

Designated by Ministry of international Trade and industry

**KANSAI ELECTRONIC INDUSTRY DEVELOPMENT CENTER**

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

Corporate Juridical Person

**TEST REPORT**Report No.A-039-99-C

Date: 27 December 1999

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 HONMACHI YOSHIDA HIGASHIOSAKA CITY 578-0982 JAPAN

**2. Identification of Tested Device**

Type of Device : Radio Control (R/C) Radio Service.

Kind of Equipment Authorization : ☐: DoC ☒: Certification ☐: Verification

FCC ID : AXYATX031

Device Name : RC-TRANSMITTER

Trade Name : AIRTRONICS

Model Number : BLAZER

Serial Number : ES01-22 ☒: Prototype ☐: Pre-production ☐: Production

Date of Manufacture : October, 1999

**3. Test Items and Procedure**☒: Measurement of RF Power Output (Substitution Method)☒: Modulation Characteristics☒: Necessary Bandwidth☒: Emission Bandwidth☒: Measurement of 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 : 24 November 1999

Test Completed on : 20 December 1999

Eizo Hariya  
General Manager of Ikoma Testing Laboratory

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## 1. GENERAL INFORMATION

### 1.1 Product Description

The Model No.BLAZER(referred as EUT in this report) is the radio control(R/C) transmitter.

#### (1) Technical Specifications

Transmitting Frequency : 75.41~75.99MHz(75.91 MHz in EUT)  
Designation of Emission : 6K25A1D

#### (2) Contained Oscillator

OVER-TONE : 37.955 MHz

#### (3) Rated Power Supply : DC 12.0 V (Ni-Cd battery)

### 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  
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 modulation mode.

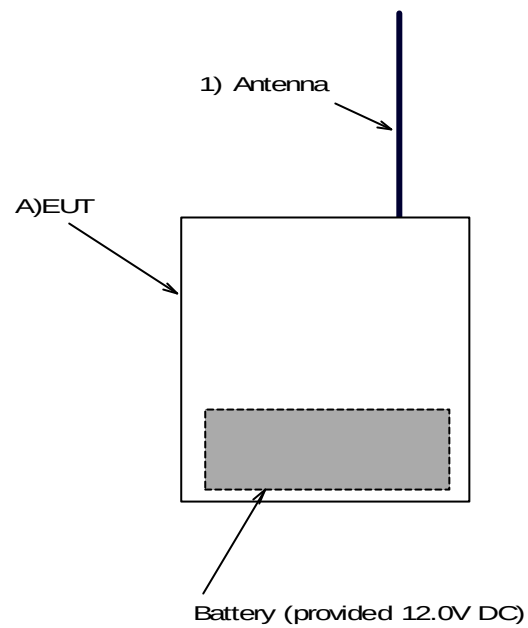
(2) Frequency Stability Measurement :

The EUT was continuously transmitted in the following 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 Antenna.

## 2.3 List of EUT System

| No | Device Name        | Model Number<br>(Serial Number) | FCC ID<br>(Trade Name)    | Note                  | Remark |
|----|--------------------|---------------------------------|---------------------------|-----------------------|--------|
| A  | RC-<br>Transmitter | BLAZER<br>(ES01-22)             | AXYATX031<br>(AIRTRONICS) | Battery : Ni-Cd 12.0V | 1)     |

[ Remark ]

(1) : EUT

## 2.4 List of Antenna

| No | Type                 | Length<br>( m ) | Note | Remark |
|----|----------------------|-----------------|------|--------|
| 1  | Built-in Rod Antenna | 0.80            |      | 1)     |

[ Remark ]

