

# 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-015-06-C

Date: 21 November 2006

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

FCC Rules and Regulations Part 74 Subpart H : Low Power Auxiliary Stations.

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 : TOA Corporation. Audio Division  
Mailing Address : 2-1 Takamatsu-cho, Takarazuka-shi, Hyogo 665-0043, Japan

### 2. Identification of Tested Device

Type of Device : Low Power Auxiliary Stations  
Kind of Equipment Authorization : ☐: DoC ☒: Certification ☐: Verification  
FCC ID : DLAWM-5270  
IC ID : 1599A-WM5270  
Device Name : Wireless Microphone  
Trade Name : TOA  
Model Number : WM-5270  
Serial Number : No.1 ☐: Production ☐: Pre-production ☒: Prototype  
Date of Manufacture : September 2006

### 3. Test Items and Procedure

Test Plan Number : 12602815B

☒: Measurement of RF Power Output (Substitution Method)  
☒: Modulation Characteristics  
☒: Emission Bandwidth  
☒: Measurement of Field Strength of Spurious Radiation (Substitution Method)  
☐: 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 : 19 September 2006  
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 : 4 November 2006

Seiichi Izumi  
General Manager / Ikoma Testing Laboratory

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## 0. LABORATORY ACCREDITATION AND MEASUREMENT UNCERTAINTY

### 0.1. Laboratory Accreditation

KEC is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) for the specific scope of accreditation under Lab Code: 200207-0.

When the test report concerns with the NVLAP accreditation test, the first page of the test report is signed by NVLAP Approved Signatory accompanied by the NVLAP logo.

The report must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

### 0.2. Measurement Uncertainty

The result of a measurement is only an approximation or estimate of the value of a specific quantity. And thus the measurand is complete only when a statement of uncertainty is given.

KEC quotes Measurement Uncertainty (U)

of +/- 4.9 dB for Radiated Emissions

of +/- 2.2 dB for Conducted Emissions

## 1. CERTIFICATION OF THE COMPLIANCE

This test report is to certify that the tested device properly complies with the requirements of FCC Rules and Regulations Part 74 Subpart H and Part 2.

## 2. GENERAL INFORMATION

### 2.1. Product Description

The TOA Model No. WM-5270 (referred to as the EUT in this report) is a Wireless Microphone.

#### (1) Technical Specification

|                              |                                         |
|------------------------------|-----------------------------------------|
| • Microphone Element         | : Dynamic microphone (Cardioid pattern) |
| • Emission                   | : F3E                                   |
| • Frequency Range            | : 690.0 ~ 806.0MHz, UHF                 |
| • Selectable Channel         | : 64 channels                           |
| • RF Carrier Power           | : Less than 50mW                        |
| • Tone Frequency             | : 32.768kHz                             |
| • Maximum Input Level        | : 142dB SPL (12dB PAD)                  |
| • Maximum Deviation          | : $\pm 40$ kHz                          |
| • Audio Frequency Response   | : 80 ~ 15000Hz                          |
| • Dynamic Range (AF Circuit) | : More than 95dB (with WT-5800)         |
| • Battery                    | : LR6 (AA)                              |
| • Battery Life               | : More than 10 hours (alkaline)         |
| • Indicator                  | : Power / Battery lamps                 |
| • Antenna                    | : Built-in type                         |
| • Operating Temperature      | : -10 to + 50°C                         |
| • Finish                     | : Dark gray                             |
| • Dimensions                 | : $\varnothing 48 \times 244$ mm        |
| • Weight                     | : 340 g (with battery)                  |

#### (2) Used Oscillators Frequencies

|             |           |             |
|-------------|-----------|-------------|
| • A, B Band | Setting 6 | : 692.10MHz |
|             | Setting 7 | : 717.00MHz |
|             | Setting 8 | : 741.90MHz |
| • C, D Band | Setting 9 | : 794.10MHz |
|             | Setting A | : 800.00MHz |
|             | Setting B | : 805.90MHz |
| • Tone      |           | : 32.768kHz |

#### (3) Rated Power Supply : DC 1.5V (“AA” Dry Battery)

## 2.2. Description for Equipment Authorization

|                                      |                                                                                                |
|--------------------------------------|------------------------------------------------------------------------------------------------|
| (1) Reference Rule and Specification | : FCC Rule Part 74 Subpart H<br>Low Power Auxiliary Stations                                   |
| (2) Kind of Equipment Authorization  | : <input checked="" type="checkbox"/> Certification <input type="checkbox"/> Verification      |
| (3) Procedure of Application         | : <input checked="" type="checkbox"/> Original Equipment <input type="checkbox"/> Modification |

## 2.3. Test Facility

|                                                                                                                                                                                                                                                                                                                                                                |                                                                                 |                                          |                                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|------------------------------------------|-----------------------------------------------------------------------------------|
| All tests described in this report were performed by:                                                                                                                                                                                                                                                                                                          |                                                                                 |                                          |                                                                                   |
| Name:                                                                                                                                                                                                                                                                                                                                                          | KANSAI ELECTRONIC INDUSTRY DEVELOPMENT CENTER (KEC)<br>IKOMA TESTING LABORATORY |                                          |                                                                                   |
| Open Area Test Site                                                                                                                                                                                                                                                                                                                                            | <input type="checkbox"/> No.1                                                   | <input type="checkbox"/> No.4            |                                                                                   |
| Anechoic Chamber                                                                                                                                                                                                                                                                                                                                               | <input type="checkbox"/> No.1                                                   | <input checked="" type="checkbox"/> No.3 |                                                                                   |
| Shielded Room                                                                                                                                                                                                                                                                                                                                                  | <input type="checkbox"/> No.1                                                   | <input type="checkbox"/> No.2            | <input checked="" type="checkbox"/> No.4 <input checked="" type="checkbox"/> No.6 |
| Address:                                                                                                                                                                                                                                                                                                                                                       | 12128, Takayama-cho Ikoma-city, Nara, 630-0101 Japan                            |                                          |                                                                                   |
| <p>These test facilities have been filed with the FCC under the criteria of ANSI C63.4-2003.<br/> The KEC has been accredited by the NVLAP (Lab. Code: 200207-0) based on ISO/IEC 17025.<br/> Also the laboratory has been authorized by TUV Product Service (GER) and TUV Rheinland (GER) based on their criteria for testing laboratory (ISO/IEC 17025).</p> |                                                                                 |                                          |                                                                                   |

3. TESTED SYSTEM

3.1. Test Mode

The compliance tests were performed under the following operation mode.

- Continuous Tx

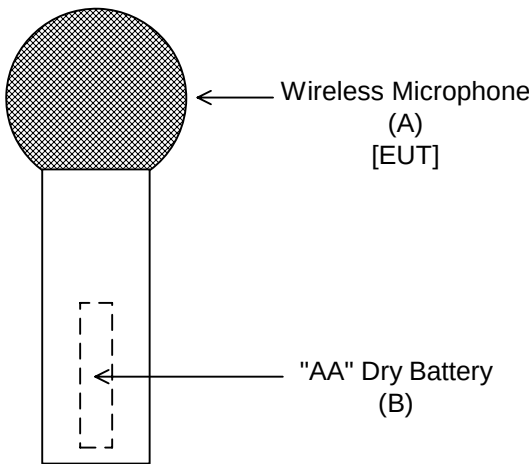
[Note]

In RF output power and Spurious emission measurement, the compliance tests were performed both of horizontally placed and vertically placed in EUT. As a results, the data of operation mode that produce the maximum emission were reported.

3.2. Characterization and condition of EUT System

☒ : normal, ☐ : not normal (that is )

3.3. Block Diagram of EUT System



[Note]

See 3.4. List of EUT System.

