平成16年2月20日

三和電子機器株式会社 御中

〒630-0101 奈良県生駒市高山町12128
社団法人 関西電子工業振興センター
生駒試験所

試験成績について

下記の通り試験結果を御報告申し上げます。

記

1. 受付番号 : A-003-04-C

2. 供試装置 : Transmitter for radio control model

商 標 名 : AIRTRONICS
型式番号 : 93675

3. 適用規格 : FCC Rules and Regulations Part 95 and Part 2

4. 試験結果 : 添付 TEST REPORTの通り

5. その他 :

本紙とTEST REPORTの総ページ数は 18 です。

担当 峯松 育弥

承認 計測技術部長 泉 誠一

KANSAI ELECTRONIC INDUSTRY DEVELOPMENT CENTER

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

KEC

Corporate Juridical Person

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

TEST REPORT

Report No.A-003-04-C Date: 20 February 2004

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

FCC Rules and Regulations Part 95 : Radio Control (R/C) Radio Service.

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 : SANWA ELECTRONIC INSTRUMENT CO., LTD.

Mailing Address : 1-2-50, YOSHIDA, HONMACHI, HIGASHIOSAKA-CITY, OSAKA, 578-0982 JAPAN

2. Identification of Tested Device

Type of Device : Radio Control (R/C) Transmitter
Kind of Equipment Authorization : ☐: DoC ☒: Certification ☐: Verification
FCC ID : AXYATX035
Device Name : Transmitter for radio control model
Trade Name : AIRTRONICS
Model Number : 93675
Serial Number : 20040209 ☒: Production ☐: Pre-production ☐: Prototype
Date of Manufacture : January 2004

3. Test Items and Procedure

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

Above all tests were performed under: FCC Part 2 Sec2.1046, Sec2..1047, Sec2.1049, 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 :10 February 2004
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 : 16 February 2004

S. Izumi

Seiichi Izumi
General Manager of Ikoma Testing Laboratory

Table of Contents

1. GENERAL INFORMATION

1.1. Product Description

The AIRTRONICS Model No. 93675 (referred to as EUT in this report) is the Transmitter for radio control model (Car).

(1) Technical Specifications

- TX Frequency : 75.410 ~ 75.990 MHz (EUT in 75.690MHz)
- Modulation : PPM / FM
- Power Output : 300mW
- Current Drain : 200mA
- Power source : Nicel Cadmium Battery
  Output DC 9.6V

(2) Used Oscillating Frequency

- 8.00MHz : XTAL (PLL IC)

(3) Provided Terminals

- DC IN Connector : for DC power source IN
- Charging Jack : for battery charging

1.2. Description for Equipment Authorization

(1) Rules Part (s) under which Equipment operated : FCC Rule Part 95 ; Radio Control (R/C) Radio Service		
(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
Anechoic Chamber No.1

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

This test facility has been filed in FCC under the criteria in ANSI C63.4-2001.
The laboratory has been accredited by the NVLAP (Lab.Code:200207-0) based on ISO/IEC17025.

2. TESTED SYSTEM

2.1. Test Mode

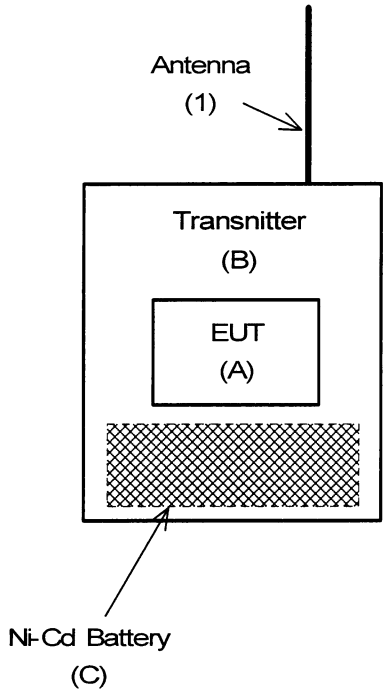
The compliance tests were performed under the following operation mode.

(1) Measurement of Field Strength of Spurious Radiation :
The EUT was continuously transmitted in modulation mode.

(2) Frequency Stability Measurement :
The EUT was continuously transmitted in 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 Antenna.

