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# KANSAI ELECTRONIC INDUSTRY DEVELOPMENT CENTER

| HEAD OFFICE | | IKOMA TESTING LABORATORY |
|---|---|---|
| 6-8-7   NISHITENMA | **KEC** | 12128   TAKAYAMA-CHO |
| KITA-KU   OSAKA   530-0047 JAPAN | | IKOMA-CITY   NARA   630-0101 JAPAN |

Corporate Juridical Person

## TEST REPORT

Report No. A-040-01-C                                                    Date: 27 December 2001

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

FCC Rules and Regulations Part 22 Subpart H ; a Public Mobile Service.

ALL 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 Electric Works, Ltd.

Mailing Address      :    1048, Kadoma, Osaka 571-8686, Japan

2. Identification of Tested Device

FCC ID                   : HHV20011107
Device Name           : Emergency Portable Cellular Telephone
Trade Name             : NAIS
Model Number         : PSD
Serial Number          : 17407801777
Date of Manufacture    : November 2001

3. Test Items and Procedure

(1) MEASUREMENT OF FIELD STRENGTH OF SPURIOUS RADIATION
(2) MEASUREMENT OF RF POWER OUTPUT( SUBSTITUTION METHOD )

Above all tests were performed under : FCC Part 2 Section 2.1046 and Section 2.1053

4. Date of Test

Receipt of Test Sample     : 17 December 2001
Test Completed on           : 20 December 2001

CERTIFIED BY :

Eizo Hariya
General Manager of Ikoma Testing Laboratory

Table  of  Contents

1. GENERAL INFORMATION

1.1   Product Description

The NAIS Model No. PSD (referred to as EUT in this report) is an ANALOG AMPS Emergency Potable Cellular Telephone.

| | | | |
|---|---|---|---|
| (1) Transmitting Frequency Range | : | 824.04 - 848.97 MHz | |
| (2) Receiving Frequency Range | : | 869.04 - 893.97 MHz | |
| (3) Emission Designator | : | F3E | |
| (4) Type of Circuit | : | Superheterodyne | |
| | | 1st IF : 83.16 MHz | |
| | | 2nd IF : 60 kHz | |
| (5) Type of Antenna | : | Internal Antenna (50Ω, unbalanced) | |
| (6) Rated Power Supply | : | DC 6.0 V (Li-ion Battery × 2) | |
| (7) Contained Oscillator | | | |
| 1) SYSTEM CLOCK | : | 14.4 MHz | |
| 2) 2nd LOCAL OSC | : | 83.1 MHz | |
| 3) RX VCO | : | 952.2 - 977.13 MHz | |
| 4) TX VCO | : | 824.04 - 848.97 MHz | |

1.2   Description for Equipment Authorization

(1) Rules Part(s) under which the equipment is operated

   FCC Rule Part 22, Subpart H ; a Public Mobile Service

(2) Kind of Equipment Authorization

   ☐ Type Acceptance          ☒ 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.4

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.

2. TESTED SYSTEM

2.1   Test Mode

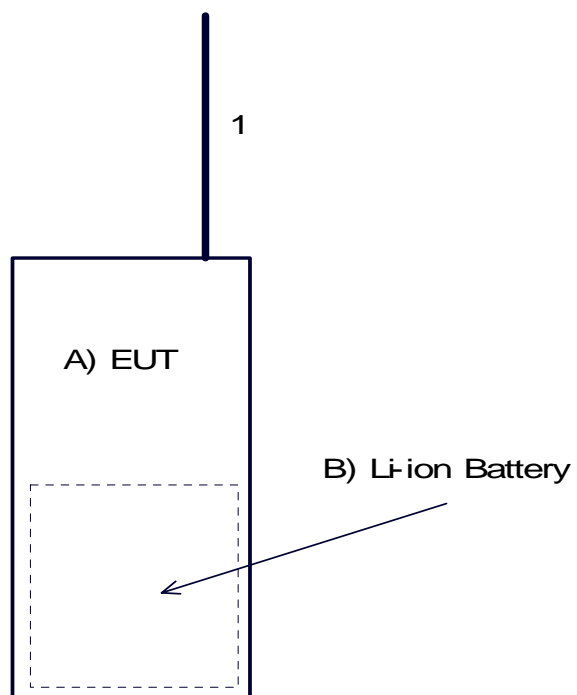The EUT was placed in horizontally and vertically on the turn table.
The data of maximum emission was reported at each conditions.