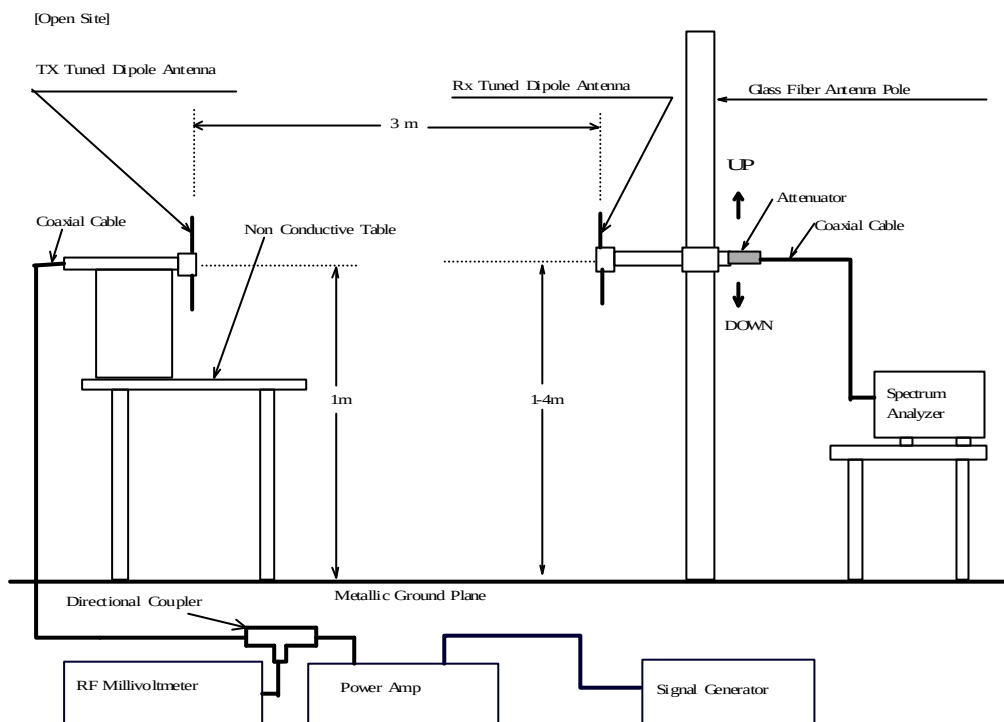
(1) : Accessory of EUT

### 3. RF POWER OUTPUT

#### 3.1 Reference Rule and Specification

FCC Rule Part 95 [Section95.639 ] and Part 2 Subpart J][Section2.1046]

#### 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<br>FREQUENCY<br>[MHz] | SPECTRUM<br>ANALYZER<br>READING<br>[dBμV] |       | RF METER<br>READING<br>[dBm] |       | CABLE<br>LOSS<br>[dB] | RF<br>OUTPUT<br>POWER<br>[mW] | LIMIT<br>[mW] |
|-------------------------------|-------------------------------------------|-------|------------------------------|-------|-----------------------|-------------------------------|---------------|
|                               | Horiz.                                    | Vert. | Horiz.                       | Vert. |                       |                               |               |
| 75.91                         | 109.7                                     | 106.4 | 20.5                         | 19.2  | 0.6                   | 97.7                          | 750           |

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 : 17 °C    Humidity : 48 %

[ Summary of Test Results ]

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

Minimum margin was 8.9 dB, horizontal polarization.