3.4. List of EUT System

| No | Device Name         | Model Number<br>(Serial Number) | FCC ID<br>(Trade Name) | Note |
|----|---------------------|---------------------------------|------------------------|------|
| A  | Wireless Microphone | WM-5270<br>(No.1)               | DLAWM-5270<br>(TOA)    | EUT  |
| B  | "AA" Dry Battery    | LR6 (G)<br>( - )                | N/A<br>(Panasonic)     |      |

[Attention]

N/A : Not Applicable

## 4. RF POWER OUTPUT

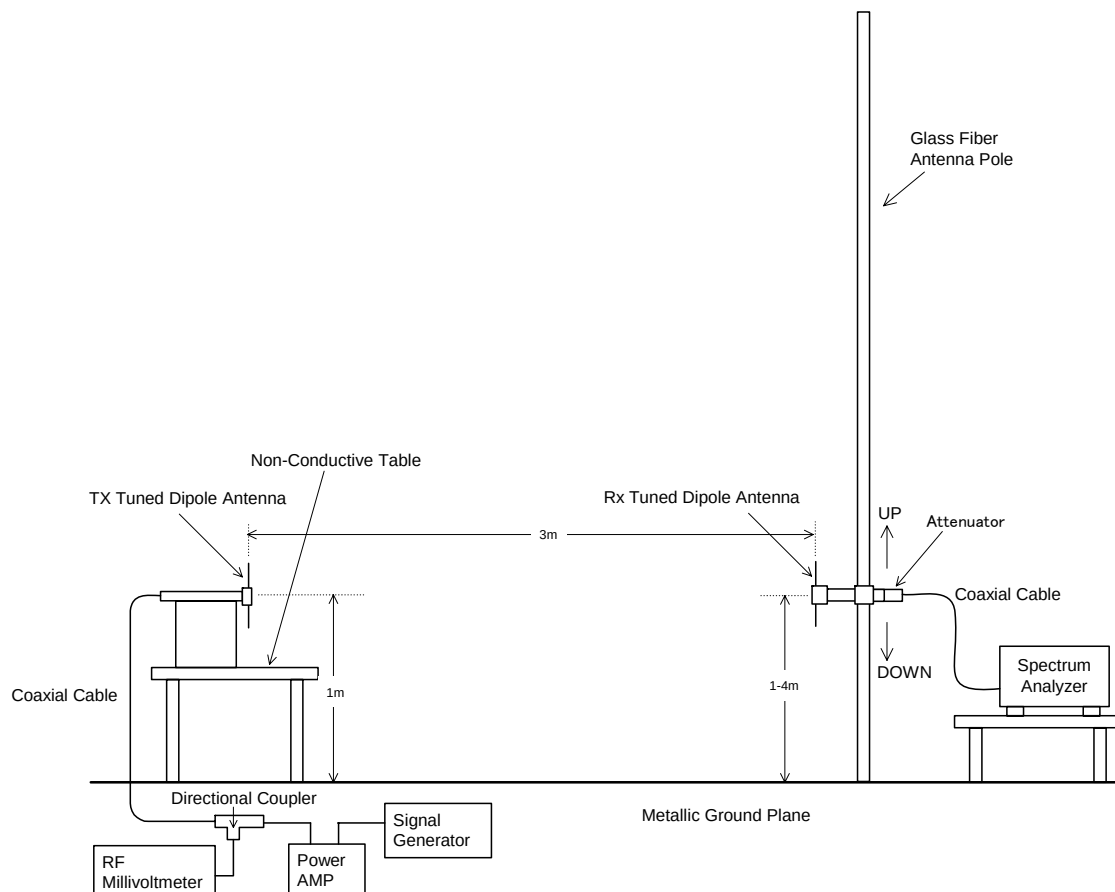
### 4.1. Reference Rule and Specification

FCC Rule Part 74 Subpart H [Section 74.861 (e) (1) (ii)]  
and Part 2 Subpart J [Section 2.1046], [Section 2.1053]

### 4.2. 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 lowering the antenna and rotating the turntable until the highest possible signal has been obtained. Record this maximum reading.
- (4) Repeat step 3 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 is obtained.
- (7) Repeat step 6 with both antennas vertically polarized.

### 4.3. Test Configuration



## 4.4. Test Results

## (1) A, B Band

## 1) Setting 6 (692.10MHz)

| Carrier Emission Frequency (MHz) | Spectrum Analyzer Reading |                 | RF Meter Reading |                | Cable Loss (dB) | ERP (dBm) | RF Output Power (mW) | Limit (mW) |
|----------------------------------|---------------------------|-----------------|------------------|----------------|-----------------|-----------|----------------------|------------|
|                                  | Horizontal (dBuV)         | Vertical (dBuV) | Horizontal (dBm) | Vertical (dBm) |                 |           |                      |            |
| 692.10                           | 79.9                      | 76.2            | 9.1              | 9.6            | 0.9             | 8.7       | 7.4                  | 250.0      |

## 2) Setting 7 (717.00MHz)

| Carrier Emission Frequency (MHz) | Spectrum Analyzer Reading |                 | RF Meter Reading |                | Cable Loss (dB) | ERP (dBm) | RF Output Power (mW) | Limit (mW) |
|----------------------------------|---------------------------|-----------------|------------------|----------------|-----------------|-----------|----------------------|------------|
|                                  | Horizontal (dBuV)         | Vertical (dBuV) | Horizontal (dBm) | Vertical (dBm) |                 |           |                      |            |
| 717.00                           | 79.0                      | 75.4            | 7.3              | 5.7            | 0.9             | 6.4       | 4.4                  | 250.0      |

## 3) Setting 8 (741.90MHz)

| Carrier Emission Frequency (MHz) | Spectrum Analyzer Reading |                 | RF Meter Reading |                | Cable Loss (dB) | ERP (dBm) | RF Output Power (mW) | Limit (mW) |
|----------------------------------|---------------------------|-----------------|------------------|----------------|-----------------|-----------|----------------------|------------|
|                                  | Horizontal (dBuV)         | Vertical (dBuV) | Horizontal (dBm) | Vertical (dBm) |                 |           |                      |            |
| 741.90                           | 79.3                      | 74.7            | 7.0              | 6.7            | 1.0             | 6.0       | 4.0                  | 250.0      |

## (2) C, D Band

## 1) Setting 9 (794.10MHz)

| Carrier Emission Frequency (MHz) | Spectrum Analyzer Reading |                 | RF Meter Reading |                | Cable Loss (dB) | ERP (dBm) | RF Output Power (mW) | Limit (mW) |
|----------------------------------|---------------------------|-----------------|------------------|----------------|-----------------|-----------|----------------------|------------|
|                                  | Horizontal (dBuV)         | Vertical (dBuV) | Horizontal (dBm) | Vertical (dBm) |                 |           |                      |            |
| 794.10                           | 83.1                      | 78.4            | 13.9             | 13.2           | 1.0             | 12.9      | 19.5                 | 250.0      |

## 2) Setting A (800.00MHz)

| Carrier Emission Frequency (MHz) | Spectrum Analyzer Reading |                 | RF Meter Reading |                | Cable Loss (dB) | ERP (dBm) | RF Output Power (mW) | Limit (mW) |
|----------------------------------|---------------------------|-----------------|------------------|----------------|-----------------|-----------|----------------------|------------|
|                                  | Horizontal (dBuV)         | Vertical (dBuV) | Horizontal (dBm) | Vertical (dBm) |                 |           |                      |            |
| 800.00                           | 82.6                      | 78.0            | 9.1              | 9.3            | 1.0             | 8.3       | 6.8                  | 250.0      |

## 3) Setting B (805.90MHz)

| Carrier Emission Frequency (MHz) | Spectrum Analyzer Reading |                 | RF Meter Reading |                | Cable Loss (dB) | ERP (dBm) | RF Output Power (mW) | Limit (mW) |
|----------------------------------|---------------------------|-----------------|------------------|----------------|-----------------|-----------|----------------------|------------|
|                                  | Horizontal (dBuV)         | Vertical (dBuV) | Horizontal (dBm) | Vertical (dBm) |                 |           |                      |            |
| 805.90                           | 81.5                      | 77.5            | 8.2              | 8.6            | 1.0             | 7.6       | 5.8                  | 250.0      |



- Continued -

[Calculation method]

The RF Power Output can be calculated from following formula:

$$RFPower(mW) = 10^{(Mr - Lo) \div 10}$$

where,

Mr : RF Meter Reading (dBm)

Lo : Loss of Cable (dB)

[Environment]

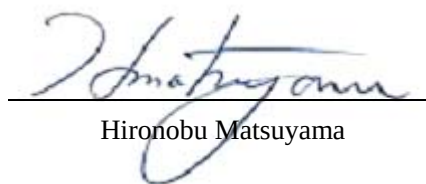
Temperature: 23 °C

Humidity: 55 %

[Tested Date / Tester]