The compliance tests were performed under the following operation mode.

The carrier wave is transmitted continuously with the maximum power level.

2.2   Block Diagram of EUT System

**1**

**A) EUT**

**B) Li-ion Battery**

[ 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 | Emergency Portable Cellular Telephone | PSD (17407801777) | HHV20011107 (NAIS) | EUT | |
| B | Li-ion Battery | CR123A ( - ) | N/A ( - ) | Output DC3.0 V × 2 Accessory of EUT | |

[ Attention ]
  N/A : Not Applicable


2.4   List of Antenna

| No | Type | Length ( m ) | Note | Remark |
|----|------|--------------|------|--------|
| 1 | Built-in Antenna (50Ω) | 0.01 | Permanently attached to EUT | |

3. MEASUREMENT OF FIELD STRENGTH OF SPURIOUS RADIATION

3.1   Reference Rule and Specification

FCC Rule Part 22 Subpart H [§22.917] and Part 2 Subpart J [§2.1053]
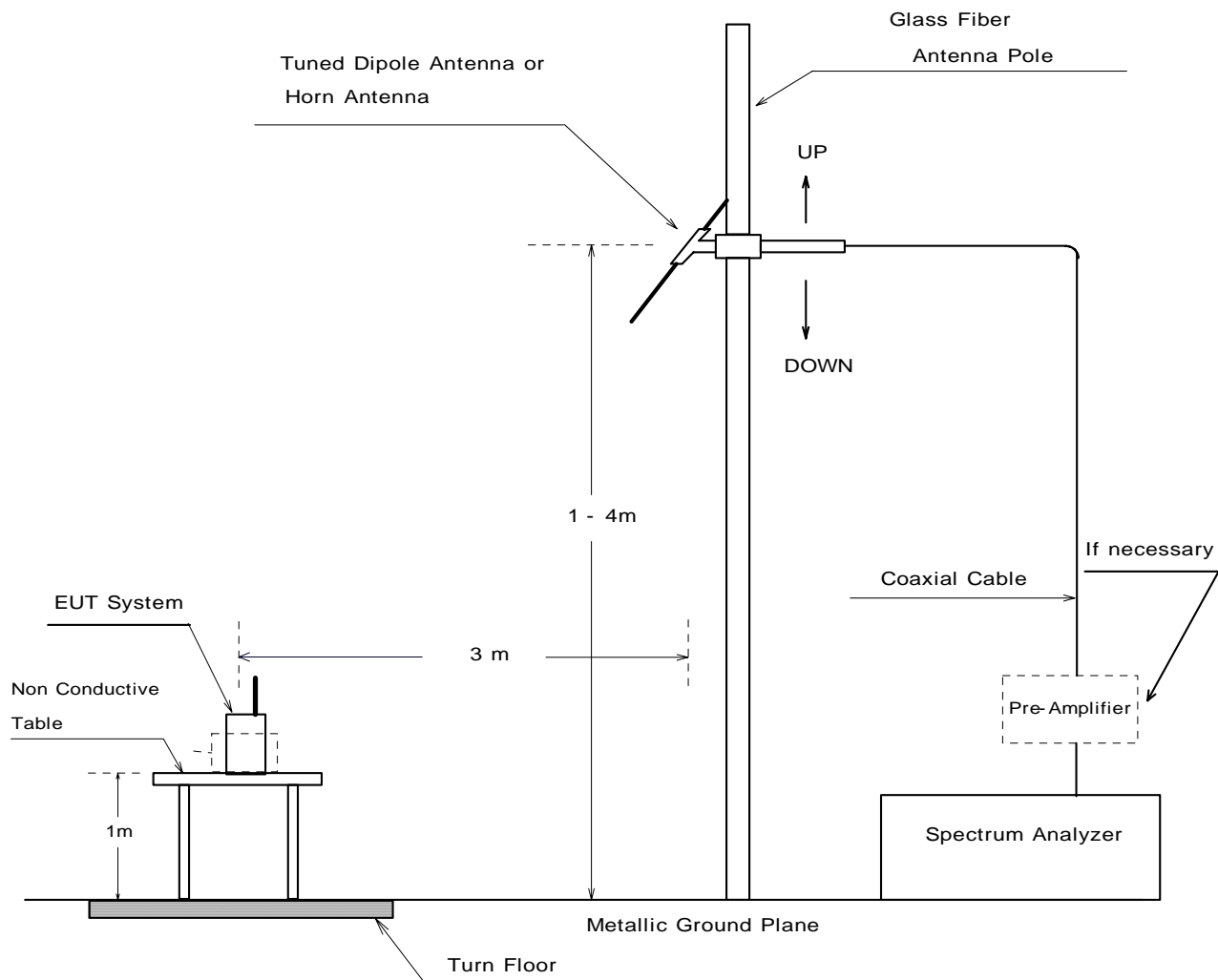
3.2   Test Procedure