Tested Date : 14 December 1999

Tester Signature

Yasunari Kawai

#### 4. MODULATION CHARACTERISTICS

##### 4.1 Reference Rule and Specification

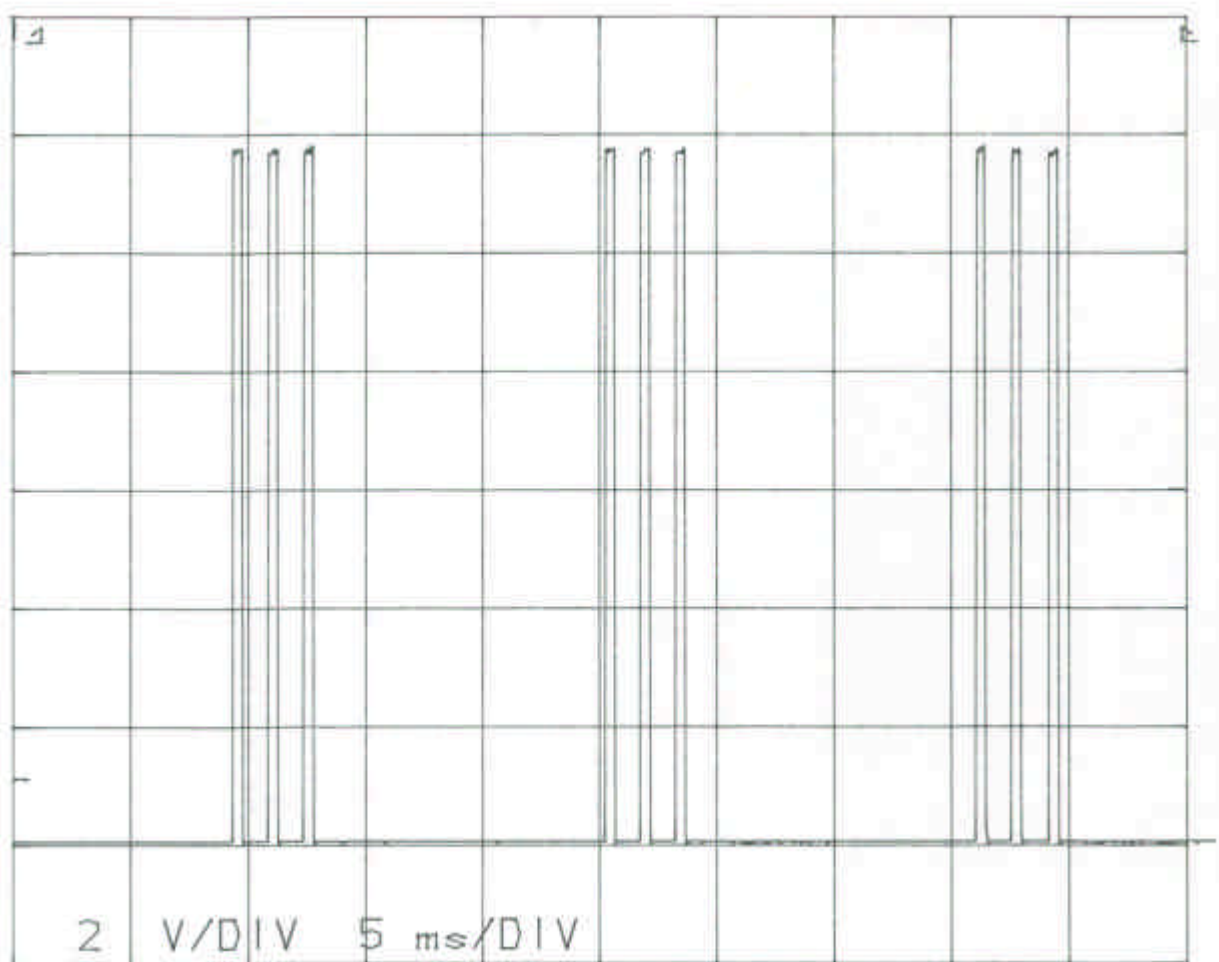
FCC Rule Part 2 Subpart J [Section2.1047]

##### 4.2 Test Results

Encoded Waveform

(1) Operation Mode of EUT

Normal Modulation

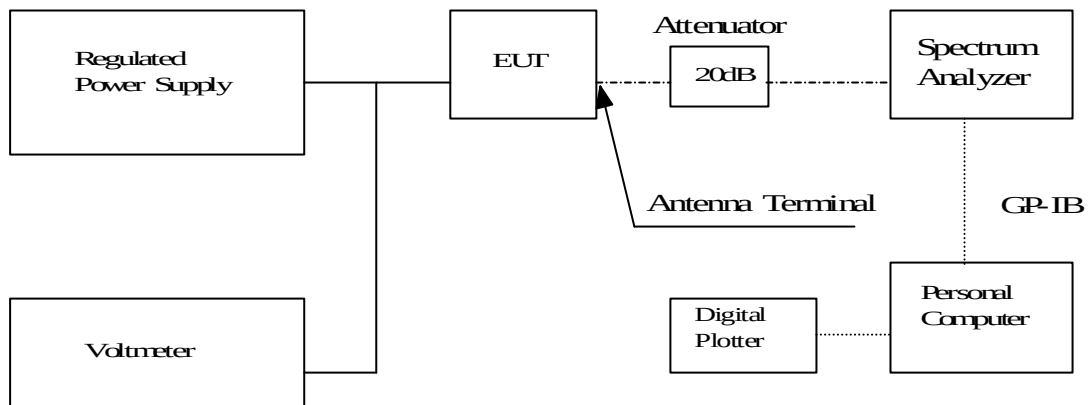


## 5. EMISSION BANDWIDTH

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

There are 1001 data on horizontal axe of display.

One of them is  $V_n$ . Then all power  $P$  becomes following formula.

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

where,  $R$  is input impedance of TR4172.