2.3. List of EUT System

No	Device Name	Model Number (Serial Number)	FCC ID (Trade Name)	Note	Remark
A	Transmitter for radio control model	93675 (20040209)	AXYATX035 (AIRTRONICS)		(1)
B	Transmitter	M8 (-)	N/A (AIRTRONICS)		
C	Ni-Cd Battery	109A20701A (-)	N/A (-)		

[Remark]
(1) : EUT

2.4. List of Antenna

No	Type	Length (m)	Note	Remark
1	Built-in Rod Antenna	0.78		

3. RF OUTPUT POWER AND RADIATED SPURIOUS EMISSIONS

3.1. Reference Rule and Specification

FCC Rule Part 95 [Section 95.635] and Part 2 Subpart J [Section 2.1053]

3.2. Test Procedure

(1) Place the transmitter to be tested (EUT) on the turntable.

(2) Measurements shall be made from the lowest radio frequency generated in the equ ipment to the tenth harmonic of the carrier.

(3) For each spurious frequency, raise and lower the test antenna from 1m to 4m to obtain a maximum reading on the spectrum analyzer with the test antenna at horizontal polarity. Then the turntable should be rotated 360° to determine the maximum reading. Repeat this procedure to obtain the highest possible reading. Record this maximum reading.

(4) Repeat step (3) for each spurious frequency with the test antenna polarized vertically.

(5) Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. At the lower frequencies, where the substitution antenna is very long, this will be impossible to achieve when the antenna is polarized vertically. In such case the lower end of the antenna should be 0.3m above the ground.

(6) Feed the substitution antenna at the transmitter end with a signal ge nerator 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 a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.

(7) Repeat step (6) with both antennas vertically polarized for each spurious frequency.

(8) Calculate power in dBm into a reference ideal half -wave dipole antenna by reducing the readings obtained in steps (6) and (7) by the power loss in the cable between the generator and the antenna and further corrected for the gain of the substitution antenna used relative to an ideal half -wave dipole antenna.

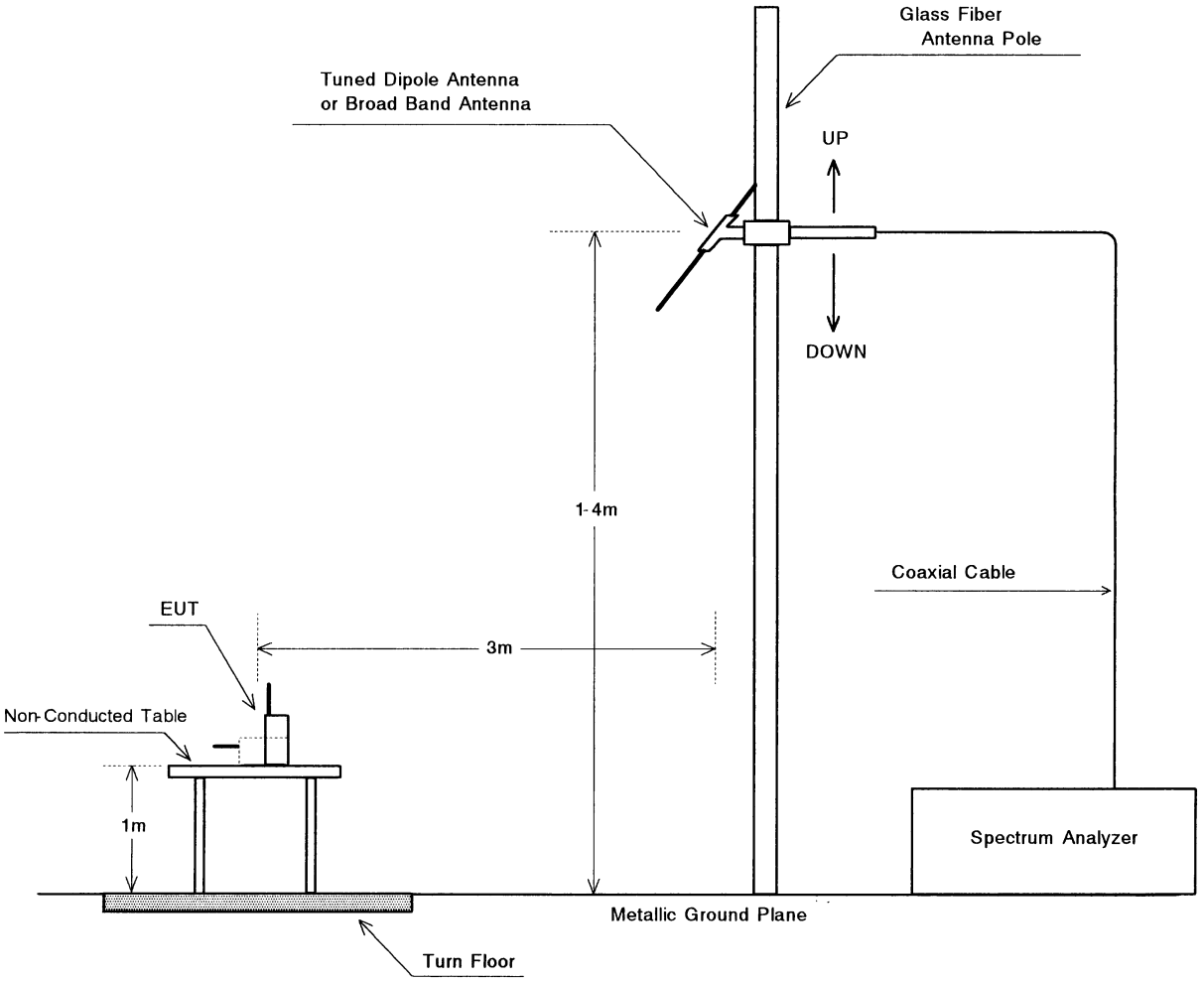
(9) The levels record in step (8) are the absolute levels of radiated spurious emissions in dBm. The radiated spurious emissions in dB can be calculated by the following:

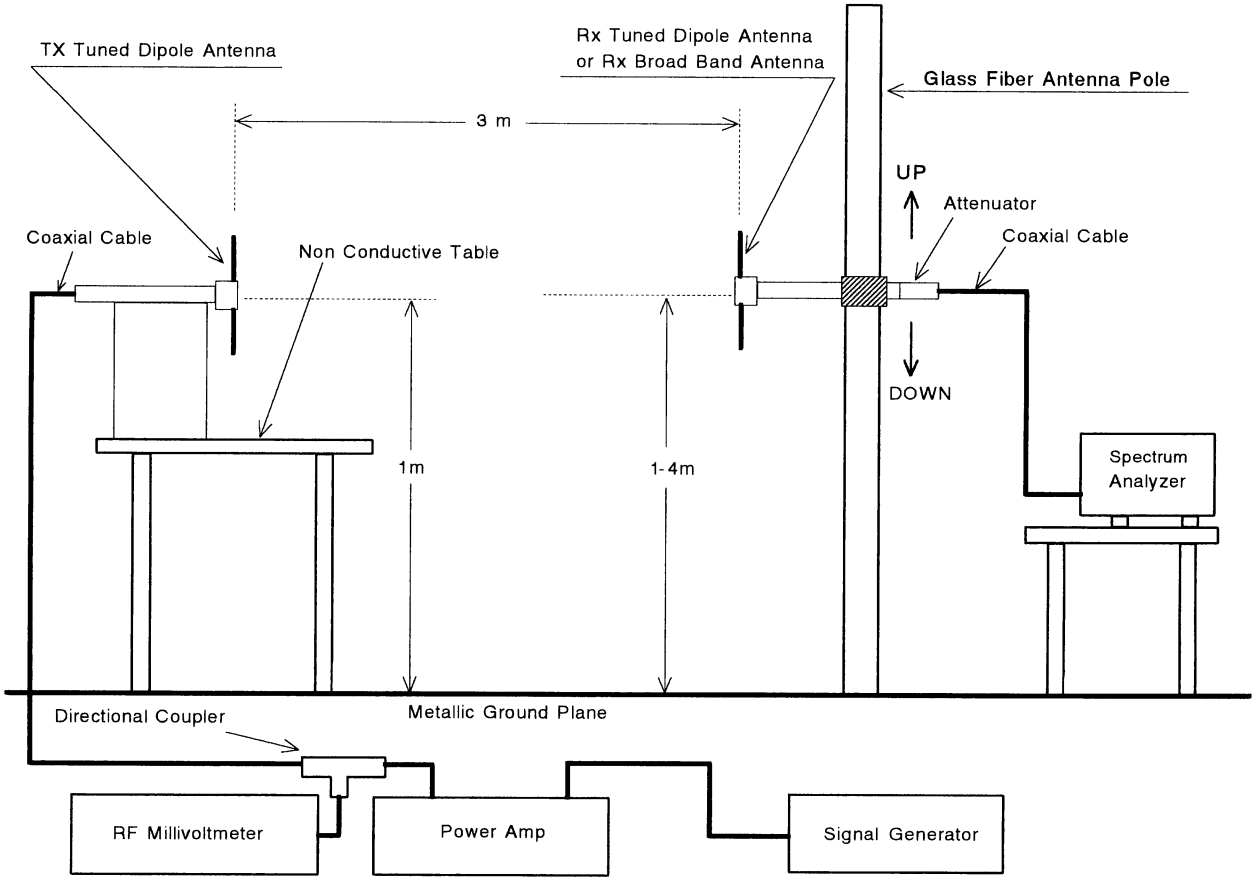
Radiated spurious emissions (dB) =

$$10 \log_{10} \left[\frac{\text{TX power in watts}}{0.001} \right] - \text{the levels in step (8)}$$

Note : It is permissible to use other antennas provided they can be referenced to a dipole.

3.3. Test Configuration

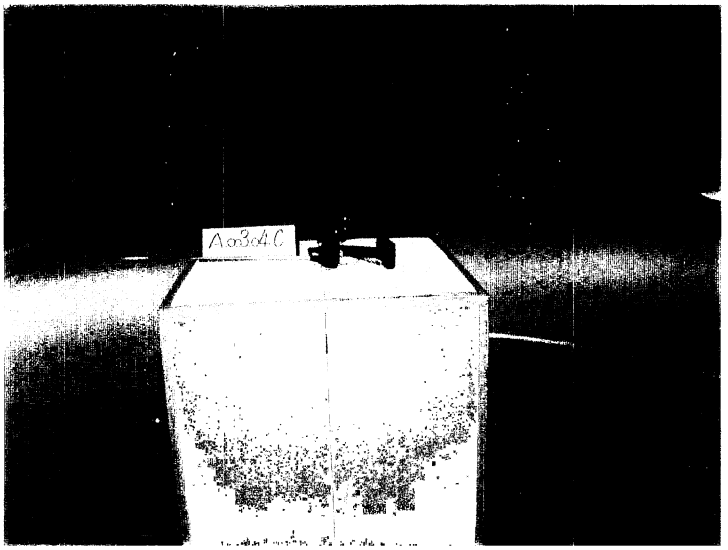



TX Tuned Dipole Antenna