(1)  Tune-up the transmitter.

(2)  The transmitter and accessories are placed on the test table.

(3)  For each spurious measurement the receiving antenna is used the dipole antenna or the broadband antenna or the horn antenna. These measurements are made from the lowest radio frequency generated in the EUT 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 Step (4) for each spurious frequency with the antennas polarized vertically.

(6)  The field strength of the spurious emission and the attenuation of the spurious in dB can be calculated from the following formula:

| Field Strength of Spurious Emission [dBμV/m] | = | Meter Reading [dBμV] | + | Antenna Factor [dB/m] | + | Cable Loss [dB] | − | Pre-AMP Gain [dB] |
|---|---|---|---|---|---|---|---|---|

| Spurious Attenuation Ratio [dB] | = | Carrier Emission [dBμV/m] | − | Spurious Emission [dBμV/m] |
|---|---|---|---|---|

3.3    Test Configuration

[ Open Site ]

Glass Fiber
Antenna Pole

Tuned Dipole Antenna or
Horn Antenna

UP

DOWN

1 - 4m

If necessary

Coaxial Cable

EUT System

3 m

Non Conductive
Table

Pre-Amplifier

1m

Spectrum Analyzer

Metallic Ground Plane

Turn Floor

3.4   Photographs of EUT System Configuration

Horizontally  Placing

Vertically  Placing

3.5  Test Results

(1) ( 991 ch. )

| Measurment Frequency ( MHz ) | Antenna Factor ( dB/m ) | Mater Reading | | Maximum Field Strength ( dBuV/m ) | Attenuation From Carrier ( dB ) | Limits ( dB ) | Margin for Limits ( dB ) |
|---|---|---|---|---|---|---|---|
| | | Horizontal ( dBuV ) | Vertical ( dBuV ) | | | | |
| Carrier Emission | | | | | | | |
| 824.04 | 29.7 | 96.7 | 95.6 | 126.4 | - | - | - |
| Spurious Emission | | | | | | | |
| 1648.08 | 23.6 | 39.5 | 41.1 | 64.7 | 61.7 | 40.9 | 20.8 |
| 2472.12 | -10.6 | 56.8 | 56.2 | 46.2 | 80.2 | 40.9 | 39.3 |
| 3296.16 | - 8.8 | 64.6 | 61.9 | 55.8 | 70.6 | 40.9 | 29.7 |
| 4120.20 | - 5.9 | 75.7 | 75.5 | 69.8 | 56.6 | 40.9 | 15.7 |
| 4944.24 | - 4.5 | 55.2 | 49.6 | 50.7 | 75.7 | 40.9 | 34.8 |
| 5768.28 | - 1.1 | 47.3 | 46.7 | 46.2 | 80.2 | 40.9 | 39.3 |
| 6592.32 | - 2.1 | 38.0 | 40.0 | 37.9 | 88.5 | 40.9 | 47.6 |
| 7416.36 | - 0.9 | 41.4 | 42.5 | 41.6 | 84.8 | 40.9 | 43.9 |
| 8240.40 | 1.2 | 42.0 | 41.3 | 43.2 | 83.2 | 40.9 | 42.3 |

