

4.2 Test Results

(A) Overall Audio Frequency Response



(b) Transmitter Deviation for a Range of Input Signal Level and Modulating Frequencies



[Environment]

Temperature : 26 °C Humidity : 60 %

Tested Date : 28 July 2000

Tester Signature

Yasunari Kawai

5. EMISSION BANDWIDTH

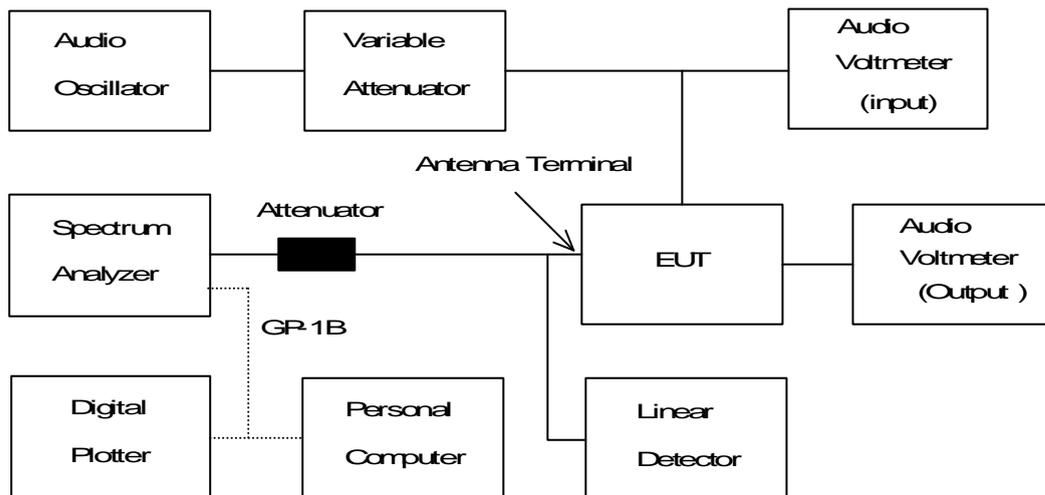
5.1 Reference Rule and Specification

FCC Part 2 Subpart J [Section2.1049]

5.2 Test Procedure

- (1) Set the reference level of the spectrum analyzer to the unmodulated carrier level of the EUT.
- (2) Searched maximum response of audio frequency and read maximum frequency deviation. Then set the frequency deviation to 50% and read audio input level.
- (3) Then EUT was modulated by 2.5KHz and it's level was increased 16dB.

5.3 Test Configuration



5.4 Test Results

See next figure (the picture of spectrum analyzer)

Occupied Bandwidth

The OBW was measured by the spectrum analyzer TR4172 which could measure 99% occupied bandwidth (OBW).

There are 1001 data on horizontal axis of display.

One of them is V_n . Then total power P can be calculated from the following formula.

$$P = \sum_{n=1}^{1001} \frac{V_n^2}{R} \dots\dots\dots (1)$$

where, R is input impedance of TR4172.

Let, x is the point which gives 0.5% of the total power and Y is the point which gives 99.5% of the total power. Then we can get the following formula.

$$0.005P = \sum_{n=1}^x \frac{V_n^2}{R} \dots\dots\dots (2)$$

$$0.995P = \sum_{n=1}^y \frac{V_n^2}{R} \dots\dots\dots (3)$$

From(1)- (3), OBW becomes .