Rx Tuned Dipole Antenna
or Rx Broad Band Antenna
Glass Fiber Antenna Pole
3 m
UP
Attenuator
Coaxial Cable
Coaxial Cable
Non Conductive Table
DOWN
Spectrum
Analyzer
1m
1-4m
Directional Coupler
Metallic Ground Plane
RF Millivoltmeter
Power Amp
Signal Generator

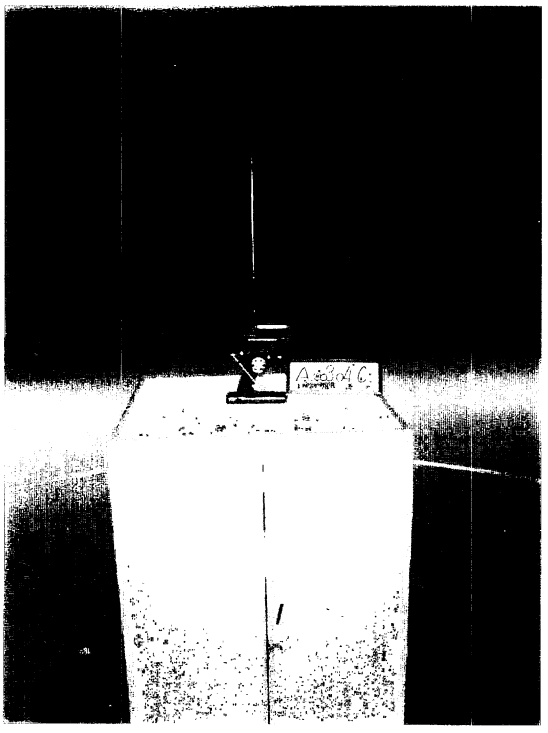
3.4. Photographs of EUT System Configuration