[ Note ]
    (1) The spectrum was scanned from 25MHz to the ten harmonic of the carrier, and all emissions not reported were very low.
    (2) The antenna factor includes the cable loss and the pre-amplifier gain.
    (3) Calculation of Limit

$$43 + 10 \text{Log (Power)} = 43 + 10 \text{Log} (0.619) = 40.9 \text{ dB}$$

[ Environment ]
    Temperature : 24°C   Humidity : 37%

[ Sample Calculation ]
  (Carrier Emission)
    Frequency         :  824.04 [ MHz ]
    Meter Reading   :  96.7  [dBμV] ( at Horizontal Polarization )
    Antenna Factor  :  29.7  [ dB/m ]

  (Spurious Emission)
    Frequency         : 1648.08 [ MHz ]
    Meter Reading   :  41.1  [dBμV] ( at Vertical Polarization )
    Antenna Factor  :  23.6  [ dB/m ]

    Then, Field Strength is calculated as follows,

        Field Strength (Carrier Emission)  = 96.7 + 29.7 = 126.4 [dBμV/m]
        Field Strength (Spurious Emission) = 41.1 + 23.6 = 64.7 [dBμV/m]

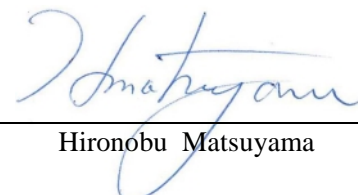    Then, Attenuation Ratio from Carrier is calculated as follows,

    Attenuation Ratio from Carrier = 126.4 – 64.7  =  61.7 [dB]

[ Summary of Test Result ]
    Minimum margin was 15.7 dB at 4120.20 MHz, at Horizontal polarization.

Tested Date:  20 December 2001     Tester Signature

Hironobu Matsuyama

- Continued -

(2) ( 383 ch. )

| Measurment Frequency ( MHz ) | Antenna Factor ( dB/m ) | Mater Reading | | Maximum Field Strength ( dBuV/m ) | Attenuation From Carrier ( dB ) | Limits ( dB ) | Margin for Limits ( dB ) |
|---|---|---|---|---|---|---|---|
| | | Horizontal ( dBuV ) | Vertical ( dBuV ) | | | | |
| Carrier Emission | | | | | | | |
| 836.49 | 29.9 | 96.2 | 96.3 | 126.2 | - | - | - |
| Spurious Emission | | | | | | | |
| 1672.98 | 23.7 | 38.9 | 39.7 | 63.4 | 62.8 | 40.7 | 22.1 |
| 2509.47 | -10.7 | 58.5 | 55.8 | 47.8 | 78.4 | 40.7 | 37.7 |
| 3345.96 | - 8.6 | 64.9 | 64.7 | 56.3 | 69.9 | 40.7 | 29.2 |
| 4182.45 | - 5.9 | 68.7 | 65.2 | 62.8 | 63.4 | 40.7 | 22.7 |
| 5018.94 | - 2.5 | 55.9 | 51.6 | 53.4 | 72.8 | 40.7 | 32.1 |
| 5855.43 | - 3.2 | 43.1 | 45.3 | 42.1 | 84.1 | 40.7 | 43.4 |
| 6691.92 | - 1.8 | 41.4 | 42.8 | 41.0 | 85.2 | 40.7 | 44.5 |
| 7528.41 | - 0.7 | 38.1 | 38.0 | 37.4 | 88.8 | 40.7 | 48.1 |
| 8364.90 | 1.2 | 40.3 | 39.8 | 41.5 | 84.7 | 40.7 | 44.0 |