29 September 2006

Signature



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Hironobu Matsuyama

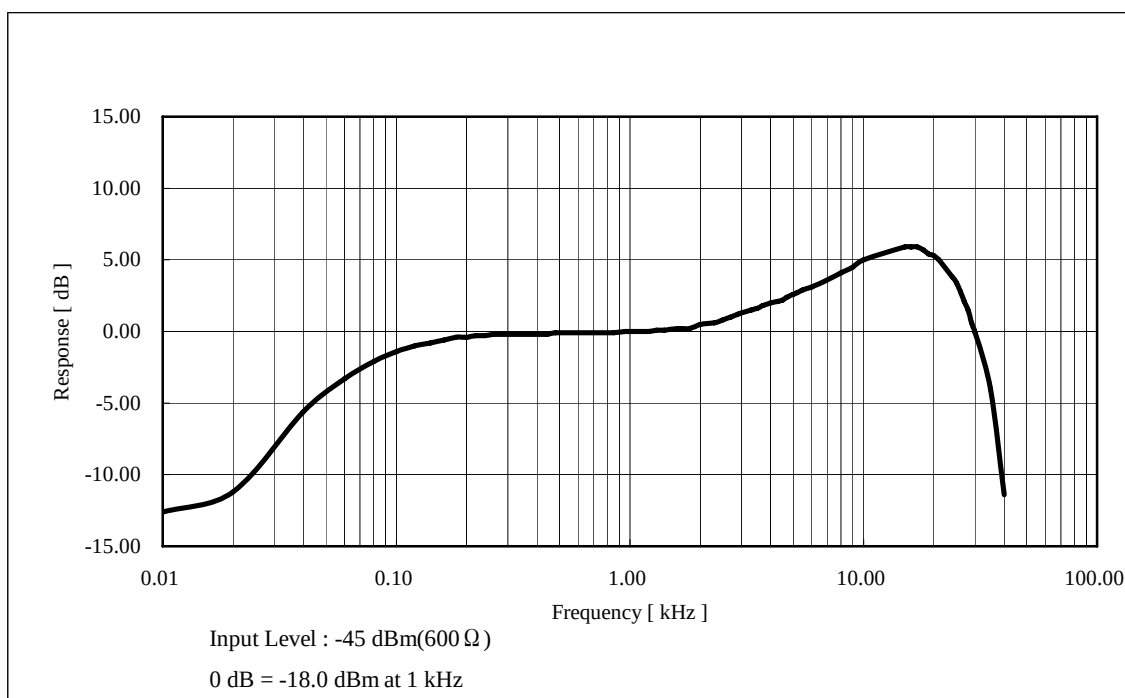
## 5. MODULATION CHARACTERISTICS

### 5.1. Reference Rule and Specification

FCC Rule Part 2 Subpart J [Section 2.1047 (a), (b)]  
FCC Rule Part 74 Subpart H [Section 74.861 (e) (3)]

### 5.2. Test Results

#### (a) Overall Audio Frequency Response



#### [Environment]

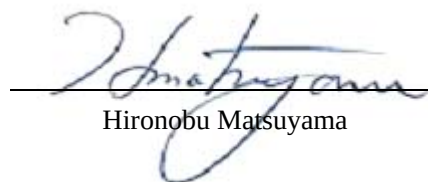
Temperature: 23 °C

Humidity: 50 %

#### [Tested Date / Tester]

4 November 2006

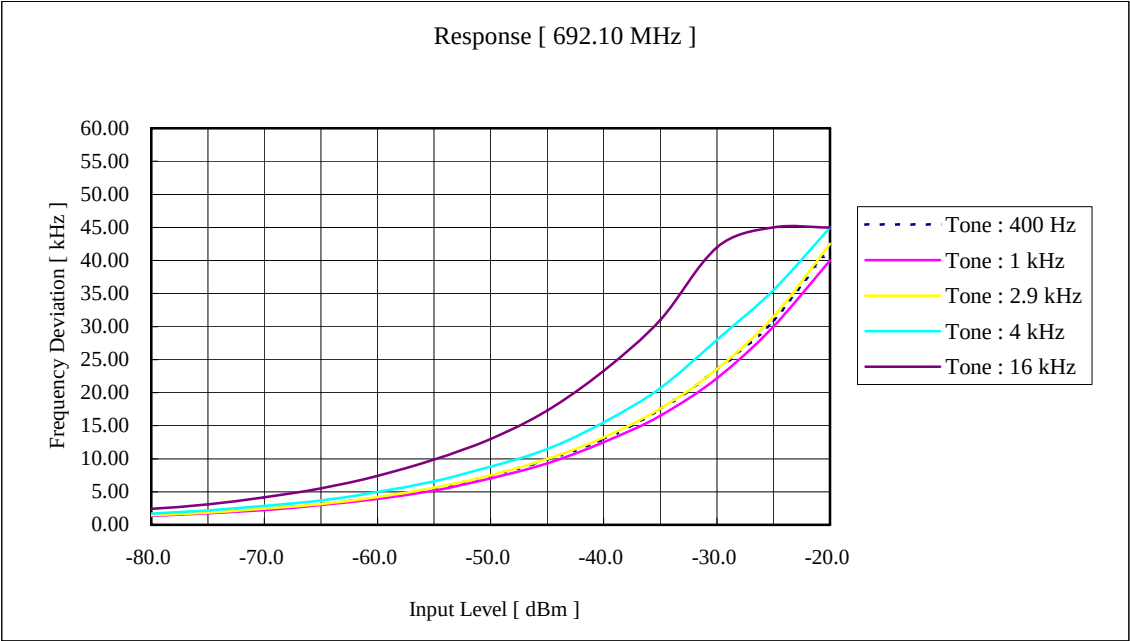
Signature

  
Hironobu Matsuyama

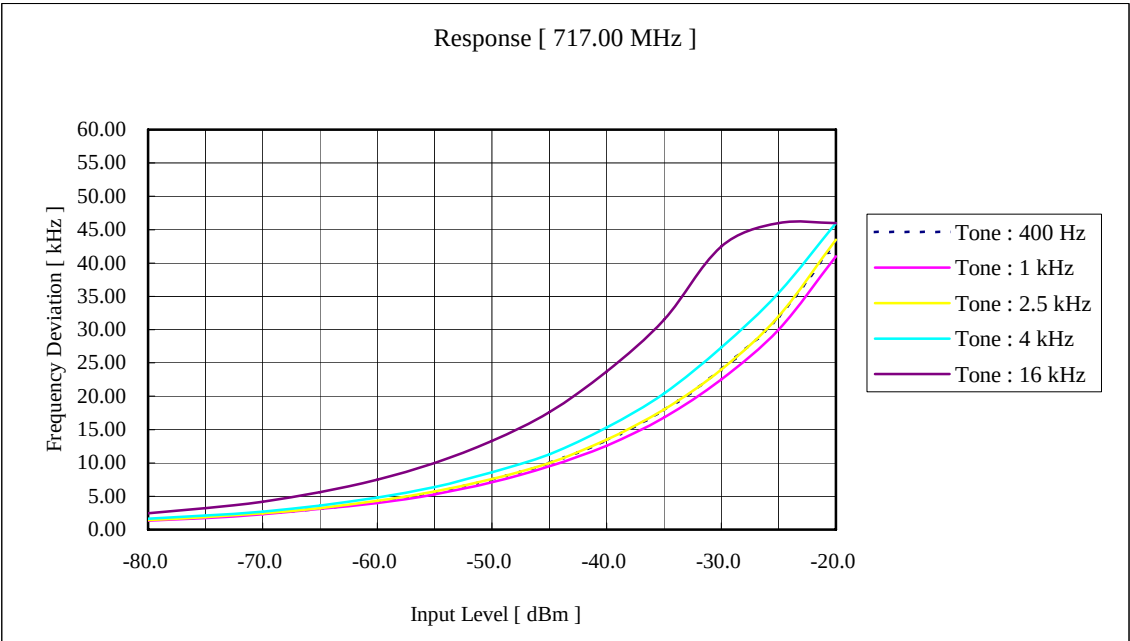
(b) Transmitter Deviation for a Range of Input Signal Level and Modulating Frequencies

(1) A, B Band

1) Setting 6 (692.10MHz)

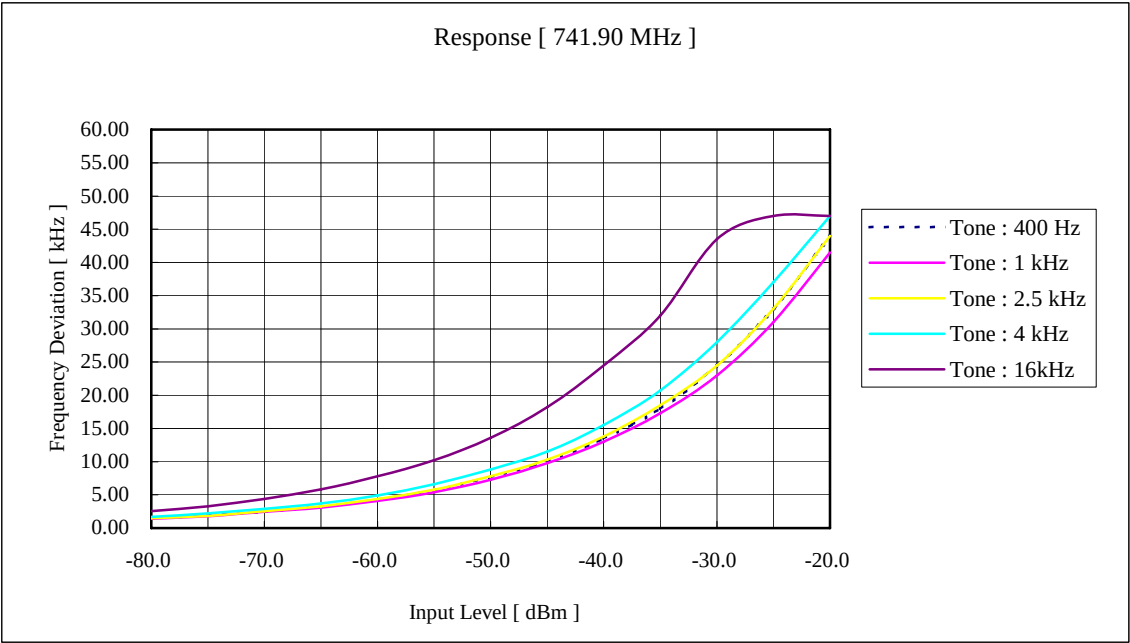


2) Setting 7 (717.00MHz)