(1) EUT

Horizontal Placing



Vertical Placing



3.5. Test Results

Carrier Frequency [MHz]	Power Meter Reading Horizontal Polarization [dBm]	Power Meter Reading Vertical Polarization [dBm]	Correction Factor (*) [dB]	ERP [dBm]	RF Output Power [mW]	Limit [mW]
75.69	-2.0	-1.2	12.4	11.2	13.2	750.0

Spurious Emission Frequency [MHz]	Power Meter Reading Horizontal Polarization [dBm]	Power Meter Reading Vertical Polarization [dBm]	Correction Factor (*) [dB]	ERP [dBm]	Separation From Carrier [dBc]	Limit of ERP [dBc]	Margin for Limits [dB]
151.38	-30.8	-29.3	-4.8	-34.1	-45.3	-37.2	8.1
227.07	-34.2	-33.5	-5.3	-38.8	-50.0	-37.2	12.8
302.76	-27.0	-35.2	-5.6	-32.6	-43.8	-37.2	6.6
378.45	-42.2	-42.7	-5.9	-48.1	-59.3	-37.2	22.1
454.14	-39.7	-43.6	-6.0	-45.7	-56.9	-37.2	19.7
529.83	-34.1	-35.1	-6.1	-40.2	-51.4	-37.2	14.2
605.52	-29.6	-27.6	-6.6	-34.2	-45.4	-37.2	8.2
681.21	-26.9	-31.5	-6.7	-33.6	-44.8	-37.2	7.6
756.90	-27.7	-29.9	-7.0	-34.7	-45.9	-37.2	8.7

[Note]

(1) Limit of ERP in dBc:

-56 - 10Log (Power) = -56 - 10Log (0.0132) = -37.2dB

(2) (*) : Convection factor is included both of a coupling factor, cable loss and attenuator loss.

[Environment]

Temperature : 14℃ Humidity : 45%

[Summary of Test Results]

Minimum Margin was 6.6 dB at 302.76 MHz, vertical polarization.

Tested Date : 11 February 2004 Tester Signature

Ikuya Minematsu

4. MODULATION CHARACTERISTICS

4.1. Reference Rule and Specification

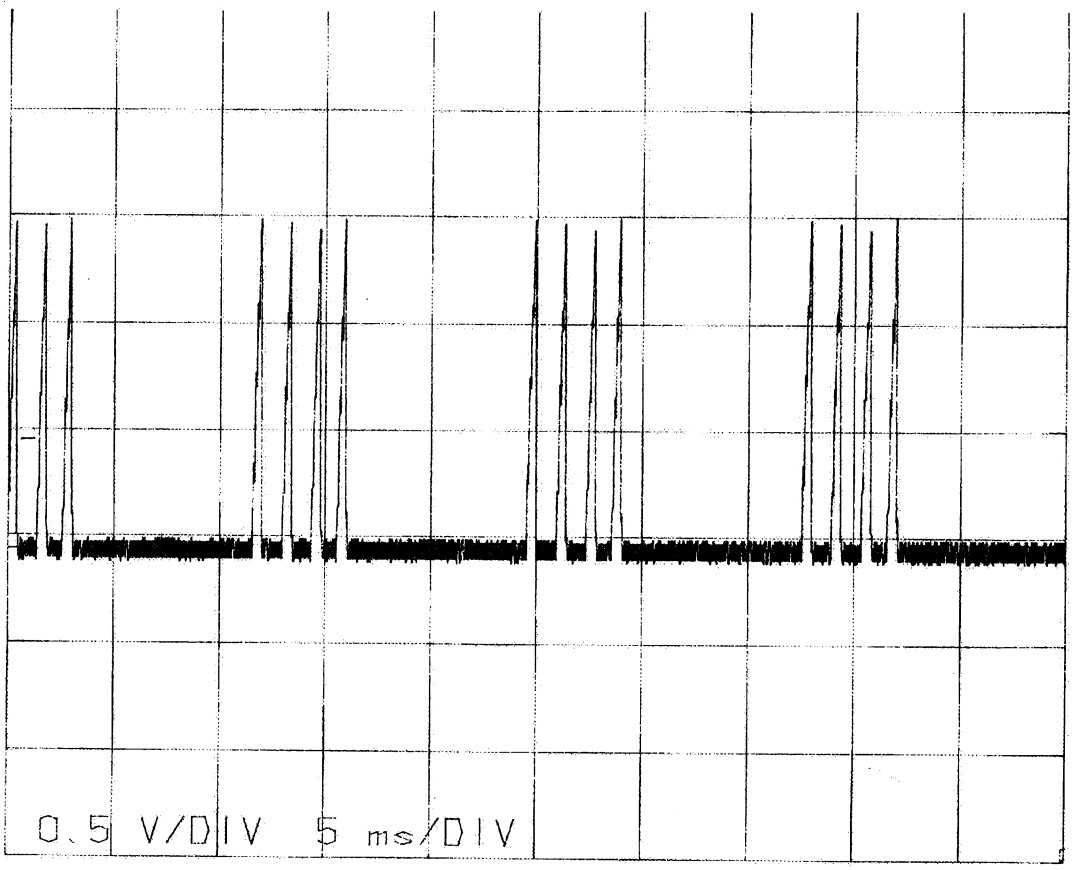
FCC Rule Part 2 Subpart J [Section2.1047]