$$OBW = \frac{F_{span}(Y - X)}{1000}$$

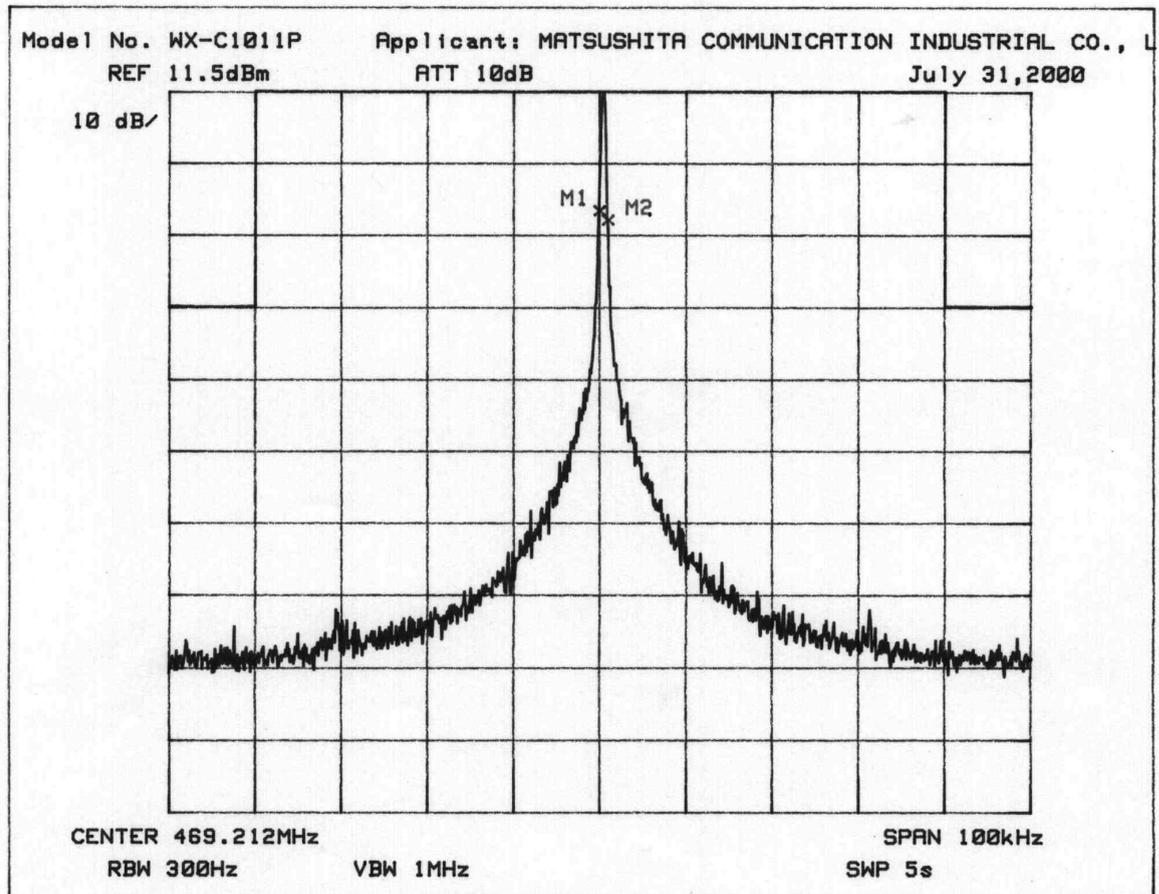
where, F_{span} is frequency span of the spectrum analyzer.

Operation Mode of EUT
Non modulation

Occupied Bandwidth = 1kHz (99% Power)

M1=469.212MHz(0.5% Power Point)

M2=469.213MHz(99.5% Power Point)