If, at number  $X$  points from the left edge of display, sum of power becomes 0.5% of  $P$  and at number  $Y$  points, sum of power become 99.5% of  $P$ ,

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

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

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

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

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

## Operation Mode of EUT

Normal modulation

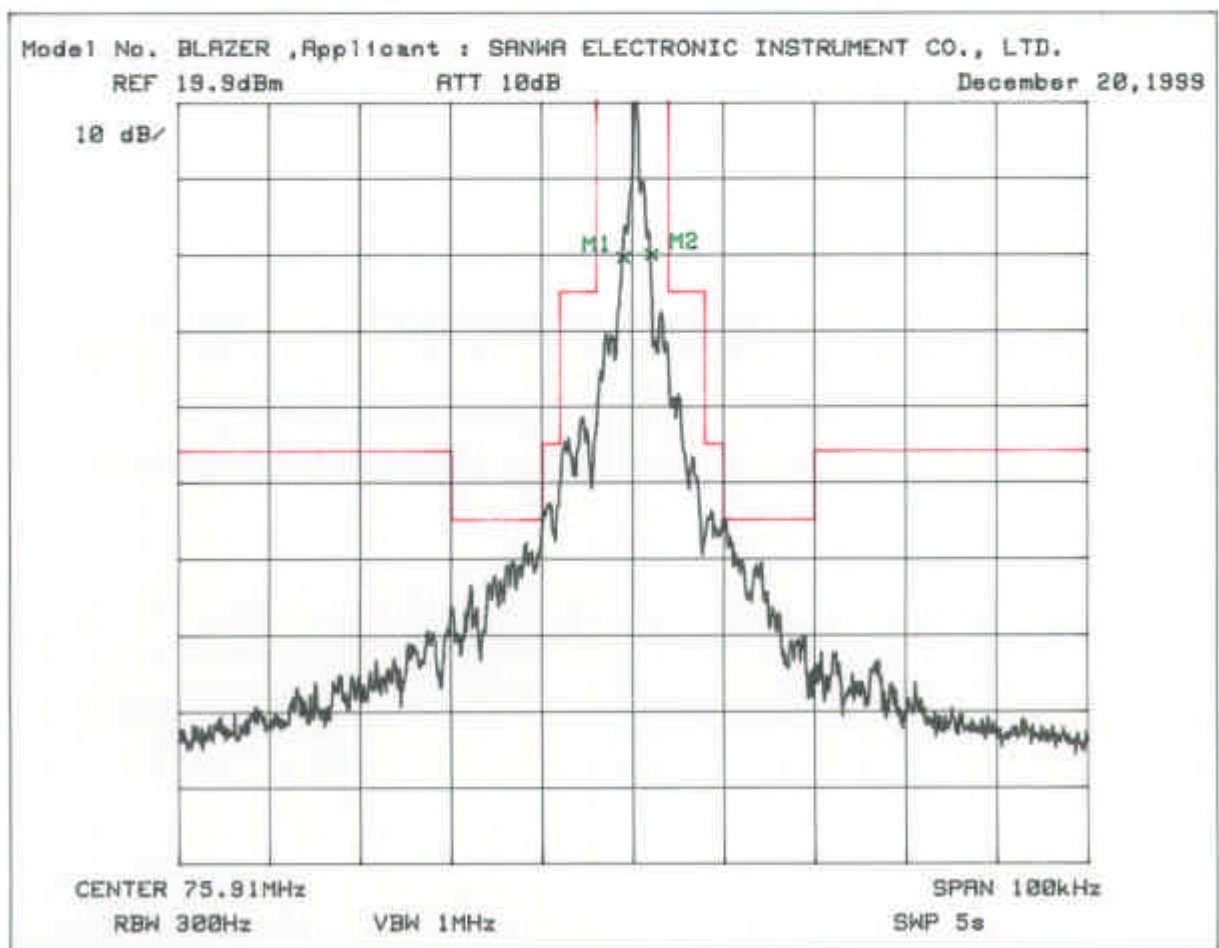
EUT was operated the various positions of JOY STICK & OTHER SWITCHES. (Reference level is the unmodulated level.)