4.2. Test Results

Encoded Waveform

(1) Operation Mode of EUT

Modulation type (F1D)

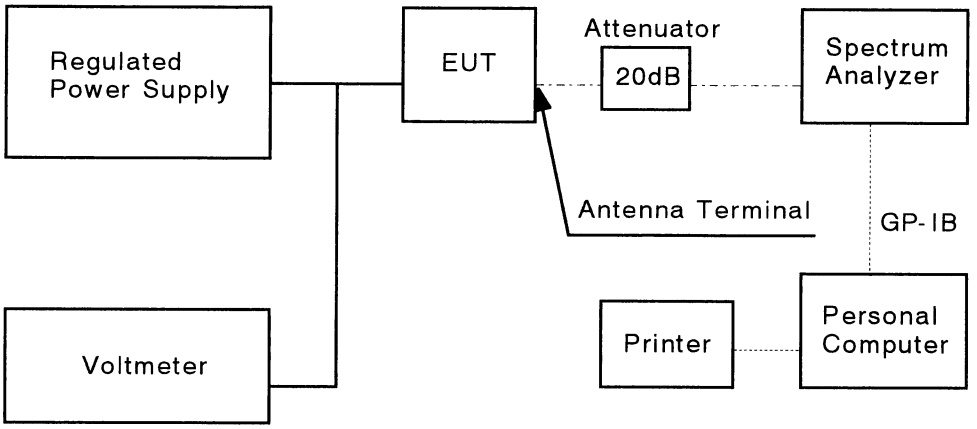


5. EMISSION BANDWIDTH

5.1. Reference Rule and Specification

FCC Rule Part 95 [Section95.633], [Section95.635] and Part 2 Subpart J [Section2.1049]

5.2. Test Configuration



5.3. Test Results

See next figure (the picture of spectrum analyzer)

Occupied Bandwidth

I have measured the OBW by the spectrum analyzer R3261B which could measure 99% occupied bandwidth (OBW).
There are 701 data on horizontal axis of display.
One of them is Vn. Then total power P can be calculated from the following formula.

$$P = \sum_{n=1}^{701} \frac{Vn^2}{R} \qquad \text{..... (1)}$$

where, R is input impedance of R 3261B.

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.