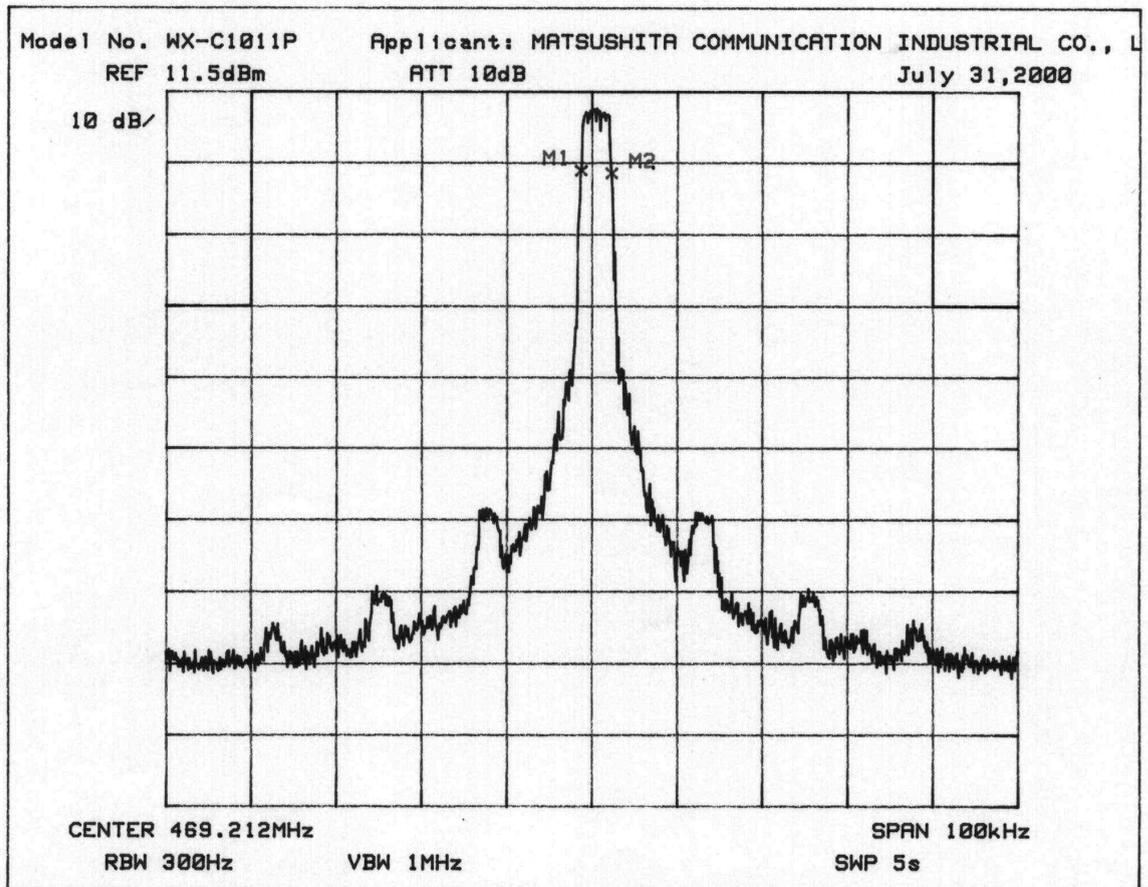


Operation Mode of EUT
Modulated by DTMF Signal.

Occupied Bandwidth = 3.6kHz (99% Power)

M1=469.2108MHz(0.5% Power Point)

M2=469.2144MHz(99.5% Power Point)



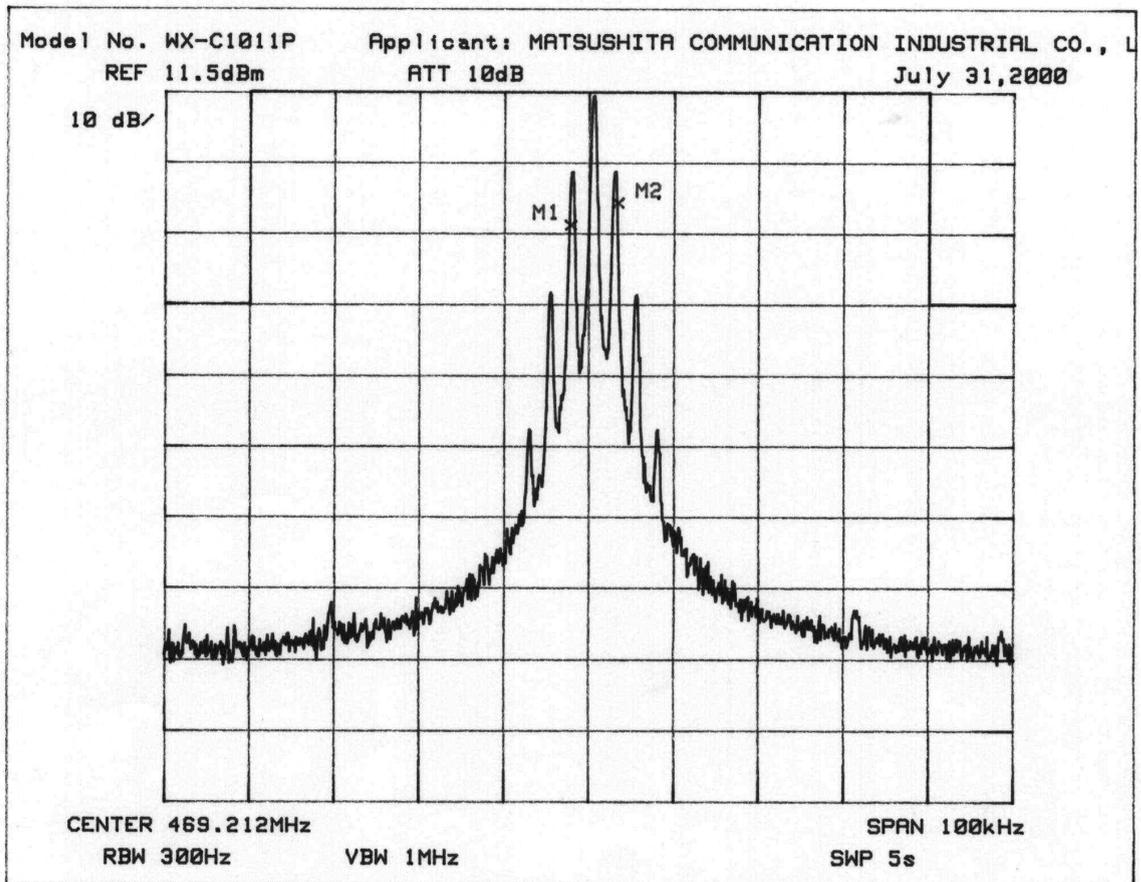
Operation Mode of EUT

Modulated by 2.5kHz tone at input level 16 dB greater than that necessary to produce 50% modulation. Then input level was established at frequency of maximum response of the modulation circuit. [DTMF Signal OFF]