[ Note ]
    (1) The spectrum was scanned from 25MHz to the ten harmonic of the carrier, and all emissions not reported were very low.
    (2) The antenna factor includes the cable loss and the pre-amplifier gain.
    (3) Calculation of Limit
        $43 + 10Log (Power) = 43 + 10Log (0.586) = 40.7$ dB

[ Environment ]
    Temperature : 24°C   Humidity : 37%

[ Sample Calculation ]
 (Carrier Emission)
    Frequency         : 836.49 [ MHz ]
    Meter Reading    : 96.3  [dBμV] ( at Vertical Polarization )
    Antenna Factor   : 29.9 [ dB/m ]

 (Spurious Emission)
    Frequency         : 1672.98 [ MHz ]
    Meter Reading    : 39.7  [dBμV] ( at Vertical Polarization )
    Antenna Factor   : 23.7 [ dB/m ]

    Then, Field Strength is calculated as follows,

        Field Strength(Carrier Emission)  = 96.3 + 29.9 = 126.2 [dBμV/m]
        Field Strength(Spurious Emission) = 39.7 + 23.7 = 63.4  [dBμV/m]

    Then, Attenuation Ratio from Carrier is calculated as follows,
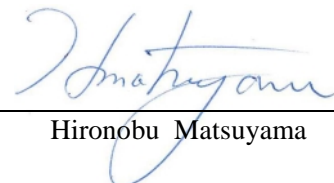
        Attenuation Ratio from Carrier = 126.2 – 63.4  =  62.8 [dB]

[ Summary of Test Result ]
    Minimum margin was  22.1 dB at 1672.98 MHz, at Vertical polarization.

Tested Date: 20 December 2001     Tester Signature

                                              Hironobu Matsuyama

- Continued -

(3) ( 799 ch. )

| Measurment Frequency ( MHz ) | Antenna Factor ( dB/m ) | Mater Reading | | Maximum Field Strength ( dBuV/m ) | Attenuation From Carrier ( dB ) | Limits ( dB ) | Margin for Limits ( dB ) |
|---|---|---|---|---|---|---|---|
| | | Horizontal ( dBuV ) | Vertical ( dBuV ) | | | | |
| Carrier Emission | | | | | | | |
| 848.97 | 30.1 | 96.7 | 96.4 | 126.8 | - | - | - |
| Spurious Emission | | | | | | | |
| 1697.94 | 23.8 | 39.1 | 38.4 | 62.9 | 63.9 | 40.7 | 23.2 |
| 2546.91 | -10.8 | 66.0 | 63.9 | 55.2 | 71.6 | 40.7 | 30.9 |
| 3395.88 | - 8.6 | 64.3 | 63.0 | 55.7 | 71.1 | 40.7 | 30.4 |
| 4244.85 | - 6.0 | 67.0 | 67.2 | 61.2 | 65.6 | 40.7 | 24.9 |
| 5093.82 | - 2.3 | 50.7 | 48.9 | 48.4 | 78.4 | 40.7 | 37.7 |
| 5942.79 | - 3.3 | 44.6 | 43.6 | 41.3 | 85.5 | 40.7 | 44.8 |
| 6791.76 | - 1.6 | 43.0 | 42.6 | 41.4 | 85.4 | 40.7 | 44.7 |
| 7640.73 | - 0.5 | 38.3 | 39.6 | 39.1 | 87.7 | 40.7 | 47.0 |
| 8489.70 | 1.4 | 39.2 | 39.4 | 40.8 | 86.0 | 40.7 | 45.3 |