Trace mode of Spectrum Analyzer : Maximum Hold

Occupied Bandwidth = 3.1kHz (99% Power)

M1=75.909MHz (0.5% Power Point)

M2=75.9121MHz (99.5% Power Point)



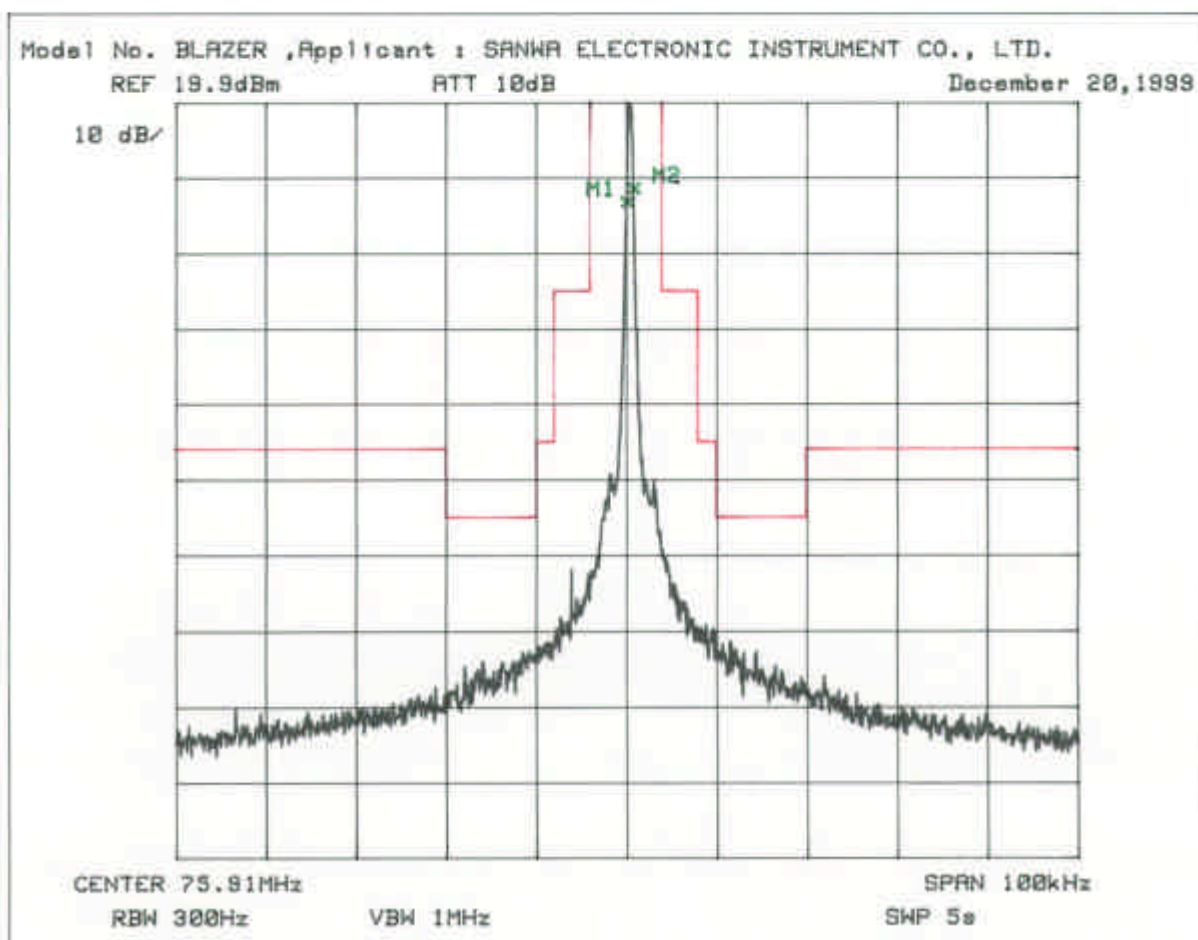
## Operation Mode of EUT

Non modulation

Occupied Bandwidth = .8kHz (99% Power)

M1=75.9101MHz(0.5% Power Point)

M2=75.9109MHz(99.5% Power Point)