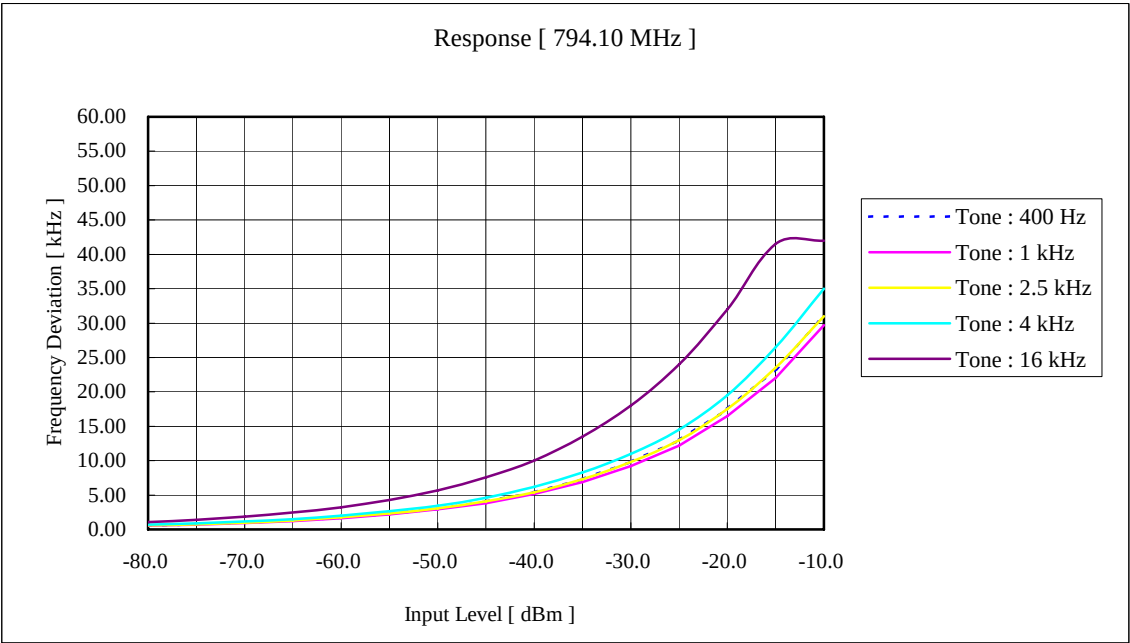
- Continued -

3) Setting 8 (741.90MHz)



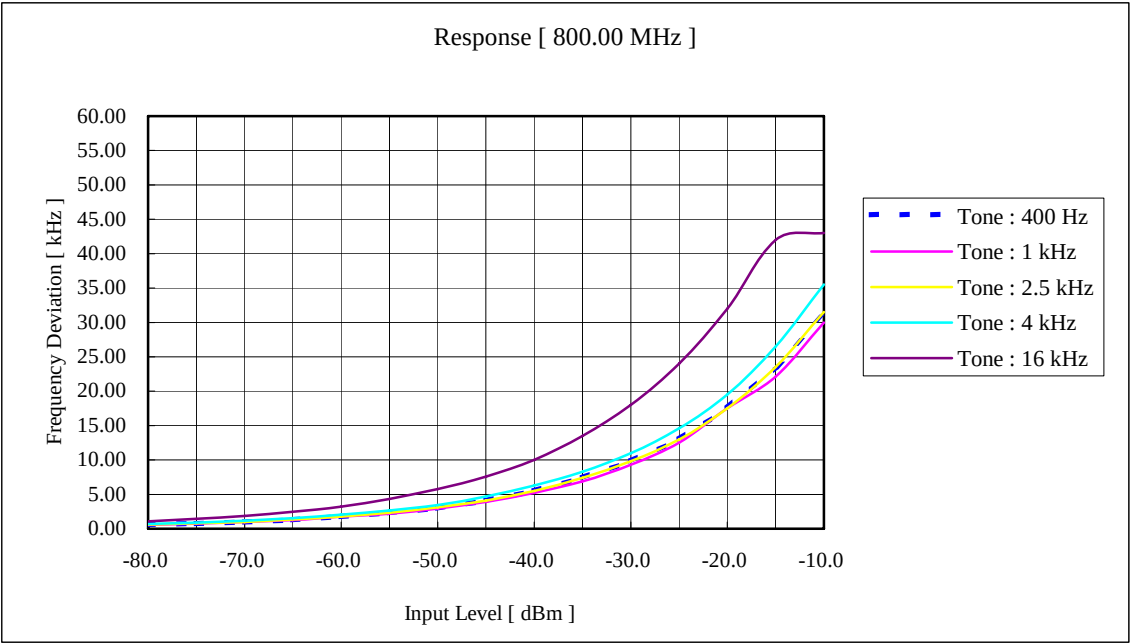
(2) C, D Band

1) Setting 9 (794.10MHz)

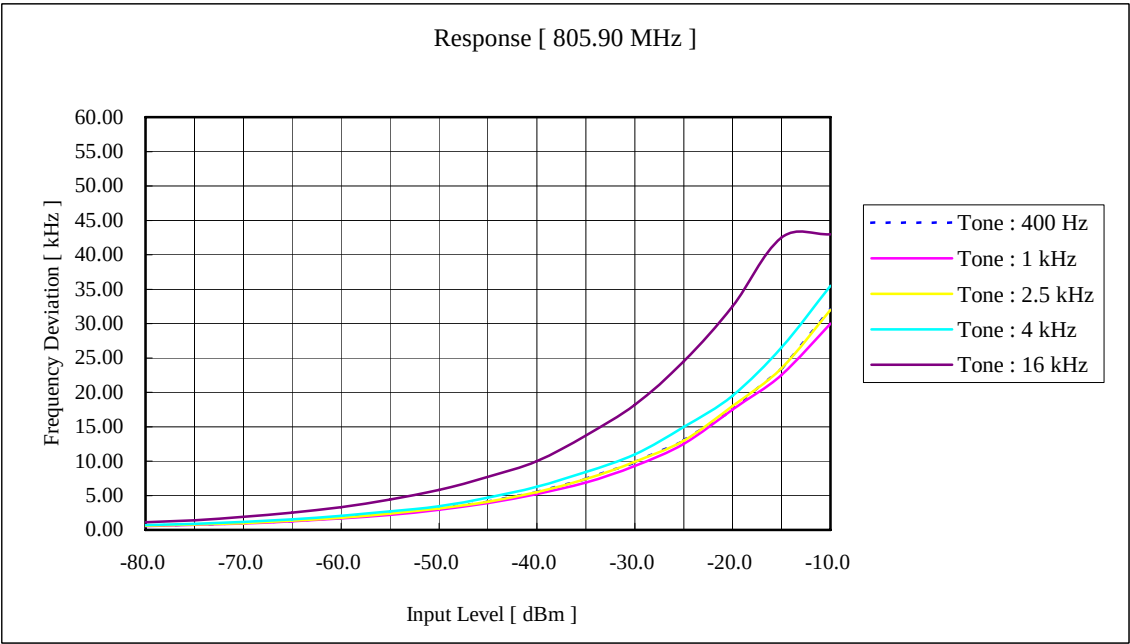


- Continued -

2) Setting A (800.00MHz)



3) Setting B (805.90MHz)



[Environment]

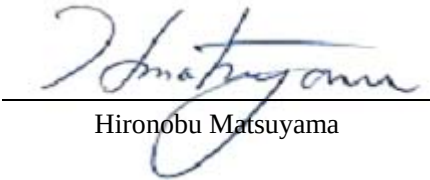
Temperature: 23 °C

Humidity: 50 %

[Tested Date / Tester]