[ Note ]
    (1) The spectrum was scanned from 25MHz to the ten harmonic of the carrier, and all emissions not reported were very low.
    (2) The antenna factor includes the cable loss and the pre-amplifier gain.
    (3) Calculation of Limit
        $43 + 10Log(Power) = 43 + 10Log(0.594) = 40.7$ dB

[ Environment ]
    Temperature : 24°C    Humidity : 37%

[ Sample Calculation ]
 (Carrier Emission)
    Frequency          :  848.97 [ MHz ]
    Meter Reading    :   96.7  [dBμV] ( at Horizontal Polarization )
    Antenna Factor   :   30.1  [ dB/m ]

 (Spurious Emission)
    Frequency          : 1697.94 [ MHz ]
    Meter Reading    :   39.1  [dBμV] ( at Horizontal Polarization )
    Antenna Factor   :   23.8  [ dB ]

    Then, Field Strength is calculated as follows,

        Field Strength (Carrier Emission)  = 96.7 + 30.1 = 126.8 [dBμV/m]
        Field Strength (Spurious Emission) = 39.1 + 23.8 = 62.9 [dBμV/m]

    Then, Attenuation Ratio from Carrier is calculated as follows,
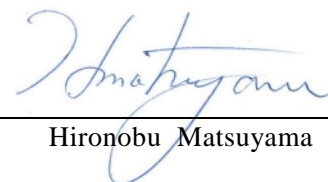
        Attenuation Ratio from Carrier = 126.8 – 62.9  =  63.9 [dB]

[ Summary of Test Result ]
    Minimum margin was 23.2 dB at 1697.94 MHz, at horizontal polarization.