$$0.005P = \sum_{n=1}^{x} \frac{Vn^2}{R} \qquad \text{..... (2)}$$

$$0.995P = \sum_{n=1}^{y} \frac{Vn^2}{R} \qquad \text{..... (3)}$$

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

$$OBW = \frac{Fspan \times (Y - X)}{700}$$

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

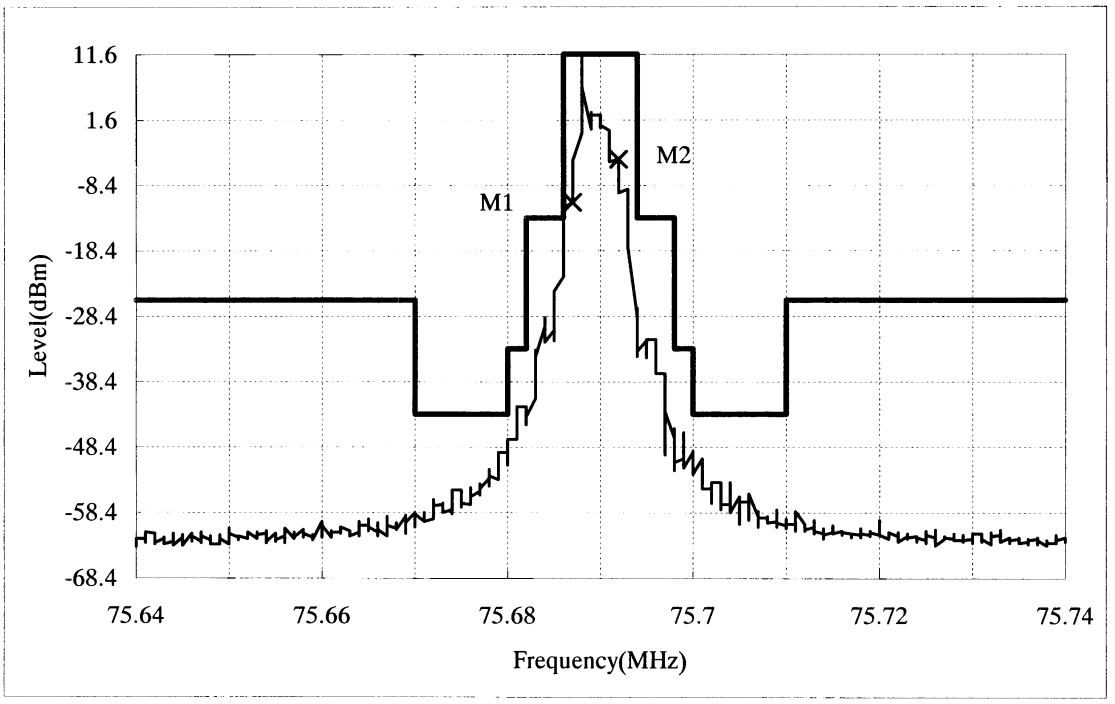
Operation Mode of EUT

Modulation

Trace mode of Spectrum Analyzer : Maximum Hold

Ref Level	Start Frequency	Stop Frequency	Center Frequency	RBW	VBW
(dBm)	(MHz)	(MHz)	(MHz)	(kHz)	(kHz)
11.60	75.64	75.74	75.69	0.30	1000.00

M1/M2 Point	Level	Occupied Bandwith	Authorized Bandwith
(MHz)	(dBm)	(kHz)	(kHz)
75.68700	-11.0	5.00	8.00
75.69200	-4.4		



[Environment]

Temperature : 22℃ Humidity : 46%

[Summary of Test Results]

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

Tested Date : 16 February 2004 Tester Signature

Ikuya Minematsu

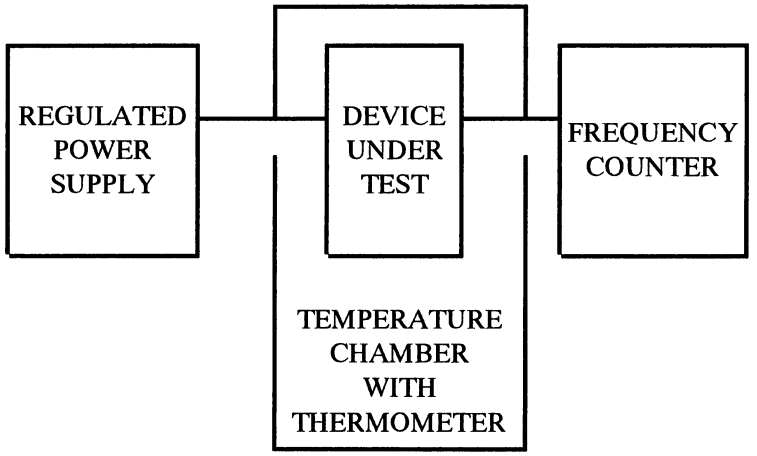
6. FREQUENCY STABILITY MEASUREMENT

6.1. Reference Rule and Specification

FCC Rule Part 95 [Section95.623] and Part 2 Subpart J [Section2.1055]