4 November 2006

Signature

  
Hironobu Matsuyama

## 6. EMISSION BANDWIDTH

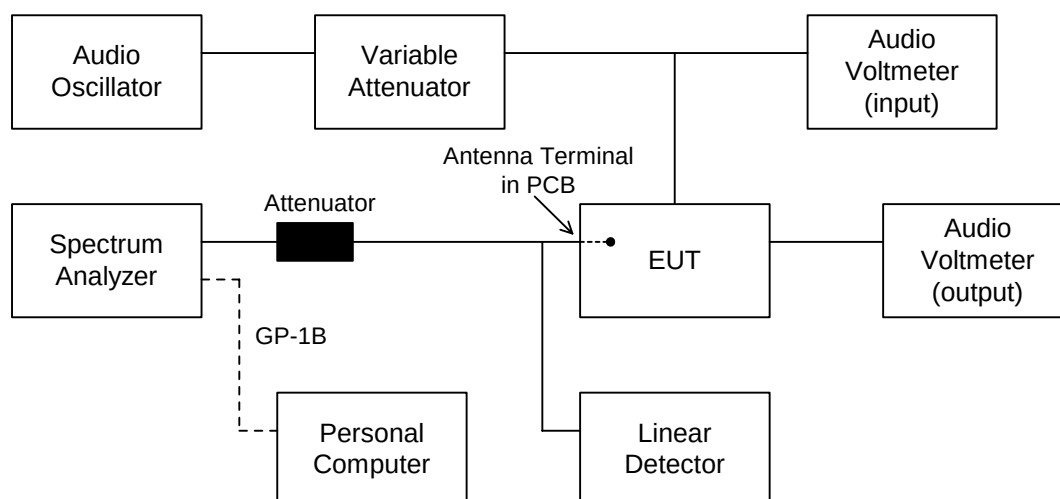
### 6.1. Reference Rule and Specification

FCC Part 74 Subpart H [Section (e) (5)] and [Section (6) (i) (ii)]  
FCC Part 2 Subpart J [Section 2.1049]

### 6.2. 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.

### 6.3. Test Configuration



#### 6.4. Test Results

See next figure (the picture of spectrum analyzer)

##### Occupied Bandwidth

The OBW was measured by the spectrum analyzer 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.

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

where,  $R$  is input impedance of R3261B.

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.

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

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

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

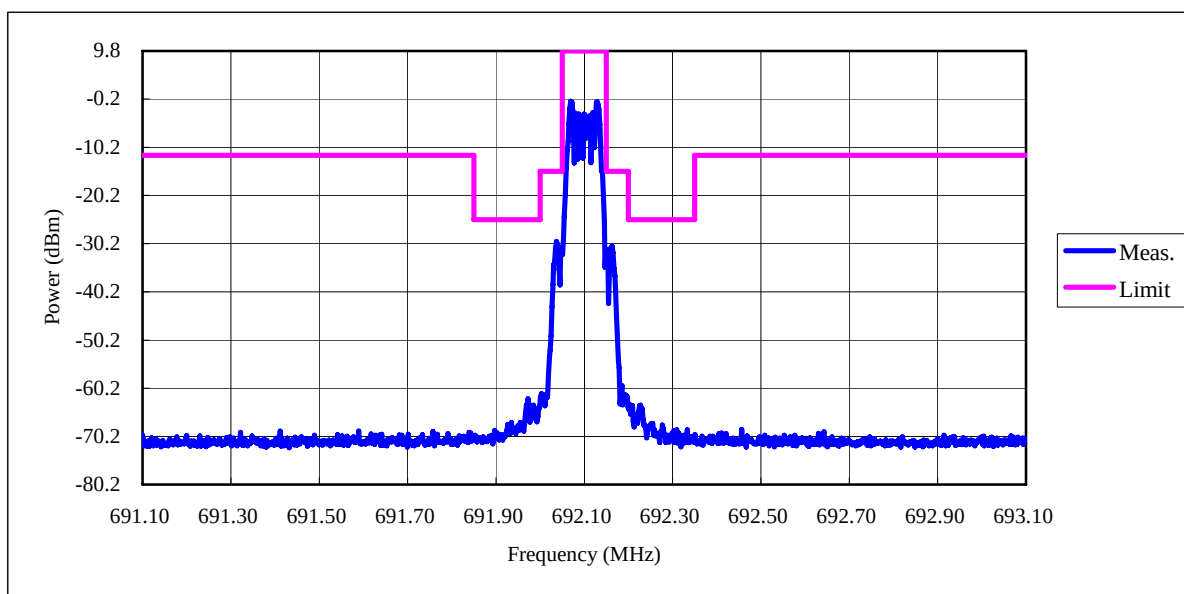
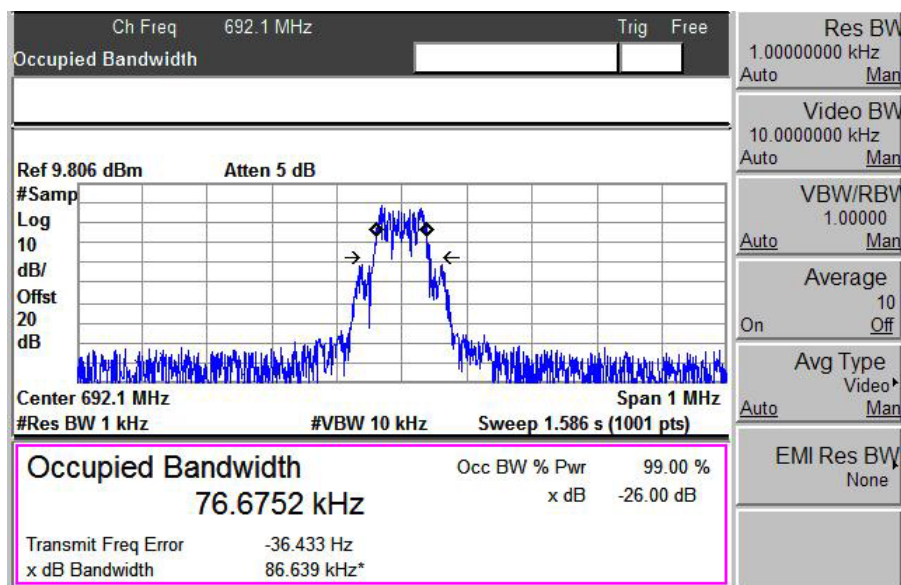
$$OBW = \frac{F_{span}(Y - X)}{1000}$$

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

- Continued -

(1) A, B Band

1) Setting 6 (692.10MHz)



[Note]

- (1) Maximum response of audio frequency was 16kHz. and maximum frequency deviation was 45kHz.
- (2) Then 50% of maximum frequency deviation was 22.5kHz. and input level became to -38.3dBm.
- (3) Then EUT was modulated by 2.5kHz and audio input level became to -38.3 + 16 = -22.3dBm.
- (4) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth : at least 25dB.
- (5) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth : at least 35dB.
- (6) One any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth at least  $43 + 10 \log_{10}$  (mean output power in watt) dB.

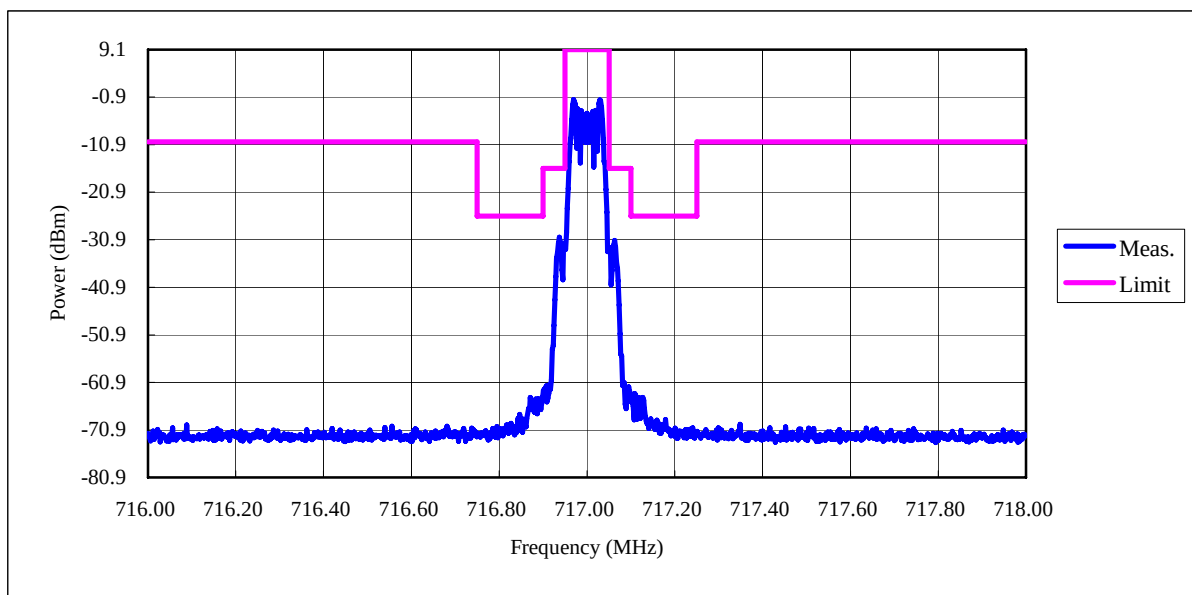
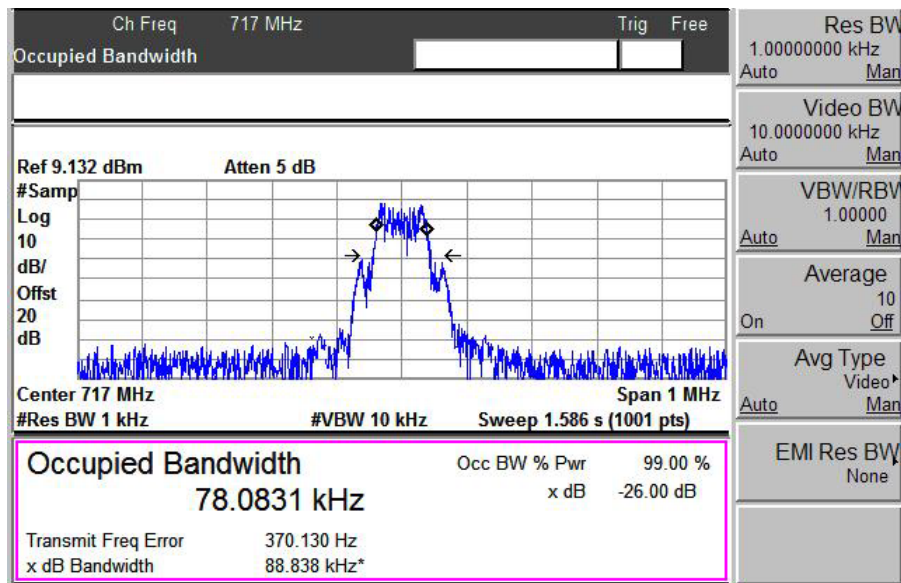
For 692.10MHz