Tested Date: 20 December 2001        Tester Signature

                                                Hironobu Matsuyama

4. MEASUREMENT OF RF POWER OUTPUT ( Substitution Method )
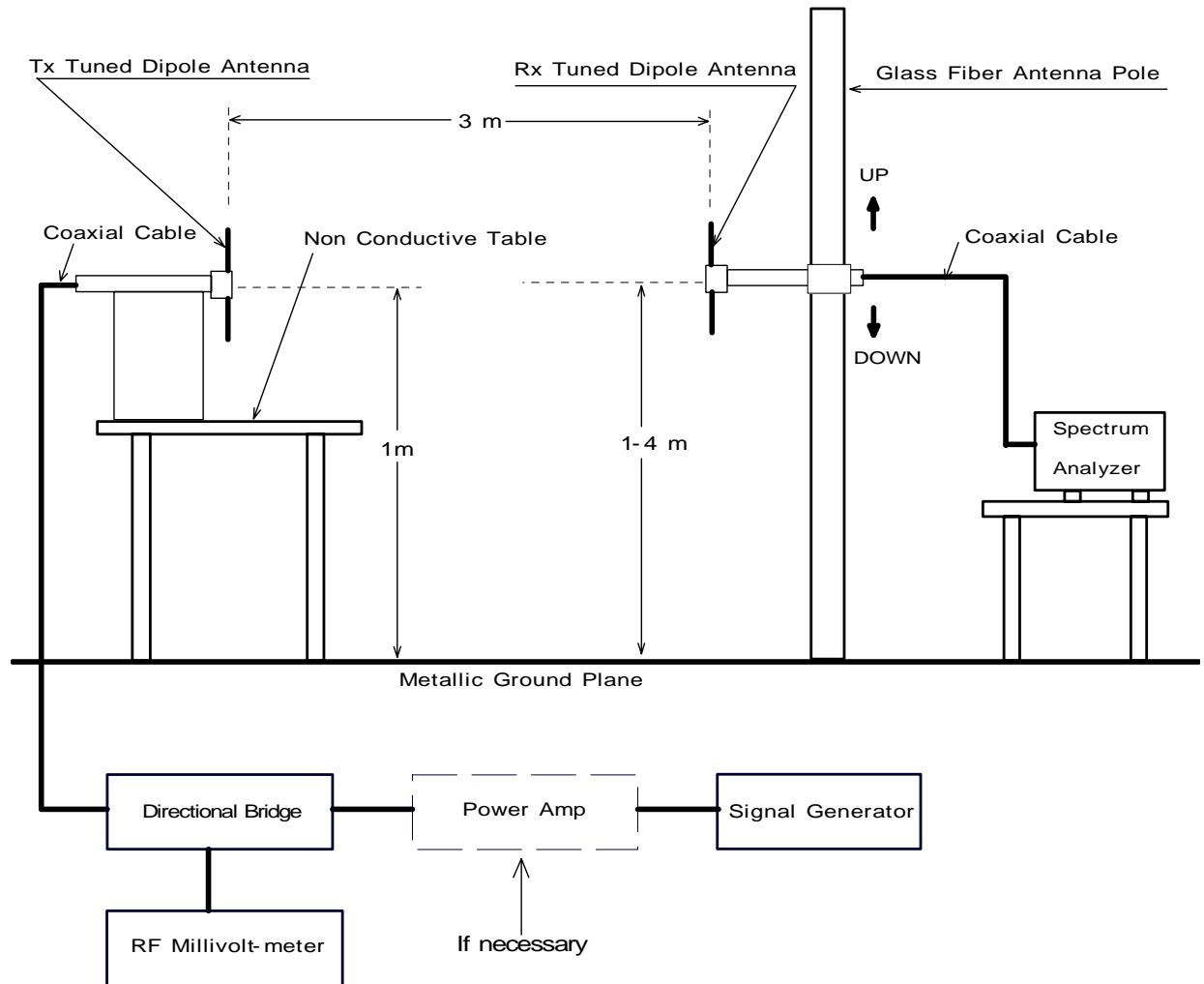
4.1    Reference Rule and Specification

    FCC Rule Part 22 Subpart H [§22.913] and Part 2 Subpart J [§2.1046]


4.2    Test Procedure

   (1) Tune-up the transmitter.

   (2) The transmitter and accessories are placed on the test table.

   (3) The receiving antenna is adjusted to the correct length for the carrier frequency.

   (4) 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.

   (5) Repeat Step (4) with the antenna polarized vertically.

   (6) Remove the transmitter and replace it with the tuned dipole antenna.
       The center of this antenna is approximately at the same location as the center of
       the transmitter.

   (7) Feed the tuned dipole 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 recorded
       maximum reading for this set of conditions its obtained.

   (8) Repeat Step (7) with both antennas vertically polarized for the frequency.

   (9) The RF Output Power can be calculated from following formula:


$$\text{RF Output Power [mW]} = 10^{\left(\text{SG Output Level [dBm]} - \text{Cable Loss [dB]}\right)/10}$$

## 4.3  Test Configuration

Tx Tuned Dipole Antenna                    Rx Tuned Dipole Antenna          Glass Fiber Antenna Pole

3 m

Coaxial Cable          Non Conductive Table                              UP          Coaxial Cable

DOWN

1m                    1-4 m                                              Spectrum

Analyzer

Metallic Ground Plane

Directional Bridge          Power Amp          Signal Generator

RF Millivolt-meter          If necessary

4.4   Test Results

| Carrier Frequency [MHz] | Meter Reading At 3m [dBμV] | SG Output Level [dBm] | Cable Loss [dB] | RF Output Power [mW] | Limit [W] |
|---|---|---|---|---|---|
| 991 ch.<br>824.04 | 92.3 | 30.02 | 2.1 | 619.4 | 7.0 |
| 383 ch.<br>836.49 | 92.5 | 29.78 | 2.1 | 586.1 | 7.0 |
| 799 ch.<br>848.97 | 93.2 | 29.94 | 2.2 | 594.2 | 7.0 |