Occupied Bandwidth = 5.6kHz (99% Power)

M1=469.2098MHz(0.5% Power Point)

M2=469.2154MHz(99.5% Power Point)



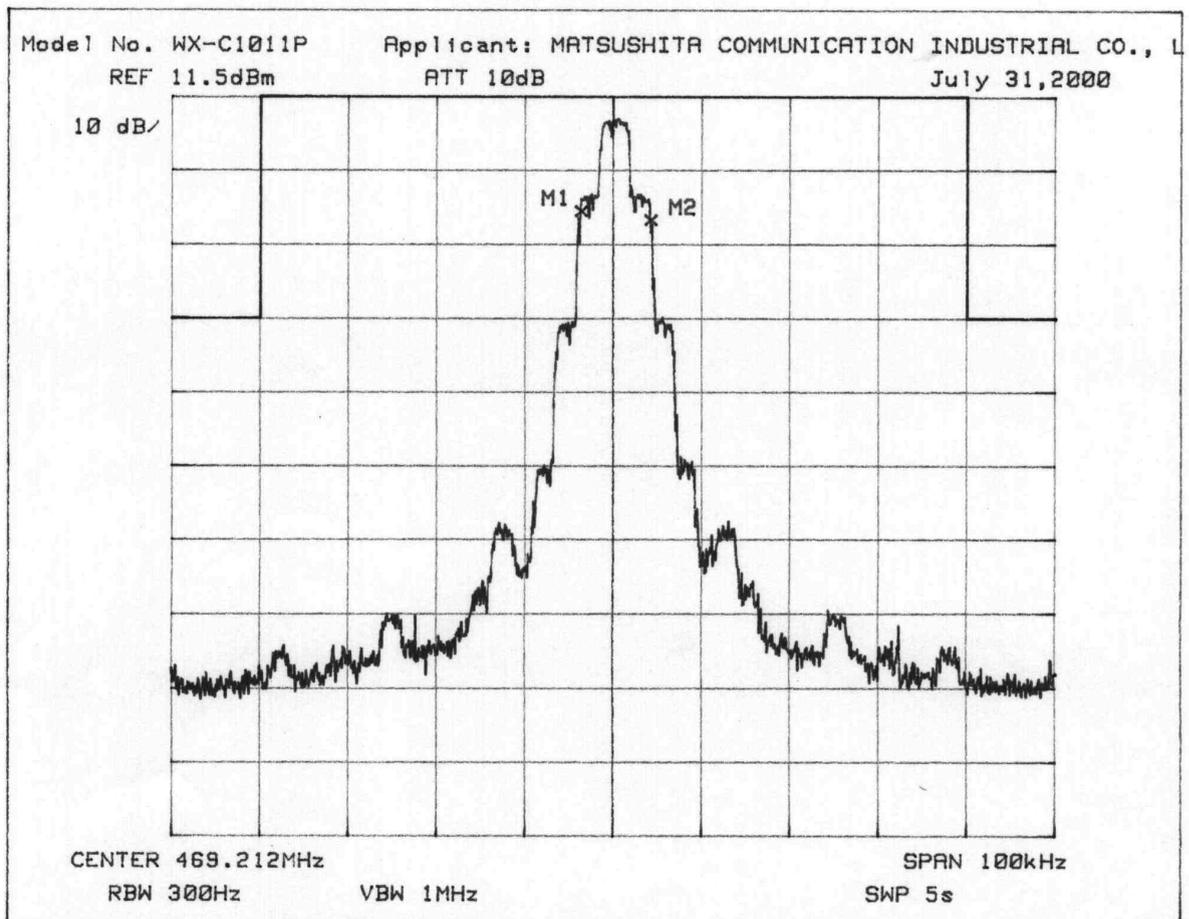
Operation Mode of EUT

Modulated by 2.5 kHz tone at input level 16 dB greater than that necessary to produce 50 % modulation. Then input level was established at frequency of maximum response of the modulation circuit. [DTMF Signal ON]

Occupied Bandwidth = 7.9kHz (99% Power)

M1=469.2084MHz(0.5% Power Point)

M2=469.2163MHz(99.5% Power Point)



[NOTE]

1. Maximum response of audio frequency was 2.9kHz. and maximum frequency deviation was 3.78kHz. and audio input level was -65.0dBVrms.
2. Then 50% of maximum frequency deviation was 1.89kHz. and input level became to -93.0dBVrms.
3. Then EUT was modulated by 2.5kHz and audio input level became to -93.0 + 16 = -77.0dBVrms.