## 6. FIELD STRENGTH OF SPURIOUS RADIATION

### 6.1 Reference Rule and Specification

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

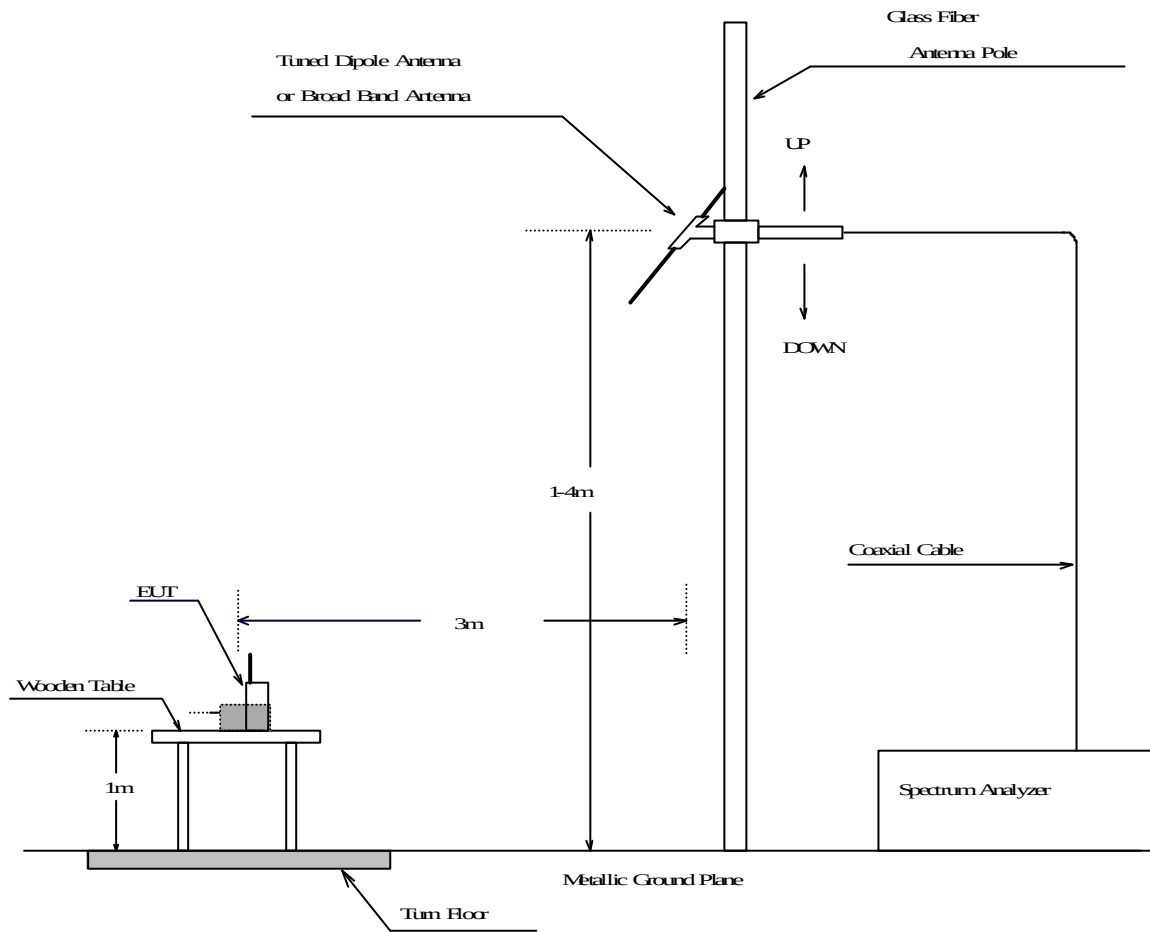
### 6.2 Test Procedure

- (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:

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

### 6.3 Test Configuration

[ Open Site ]