$$\text{Limit} = 43 + (8.7 - 30) = 21.7\text{dB} (-21.7\text{dBc})$$



- Continued -

## 2) Setting 7 (717.00MHz)



[Note]

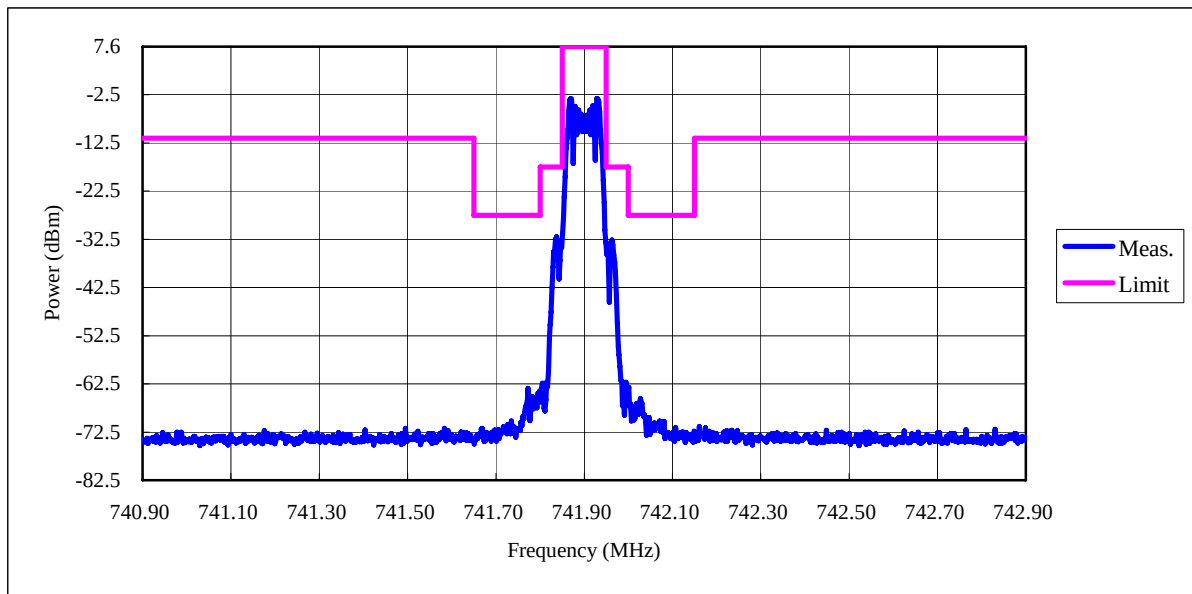
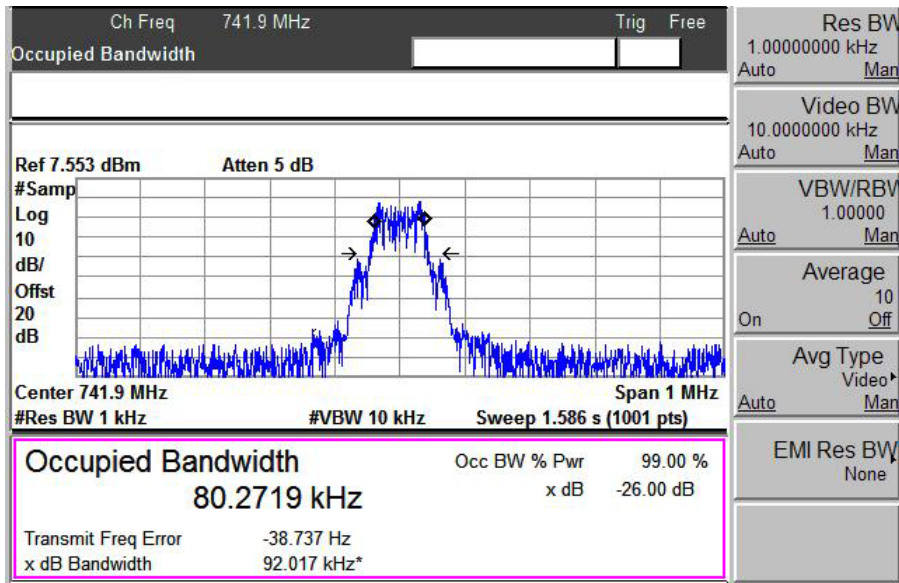
- (1) Maximum response of audio frequency was 16kHz. and maximum frequency deviation was 46kHz.
- (2) Then 50% of maximum frequency deviation was 23kHz. and input level became to -38.5dBm.
- (3) Then EUT was modulated by 2.5kHz and audio input level became to -38.5 + 16 = -22.5dBm.
- (4) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth : at least 25dB.
- (5) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth : at least 35dB.
- (6) One any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth at least  $43 + 10 \log_{10}$  (mean output power in watt) dB.

For 717.00MHz

$$\text{Limit} = 43 + (6.4 - 30) = 19.4\text{dB} (-19.4\text{dBc})$$

- Continued -

### 3) Setting 8 (741.90MHz)



[Note]

- (1) Maximum response of audio frequency was 16kHz. and maximum frequency deviation was 47kHz.
- (2) Then 50% of maximum frequency deviation was 23.5kHz. and input level became to -38.2dBm.
- (3) Then EUT was modulated by 2.5kHz and audio input level became to -38.2 + 16 = -22.2dBm.
- (4) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth : at least 25dB.
- (5) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth : at least 35dB.
- (6) One any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth at least  $43 + 10 \log_{10}$  (mean output power in watt) dB.