[Environment]

Temperature : 26 °C Humidity : 60 %

Tested Date : 28 July 2000

Tester Signature



Yasunari Kawai

6. FIELD STRENGTH OF SPURIOUS RADIATION

6.1 Reference Rule and Specification

FCC Rule Part 90 [Section 90.217] and Part 2 Subpart J [Section 2.1053]

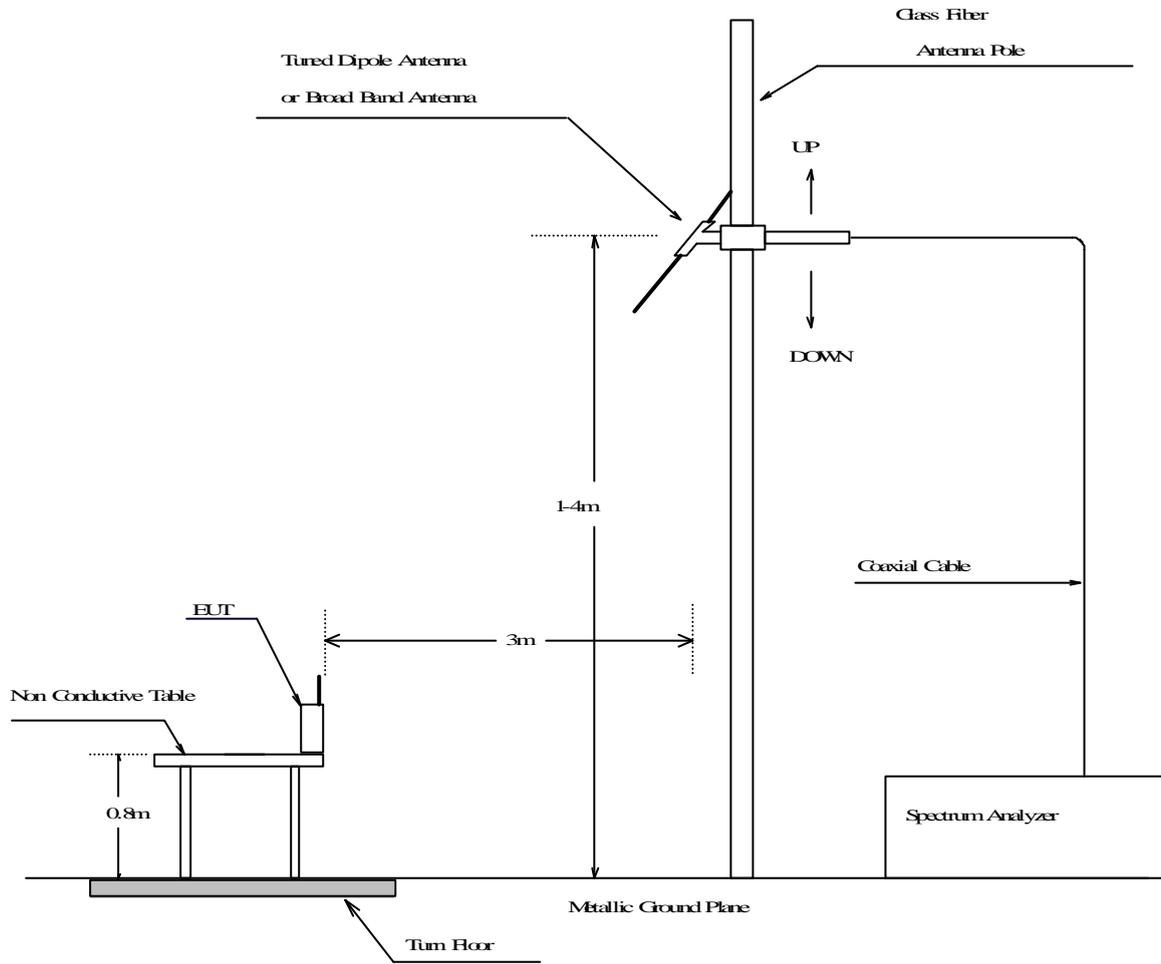
6.2 Test Procedure

- (1) Tune-up the transmitter(EUT).
- (2) Device Vertical : Place the device so that it's longest axis is vertical.
- (3) For each spurious measurement the receiving antenna is adjusted to the correct length for the frequency involved. These measurements are made from the lowest radio frequency generated in the EUT or 25MHz to the tenth harmonic of the carrier.
- (4) For each spurious frequency, raise and lower the receiving antenna to obtain a maximum reading on the spectrum analyzer with the antenna at horizontal polarity. Then the turntable is rotated to further increase this maximum reading. Repeat this procedure of raising and lower the antenna and rotating the turntable until highest possible signal has been obtain. Record this maximum reading.
- (5) Repeat Step4 for each spurious frequency with the antennae polarized vertically.
- (6) Device Horizontal : Place the device so that it's longest axis is horizontal.
- (7) Repeat Step3, Step4, and Step5
- (8) The attenuation of the spurious in dB can be calculated from the following formula:

$$\begin{array}{rcccl} \text{Spurious Emission} & & \text{Field Strength} & & \text{Field Strength} \\ \text{Attenuation} & = & \text{of Carrier Emission} & - & \text{of Spurious Emission} \\ [\text{dB}] & & [\text{dB}\mu\text{V/m}] & & [\text{dB}\mu\text{V/m}] \end{array}$$

6.3 Test Configuration

[Open Site]



6.4 Photographs of EUT System Configuration

Front View



Rear View



6.5 Test Results

Measured Frequency	Antenna Factor	Meter Reading		Maximum Field Strength	Attenuation From Carrier	Limits
		Horizontal	Vertical			
(MHz)	(dB/m)	(dBuV)	(dBuV)	(dBuV/m)	(dB)	(dB)
469.21	30.0	78.8	83.7	113.7	-	-
938.43	29.6	33.4	33.7	63.3	50.4	30.0
1407.64	23.6	30.3	30.8	54.4	59.3	30.0
1876.85	26.2	32.8	34.0	60.2	53.5	30.0
2346.06	23.5	36.9	42.6	66.1	47.6	30.0
2815.28	24.3	35.5	32.6	59.8	53.9	30.0
3284.49	24.6	32.5	39.7	64.3	49.4	30.0
3753.70	26.7	26.0	31.6	58.3	55.4	30.0
4222.91	25.4	29.0	29.9	55.3	58.4	30.0
4692.13	27.5	23.0	26.1	53.6	60.1	30.0

[Environment]

Temperature : 25°C Humidity : 59%

[Summary of Test Results]

Minimum Margin was 17.6 dB at 2346.06 MHz, vertical polarization.

Tested Date : 26 July 2000

Tester Signature

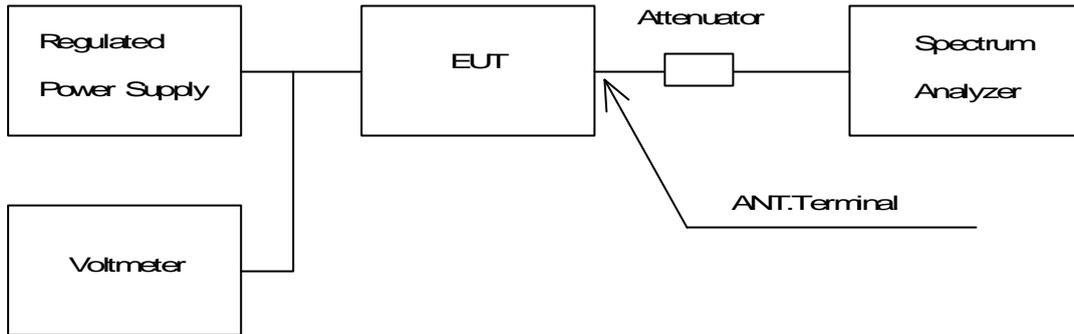
Yasunari Kawai

7. SPURIOUS EMISSION AT ANTENNA TERMINAL

7.1 Reference Rule and Specification

FCC Rule Part 90 [Section 90.217] and Part 2 Subpart J [Section 2.1046],[Section 2.1051]

7.2 Test Configuration



7.3 Test Results

[Left Side Antenna Terminal] (Right side antenna terminal is terminated by 50 ohms)