#### 6.4 Photographs of EUT System Configuration

##### Horizontal Placing



Vertical Placing



## 6.5 Test Results

| EMISSION<br>FREQUENCY    | METER<br>READING<br>at 3m [dBμV] |       | ANTENNA<br>FACTOR | MAXIMUM<br>FIELD<br>STRENGTH | ATTENUATION<br>FROM CARRIER | LIMIT |
|--------------------------|----------------------------------|-------|-------------------|------------------------------|-----------------------------|-------|
| [MHz]                    | Horiz.                           | Vert. | [dB]              | [dBμV/m]                     | [dB]                        | [dB]  |
| <u>Carrier Emission</u>  |                                  |       |                   |                              |                             |       |
| 75.91                    | 109.7                            | 106.4 | 7.8               | 117.5                        | -                           | -     |
| <u>Spurious Emission</u> |                                  |       |                   |                              |                             |       |
| 113.87                   | 27.1                             | 23.3  | 13.9              | 51.0                         | 66.5                        | 45.9  |
| 151.82                   | 39.6                             | 30.4  | 27.2              | 66.8                         | 50.7                        | 45.9  |
| 189.78                   | 26.7                             | <20.0 | 28.8              | 55.5                         | 62.0                        | 45.9  |
| 227.73                   | 22.9                             | <20.0 | 29.7              | 52.6                         | 64.9                        | 45.9  |
| 265.69                   | <20.0                            | <20.0 | 31.2              | <51.2                        | >66.3                       | 45.9  |
| 303.64                   | 36.7                             | 30.6  | 17.6              | 54.3                         | 63.2                        | 45.9  |
| 341.60                   | 31.1                             | 28.7  | 18.6              | 49.7                         | 67.8                        | 45.9  |
| 379.55                   | 27.0                             | 23.7  | 19.5              | 46.5                         | 71.0                        | 45.9  |
| 417.51                   | 36.3                             | 33.6  | 20.5              | 56.8                         | 60.7                        | 45.9  |
| 455.46                   | 30.1                             | 26.1  | 21.5              | 51.6                         | 65.9                        | 45.9  |
| 493.42                   | 35.5                             | 29.0  | 22.4              | 57.9                         | 59.6                        | 45.9  |
| 531.37                   | 32.1                             | 25.1  | 23.2              | 55.3                         | 62.2                        | 45.9  |
| 569.33                   | 28.5                             | 24.7  | 24.0              | 52.5                         | 65.0                        | 45.9  |
| 607.28                   | 30.2                             | 23.7  | 24.7              | 54.9                         | 62.6                        | 45.9  |
| 645.24                   | 29.7                             | 25.0  | 25.2              | 54.9                         | 62.6                        | 45.9  |
| 683.19                   | 30.0                             | 22.3  | 25.7              | 55.7                         | 61.8                        | 45.9  |
| 759.10                   | <20.0                            | <20.0 | 27.0              | <47.0                        | >70.5                       | 45.9  |

[ Note ]

Limit of the attenuation of the spurious in dB:

$$56 + 10\text{Log}(\text{Power}) = 56 + 10\text{Log}(0.0977) = 45.9 \text{ dB}$$

[ Environment ]

Temperature : 17°C Humidity : 48%

[ Summary of Test Results ]

Minimum Margin was 4.8 dB at 151.82 MHz, horizontal polarization.

Tested Date : 4 December 1999

Tester Signature



Yasunari Kawai

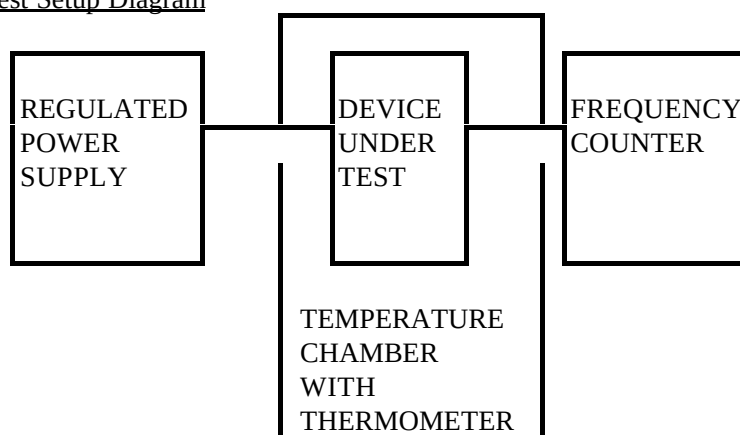
## 7. FREQUENCY STABILITY MEASUREMENT

### 7.1 Reference Rule and Specification

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

### 7.2 Frequency vs Temperature Test

Test Setup Diagram



Test Result

Test Voltage: 12.0V

| REFERENCE<br>FREQUENCY<br>[MHz] | TEMPERATURE<br>[°C] | FREQUENCY<br>DRIFT<br>[%] | LIMIT<br>[%] |
|---------------------------------|---------------------|---------------------------|--------------|
| <u>75.91</u>                    | -30                 | -0.000308                 | ±0.002       |
|                                 | -20                 | 0.000125                  |              |
|                                 | -10                 | 0.000441                  |              |
|                                 | 0                   | 0.000586                  |              |
|                                 | +10                 | 0.000674                  |              |
|                                 | +20                 | 0.000736                  |              |
|                                 | +30                 | 0.000872                  |              |
|                                 | +40                 | 0.001146                  |              |
|                                 | +50                 | 0.001591                  |              |

## 7.3 Frequency vs Voltage Test

Test Setup Diagram : Same as (1)

Test Result

Temperature : +20°C

| REFERENCE<br>FREQUENCY<br>[MHz] | SUPPLIED<br>VOLTAGE<br>[Volt] | FREQUENCY<br>DRIFT<br>[%] | LIMIT<br>[%] |
|---------------------------------|-------------------------------|---------------------------|--------------|
| <u>75.91</u>                    | 7.2                           | -0.000258                 | ±0.002       |