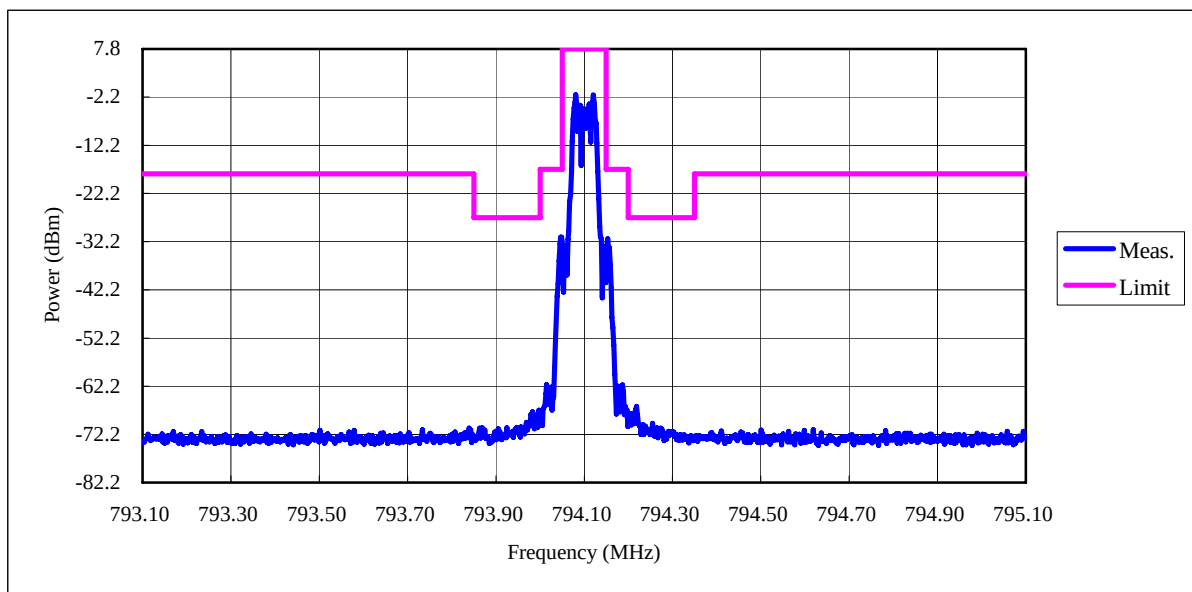
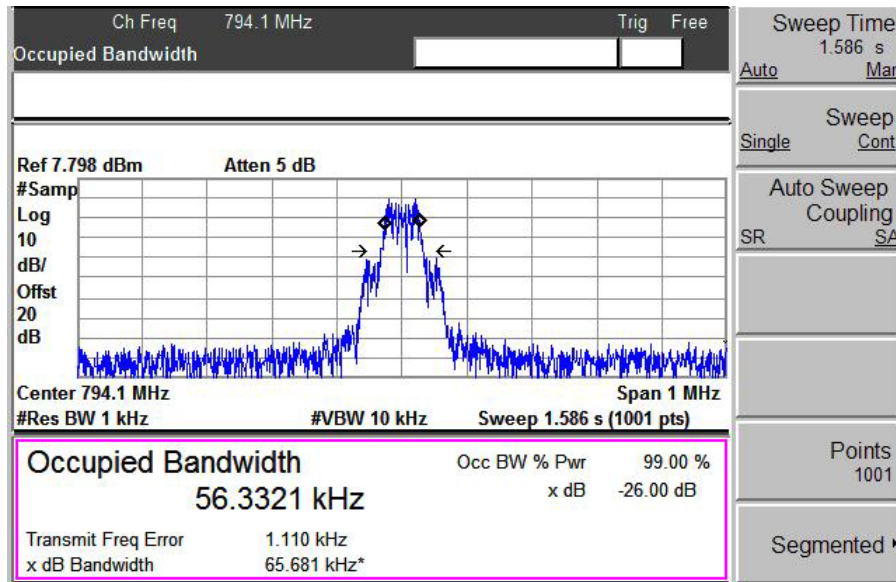
For 741.90MHz

$$\text{Limit} = 43 + (6.0 - 30) = 19.0\text{dB} (-19.0\text{dBc})$$

- Continued -

(2) C, D Band

1) Setting 9 (794.10MHz)



[Note]

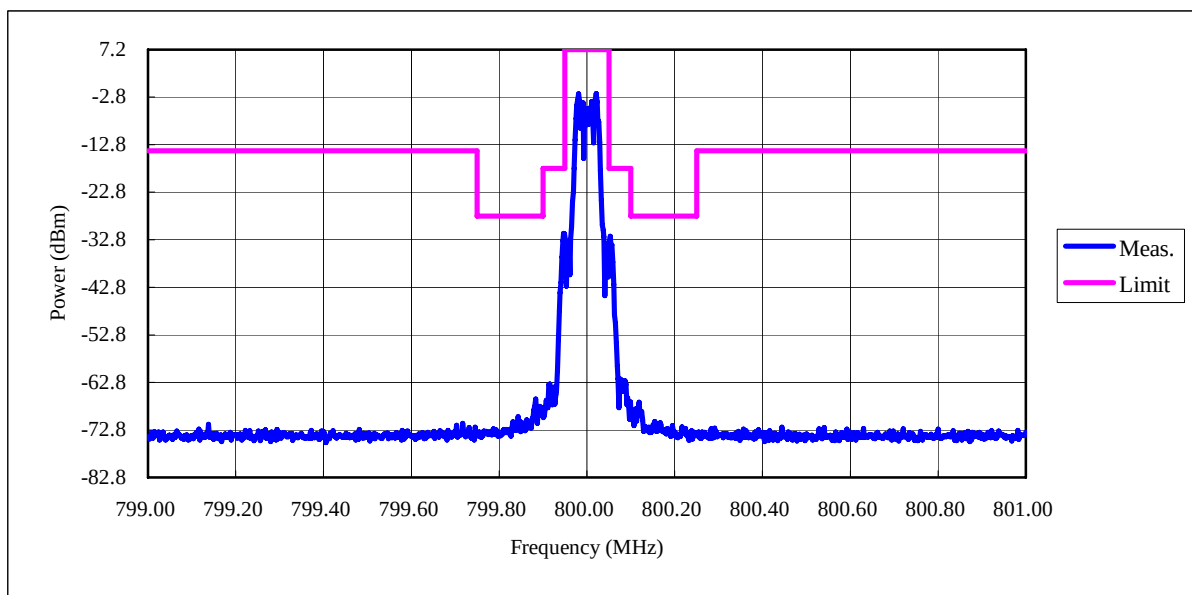
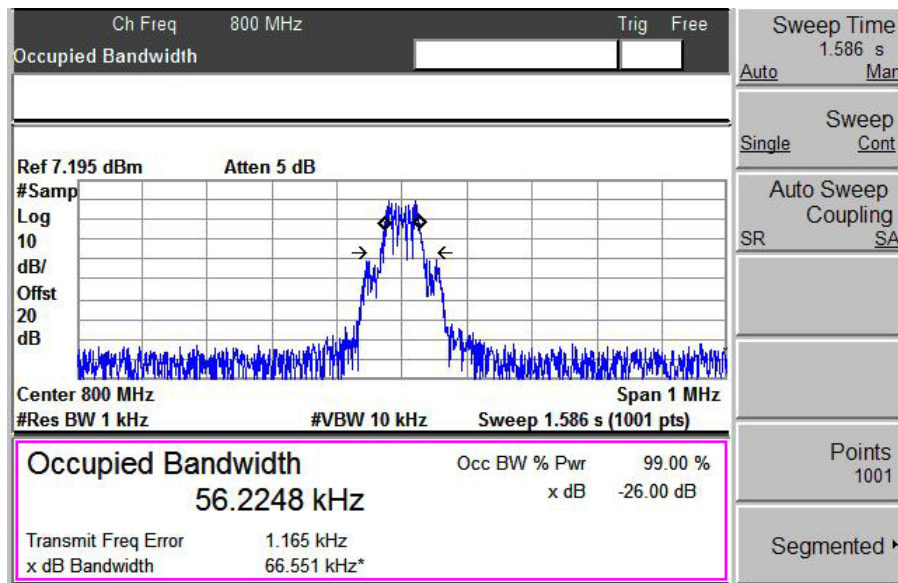
- (1) Maximum response of audio frequency was 16kHz. and maximum frequency deviation was 42kHz.
- (2) Then 50% of maximum frequency deviation was 21kHz. and input level became to -38.3dBm.
- (3) Then EUT was modulated by 2.5kHz and audio input level became to -38.3 + 16 = -22.3dBm.
- (4) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth : at least 25dB.
- (5) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth : at least 35dB.
- (6) One any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth at least  $43 + 10 \log_{10}$  (mean output power in watt) dB.

For 794.10MHz

$$\text{Limit} = 43 + (12.9 - 30) = 25.9\text{dB} \text{ (-25.9dBc)}$$

- Continued -

## 2) Setting A (800.00MHz)



[Note]