Measured Frequency	Attenuator	Meter Reading	Antenna Terminal Voltage	Attenuation From Carrier	Limits
(MHz)	(dB)	(dBm)	(dBm)	(dB)	(dB)
469.21	20.2	-6.1	14.1	-	-
938.43	20.3	-53.3	-33.0	47.1	30.0
1407.64	20.4	-67.9	-47.5	61.6	30.0
1876.85	20.4	-61.5	-41.1	55.2	30.0
2346.06	20.5	-48.8	-28.3	42.4	30.0
2815.28	20.5	-59.5	-39.0	53.1	30.0
3284.49	20.5	-54.3	-33.8	47.9	30.0
3753.70	20.5	-77.2	-56.7	70.8	30.0
4222.91	20.5	-75.7	-55.2	69.3	30.0
4692.13	20.6	-86.0	-65.4	79.5	30.0

[Environment]

Temperature : 26 °C Humidity : 60 %

[Summary of Test Results]

Above data shows that the test device complies with the requirements

Tested Date : 28 July 2000

Tester Signature

Yasunari Kawai

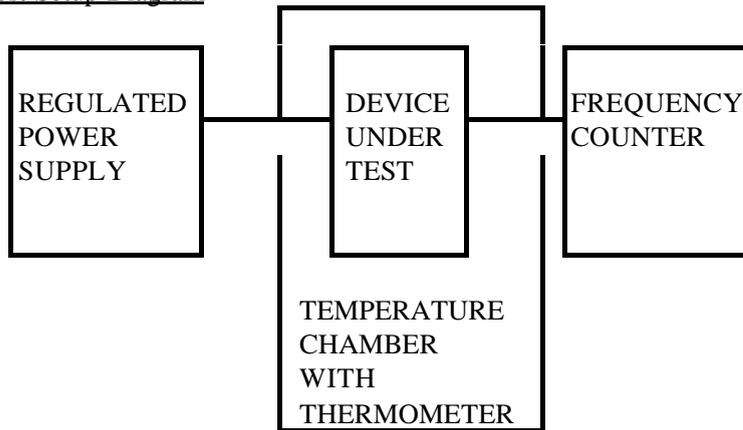
8. FREQUENCY STABILITY MEASUREMENT

8.1 Reference Rule and Specification

FCC Rule Part 90 [Section90.213] and Part 2 Subpart J [Section2.1055]

8.2 Frequency vs Temperature Test

Test Setup Diagram



Test Result

Test Voltage: 120.0V

REFERENCE FREQUENCY [MHz]	TEMPERATURE [°C]	FREQUENCY DRIFT [kHz]	LIMIT [kHz]
469.2125	-30	-1.30	±2.35 (±5ppm)
	-20	0.40	
	-10	1.32	
	0	1.51	
	+10	1.30	
	+20	0.94	
	+30	0.41	
	+40	0.42	
	+50	1.02	

8.3 Frequency vs Voltage Test

Test Setup Diagram : Same as (1)

Test Result Temperature : +20°C

REFERENCE FREQUENCY [MHz]	SUPPLIED VOLTAGE [Volt]	FREQUENCY DRIFT [kHz]	LIMIT [kHz]
<u>469.2125</u>	(+15%) 103	0.92	±2.35 (±5ppm)
	(-15%) 138	0.91	

[Environment] Temperature : 20 °C Humidity : 57 %

[Summary of Test Results]

Above data shows that the test device complies with the requirements.