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

[ Environment ] Temperature : 20°C Humidity : 60%

[ Summary of Test Results ]

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

Tested Date : 16 December 1999

Tester Signature

Yasunari Kawai

## 8. 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<br>50 Hz - 1.8 GHz                             | SA-27           | <input checked="" type="checkbox"/> | 1999/7    | 2000/7    |
| Biconical Antenna                    | Schwarzbeck                   | BBA9106      | Frequency Range<br>30 MHz - 300 MHz                            | AN-80           | <input checked="" type="checkbox"/> | 1999/2    | 2000/2    |
| Log-Periodic                         | Schwarzbeck                   | UHALP 9107   | Frequency Range<br>300 MHz - 1 GHz                             | AN-215          | <input checked="" type="checkbox"/> | 1999/2    | 2000/2    |
| Tuned Dipole                         | Kyoritsu                      | KBA-511S     | Frequency Range<br>25 MHz - 500 MHz                            | AN-135          | <input checked="" type="checkbox"/> | 1999/3    | 2000/3    |
|                                      | Kyoritsu                      | KBA-611S     | Frequency Range<br>500 MHz - 1 GHz                             | AN-137          | <input checked="" type="checkbox"/> | 1999/3    | 2000/3    |
| Tuned Dipole Antenna                 | Kyoritsu                      | KBA-511S     | Frequency Range<br>25 MHz - 500 MHz                            | AN-134          | <input checked="" type="checkbox"/> | 1999/3    | 2000/3    |
| Signal Generator                     | Anritsu                       | MG3601A      | Frequency Range<br>0.1 MHz - 1040 MHz                          | SG-41           | <input checked="" type="checkbox"/> | 1999/9    | 2000/9    |
| Power Amp.                           | ENI                           | 601L         | Frequency Range<br>0.8 MHz - 1 GHz                             | AM-24           | <input checked="" type="checkbox"/> | 1999/9    | 2000/9    |
| RF Millivolt-Meter                   | Rohde & Schwarz               | URV5         | Frequency Range<br>10 kHz - 2 GHz                              | VV-29           | <input checked="" type="checkbox"/> | 1999/6    | 2000/6    |
| Coaxial Cable                        | Suhner                        | SUCOFLEX 104 | Length : 10m<br>[SMA(p)-SMA(p)]                                | CL-46           | <input checked="" type="checkbox"/> | 1999/2    | 2000/2    |
| Attenuator                           | Weinschel Engineering         | 2            | Frequency Range<br>1 MHz - 20 GHz<br>-10 dB                    | AT-42-1         | <input checked="" type="checkbox"/> | 1999/3    | 2000/3    |
| Regulated DC Power Supply            | Kikusui                       | PAB18-3A     | Output<br>0-18V, 3A                                            | PD-32           | <input checked="" type="checkbox"/> | -         | -         |
| Temperature Chamber With Thermometer | Tabai Mfg.                    | MC-710       | Temperature Range<br>-75 - +100 °C                             | CH-31           | <input checked="" type="checkbox"/> | -         | -         |
| Frequency Counter                    | Advantest                     | TR5823H      | Freq.Range<br>1 mHz-1300 MHz                                   | CU-17           | <input checked="" type="checkbox"/> | 1999/5    | 2000/5    |
| Spectrum Analyzer                    | Advantest                     | TR4172       | Frequency Range<br>50 Hz - 1.8 GHz                             | SA-27           | <input checked="" type="checkbox"/> | 1999/7    | 2000/7    |
| Digital Plotter                      | Hewlett Packard               | 7090A        | Plot Area<br>A3 size                                           | RE-17           | <input checked="" type="checkbox"/> | -         | -         |
| Multimeter                           | John Fluke                    | 37           | Volt Range<br>0.1mV - 1000 V<br>Ampere Range<br>0.01 mA - 20 A | MM-91           | <input checked="" type="checkbox"/> | 1999/3    | 2000/3    |
| Personal Computer                    | Hewlett Packard               | 9121         | Memory 512kB<br>Language BASIC                                 | PC-38-2         | <input checked="" type="checkbox"/> | -         | -         |
| Digital Oscilloscope                 | Matsushita Communication Ind. | VP-5740A     | Frequency Range<br>DC -10 MHz                                  | OS-22           | <input checked="" type="checkbox"/> | 1999/5    | 2000/5    |