[ Environment ]

        Temperature : 18°C      Humidity : 56%

[ Sample Calculation ]

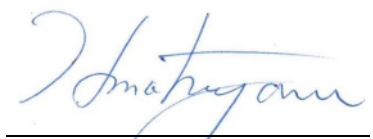   Frequency              :   824.04      [ MHz ]
   SG Output Level        :    30.02      [ dBm ]   ( at 991 ch. )
   Cable Loss             :     2.1       [ dB ]

   Then, RF Power Output is calculated as follows,

   RF Power Output   =   $10^{(30.02 - 2.1)/10}$   =   619.4 [ mW ]

Tested Date   : 19 December 2001          Tester Signature

                                                          Hironobu Matsuyama

## 5. LIST OF TEST INSTRUMENTS

| Instrument | Manufacturer | Model No | Specifications | KEC Control No. | If used, checked By "×". | Last Cal. | Next Cal. |
|---|---|---|---|---|---|---|---|
| Spectrum Analyzer | Hewlett Packard | HP8564E | Frequency Range 9 kHz to 40 GHz | SA-39 | ⊠ | 2001/2 | 2002/2 |
| Tuned Dipole Antenna | Kyoritsu | KBA-611S | Frequency Range 500 MHz - 1 GHz | AN-136 | ⊠ | 2001/2 | 2002/2 |
| Tuned Dipole Antenna | Kyoritsu | KBA-611S | Frequency Range 500 MHz - 1 GHz | AN-115 | ⊠ | 2001/2 | 2002/2 |
| Signal Generator | Wiltron | 6769B | Frequency Range 10 MHz - 40 GHz | SG-42 | ⊠ | 2001/10 | 2002/10 |
| Power Amp. | Amplifier Research | 100W1000M1 | Frequency Range 70 MHz – 1 GHz | AM-55 | ⊠ | 2001/6 | 2002/6 |
| RF Millivolt-Meter | Rohde & Schwarz | URV5 | Frequency Range 9 kHz – 2 GHz | VV-29 | ⊠ | 2001/3 | 2002/3 |
| Coaxial Cable | Suhner | SUCOFLEX 104 | Length : 1m [SMA(p)-SMA(p)] | CL-42 | ⊠ | 2001/2 | 2002/2 |
| | | | Length : 10m [SMA(p)-SMA(p)] | CL-45 | ⊠ | 2001/2 | 2002/2 |
| | | | | CL-46 | ⊠ | 2001/2 | 2002/2 |
| Horn Antenna | Raven | 91888-2 | Frequency Range 1 GHz - 2 GHz | AN-167 | ⊠ | 2001/4 | 2002/4 |
| | | 91889-2 | Frequency Range 2 GHz - 5 GHz | AN-168 | ⊠ | 2001/4 | 2002/4 |
| | Scientific Atlanta | 12-3.9 | Frequency Range 3.95GHz - 5.85 GHz | AN-231 | ⊠ | 2001/4 | 2003/4 |
| | | 12-5.8 | Frequency Range 5.85 GHz - 8.2 GHz | AN-143 | ⊠ | 2001/4 | 2003/4 |
| | | 12-8.2 | Frequency Range 8.2 GHz - 12.4 GHz | AN-144 | ⊠ | 2001/4 | 2003/4 |
| Terminator | Anritsu | MP752A | 50 Ω | AX-503 | ⊠ | 2001/2 | 2002/2 |
| 100V Insertion Unit | Rohde & Schwarz | URV5-Z4 | Frequency Range 100 kHz - 2 GHz | VV-24-2 | ⊠ | 2001/3 | 2002/3 |
| Directional Bridge | Hewlett Packard | 86205A | Frequency Range 300 kHz - 6 GHz | AX-55 | ⊠ | 2001/8 | 2002/8 |