6.2. Frequency vs Temperature Test

Test Setup Diagram



Test Result Test Voltage: 10.0V

REFERENCE FREQUENCY [MHz]	TEMPERATURE [°C]	FREQUENCY DRIFT [%]	LIMIT [%]
75.69	-30	-0.001454	±0.002
	-20	-0.001292	
	-10	-0.001353	
	0	-0.001469	
	+10	-0.001560	
	+20	-0.001638	
	+30	-0.001626	
	+40	-0.001452	
	+50	-0.001108	

6.3. Frequency vs Voltage Test

Test Setup Diagram : Same as (1)

Test Result Temperature : +20 °C

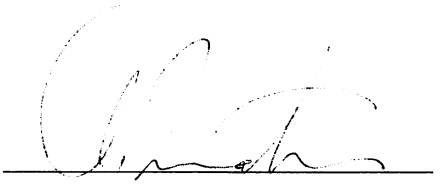
REFERENCE FREQUENCY [MHz]	SUPPLIED VOLTAGE [Volt]	FREQUENCY DRIFT [%]	LIMIT [%]
FREQUENCY	9.0	-0.001366	±0.002

[Note]
Reduced primary supply voltage to the operating and point which shall be specified by the manufacturer.

[Environment]
Temperature : 22°C Humidity : 56%

[Summary of Test Results]
Above data shows that the test device complies with the requirements.

Tested Date : 13 February 2004 Tester Signature



Ikuya Minematsu

7. USED TEST EQUIPMENTS AND CALIBRATION STATUS

Equipment	Manufacturer	Model No	Specifications	KEC Control No.	if used, checked by "×".	Last Cal.	Next Cal.
Spectrum Analyzer	Rohde & Schwarz	FSA	Frequency Range 100 Hz - 1.8 GHz	SA-35	☒	2003/4	2004/4
Biconical Antenna	Schwarzbeck	BBA9106	Frequency Range 30 MHz - 300 MHz	AN-219	☒	2003/2	2004/2
Log-Periodic	Schwarzbeck	UHAL9108A	Frequency Range 300 MHz - 1 GHz	AN-216	☒	2003/2	2004/2
Tuned Dipole Antenna (Tx)	Kyoritsu	KBA-511AS	Frequency Range 25 MHz - 500 MHz	AN-132	☒	2003/2	2005/2
	Kyoritsu	KBA-611S	Frequency Range 500 MHz - 1 GHz	AN-115	☒	2003/2	2005/2
Signal Generator	Hewlett Packard	8662A	Frequency Range 10 kHz - 1280 MHz	SG-49	☒	2003/4	2004/4
Power Amp.	ENI	601L	Frequency Range 0.8 MHz - 1 GHz	AM-24	☒	2003/6	2004/6
RF Millivolt-Meter	Rohde & Schwarz	URV5	Frequency Range 10 kHz - 2 GHz	VV-29	☒	2003/3	2004/3
Coaxial Cable	Suhner	SUCOFLEX 104	Length : 10m [SMA(p) - SMA(p)]	CL-45	☒	2003/2	2004/2
Attenuator	Anritsu	M22665	Frequency Range 1 MHz - 20 GHz -10 dB	AT-44-3	☒	2003/2	2004/2
	Anritsu	M45665	Frequency Range 1 MHz∨ - 20GHz -20 dB	AT-44-4	☐	2003/2	2004/2
Regurated DC Power Supply	Kikusui	PAB18-3A	Output 0 - 18V, 3A	PD-32	☒	–	–
Temperature Chamber With Thermometer	Tabai Mfg.	MC-710	Temperature Range -75 - +100 °C	CH-31	☒	–	–
Frequency Counter	Advantest	TR5823H	Freq.Range 1 mHz - 1300 MHz	CU-17	☒	2003/5	2004/5
Multimeter	John Fluke	37	Volt Range 0.1mV - 1000 V Ampere Range 0.01 mA - 20 A	MM-91	☒	2003/2	2004/2
Digital Oscilloscope	Matsushita Communication Ind.	VP-5740A	Frequency Range DC - 10 MHz	OS-22	☒	2003/5	2004/5
Directional Coupler	Hewlett Packard	86205A	Frequency Range 300 kHz – 6 GHz	AX-55	☒	2003/8	2004/8