Tested Date : 23 August 2000

Tester Signature _____

Yasunari Kawai

9. LIST OF TEST INSTRUMENTS

Instrument	Manufacturer	Model No	Specifications	KEC Control No.	if used, checked by "X".	Last Cal.	Next Cal.
Spectrum Analyzer	Advantest	TR4172	Frequency Range 50 Hz - 1.8 GHz	SA-27	<input checked="" type="checkbox"/>	2000/7	2001/7
Biconical Antenna	Schwarzbeck	BBA9106	Frequency Range 30 MHz - 300 MHz	AN-80	<input checked="" type="checkbox"/>	2000/2	2001/2
Log-Periodic	Schwarzbeck	UHALP 9107	Frequency Range 300 MHz - 1 GHz	AN-215	<input checked="" type="checkbox"/>	2000/2	2001/2
Tuned Dipole	Kyoritsu	KBA-511S	Frequency Range 25 MHz - 500 MHz	AN-135	<input checked="" type="checkbox"/>	2000/3	2001/3
	Kyoritsu	KBA-611S	Frequency Range 500 MHz - 1 GHz	AN-137	<input checked="" type="checkbox"/>	2000/3	2001/3
Tuned Dipole Antenna	Kyoritsu	KBA-511S	Frequency Range 25 MHz - 500 MHz	AN-134	<input checked="" type="checkbox"/>	2000/3	2001/3
Signal Generator	Anritsu	MG3601A	Frequency Range 0.1 MHz - 1040 MHz	SG-41	<input checked="" type="checkbox"/>	1999/9	2000/9
Power Amp.	ENI	601L	Frequency Range 0.8 MHz - 1 GHz	AM-24	<input checked="" type="checkbox"/>	1999/9	2000/9
RF Millivolt-Meter	Rohde & Schwarz	URV5	Frequency Range 10 kHz - 2 GHz	VV-29	<input checked="" type="checkbox"/>	2000/3	2001/3
Coaxial Cable	Suhner	SUCOFLEX 104	Length : 10m [SMA(p)-SMA(p)]	CL-46	<input checked="" type="checkbox"/>	2000/2	2001/2
Attenuator	Weinschel Engineering	2	Frequency Range 1 MHz - 20 GHz -10 dB	AT-42-1	<input checked="" type="checkbox"/>	2000/3	2001/3
Regurated DC Power Supply	Kikusui	PAB18-3A	Output 0-18V, 3A	PD-32	<input checked="" type="checkbox"/>	-	-
Temperature Chamber With Thermometer	Tabai Mfg.	MC-710	Temperature Range -75 - +100 °C	CH-31	<input checked="" type="checkbox"/>	-	-
Frequency Counter	Advantest	TR5823H	Freq.Range 1 mHz-1300 MHz	CU-17	<input checked="" type="checkbox"/>	2000/5	2001/5
Spectrum Analyzer	Advantest	TR4172	Frequency Range 50 Hz - 1.8 GHz	SA-27	<input checked="" type="checkbox"/>	2000/7	2001/7
Digital Ploterr	Hewlett Packard	7090A	Plot Area A3 size	RE-17	<input checked="" type="checkbox"/>	-	-
Multimeter	John Fluke	37	Volt Range 0.1mV - 1000 V Ampere Range 0.01 mA - 20 A	MM-91	<input checked="" type="checkbox"/>	2000/2	2001/3
Personal Computer	Hewlett Packard	9121	Memory 512kB Language BASIC	PC-38-2	<input checked="" type="checkbox"/>	-	-
Digital Oscilloscope	Matsushita Communication Ind.	VP-5740A	Frequency Range DC -10 MHz	OS-22	<input checked="" type="checkbox"/>	2000/5	2001/5

Instrument	Manufacturer	Model No	Specifications	KEC Control No.	if used, checked by "X".	Last Cal.	Next Cal.
Power Amp.	ENI	60IL	Freq. Range: 800KHz to 1000MHz Gain:37dB (Max 1.2W)	AM-24	<input checked="" type="checkbox"/>	2000/6	2001/6
Signal Generator	Anritsu	MG3601A	Freq. Range: 100KHz to 1.04GHz Output: -133 to + 13dBm	SG-41	<input checked="" type="checkbox"/>	1999/9	2000/9
Synthesized Level Generator	Anritsu Electric	MG442A	Freq. Range: 10Hz to 20MHz	MG-36	<input checked="" type="checkbox"/>	1999/12	2000/12
FM Linear Detector	Anritsu Electric	MS61A	Freq. Range: 20 to 1000MHz Deviation: 0.05 to 300KHz	MM-54	<input checked="" type="checkbox"/>	2000/5	2001/5
Variable Attenuator	Anritsu	MN510C	Freq. Range: DC to 500MHz Attenuation: 0 to 91dB (50 ohms)	SG-30-2	<input checked="" type="checkbox"/>	1999/9	2000/9
AC Voltmeter	Matsushita Communication	VP-9631A	Freq. Range: 10Hz to 1MHz Level:300 μ V to 300V	VV-19	<input checked="" type="checkbox"/>	2000/6	2001/6
	Matsushita Communication	VP-9690A	Freq. Range: 10Hz to 500KHz Level:300 μ V to 300V	VV-20	<input checked="" type="checkbox"/>	2000/6	2001/6
Personal Computer	Hewlett Packard	9816S	Memory : 512kB Language : BASIC	MM-63	<input checked="" type="checkbox"/>	-	-
Measurement Plotting System	Hewlett Packard	7090A	Plot Area A4 size	RE-17	<input checked="" type="checkbox"/>	-	-