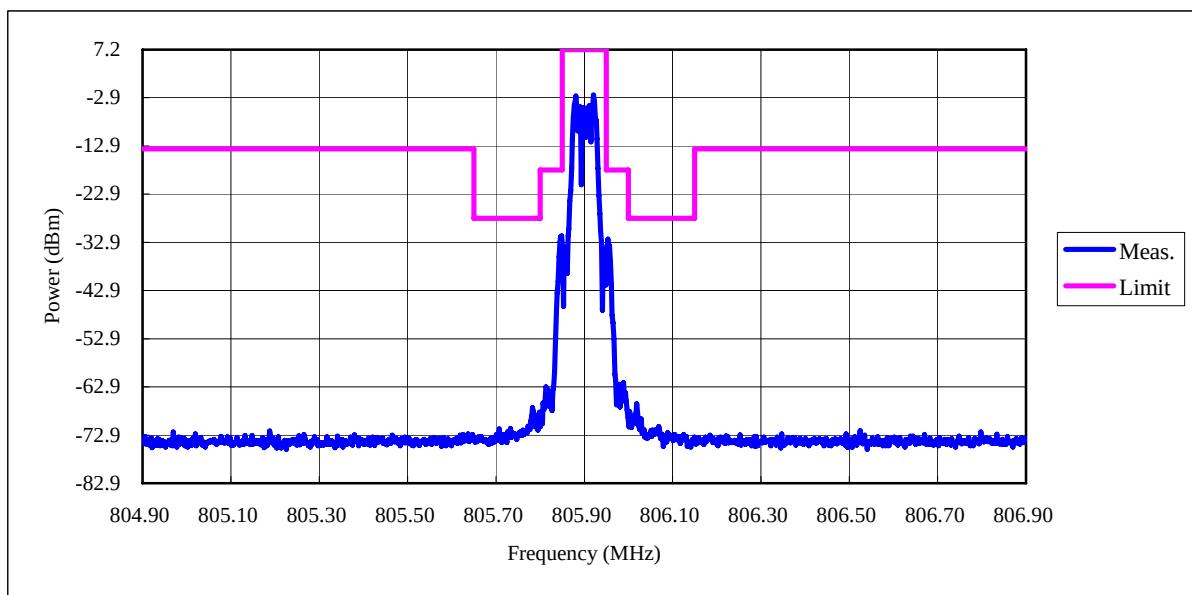
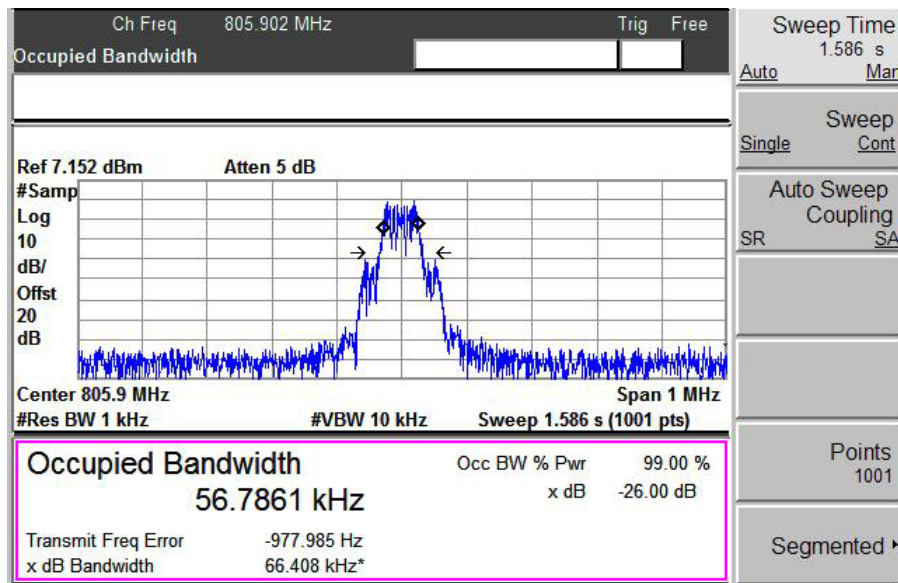
- (1) Maximum response of audio frequency was 16kHz. and maximum frequency deviation was 43kHz.
- (2) Then 50% of maximum frequency deviation was 21.5kHz. and input level became to -38.5dBm.
- (3) Then EUT was modulated by 2.5kHz and audio input level became to -38.5 + 16 = -22.5dBm.
- (4) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth : at least 25dB.
- (5) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth : at least 35dB.
- (6) One any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth at least  $43 + 10 \log_{10}(\text{mean output power in watt})$  dB.

For 800.00MHz

$$\text{Limit} = 43 + (8.3 - 30) = 21.3\text{dB} \text{ (-21.3dBc)}$$

- Continued -

### 3) Setting B (805.90MHz)



[Note]

- (1) Maximum response of audio frequency was 16kHz. and maximum frequency deviation was 43kHz.
- (2) Then 50% of maximum frequency deviation was 21.5kHz. and input level became to -38.2dBm.
- (3) Then EUT was modulated by 2.5kHz and audio input level became to -38.2 + 16 = -22.2dBm.
- (4) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth : at least 25dB.
- (5) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth : at least 35dB.
- (6) One any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth at least  $43 + 10 \log_{10}$  (mean output power in watt) dB.

For 805.90MHz

$$\text{Limit} = 43 + (7.6 - 30) = 20.6\text{dB} \text{ (-20.6dBc)}$$

- Continued -

[Environment]

Temperature: 23 °C

Humidity: 50 %

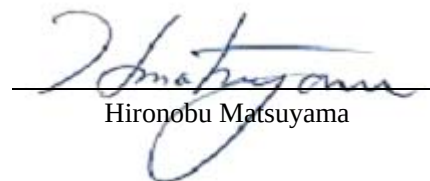
[Summary of Test Results]

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

[Tested Date / Tester]

4 November 2006

Signature

A handwritten signature in blue ink, appearing to read 'H. Matsuyama', is written over a horizontal line. Below the line, the name 'Hironobu Matsuyama' is printed.

Hironobu Matsuyama

## 7. FIELD STRENGTH OF SPURIOUS RADIATION

### 7.1. Reference Rule and Specification

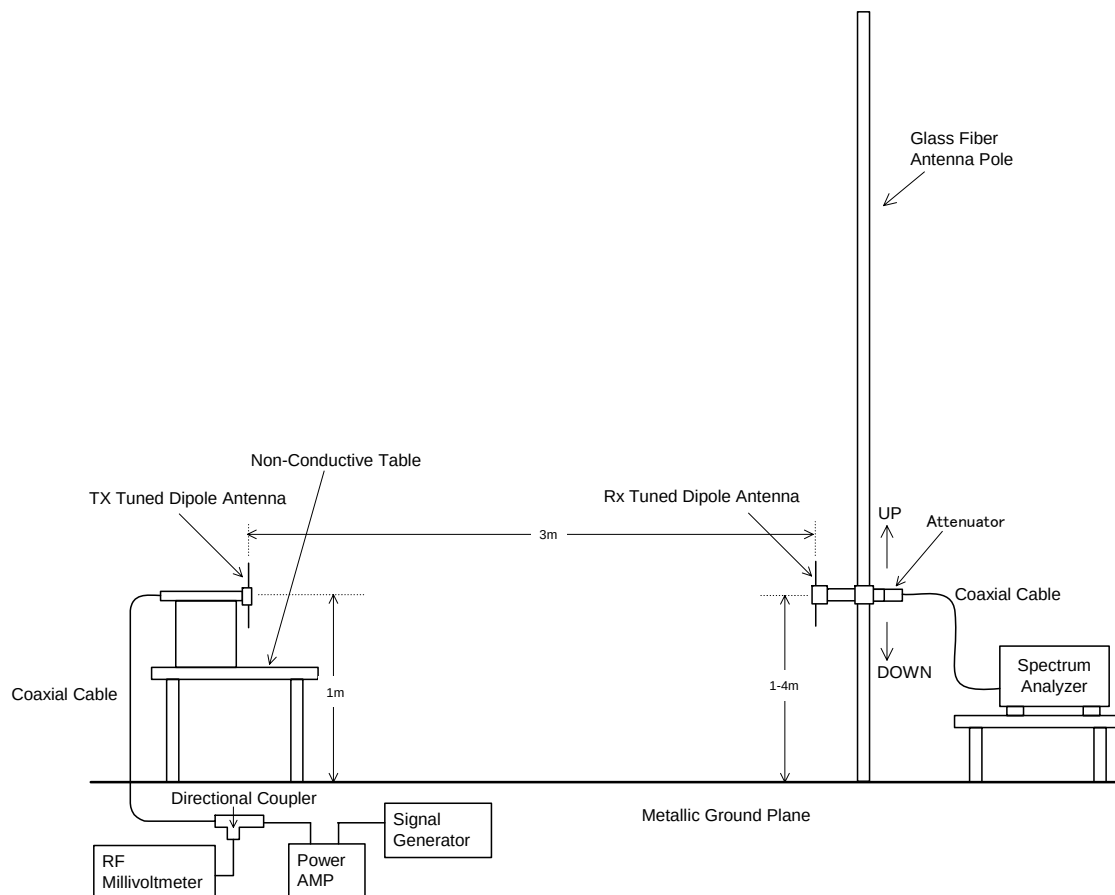
FCC Rule Part 74 Subpart H [Section 74.861 (e) (6) (iii)] and Part 2 Subpart J [Section 2.1053]

### 7.2. Test Procedure

- (1) Tune-up the transmitter (EUT).
- (2) The device is arranged in X axis.
- (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) The device is arranged in Y axis.
- (7) Repeat Step3, Step4, and Step5
- (8) The attenuation of the spurious in dB can be calculated from the following formula:  

$$\text{Spurious Emission Attenuation [dB]} = \text{Carrier Power [dBm]} - \text{Spurious Emission Power [dBm]}$$

### 7.3. Test Configuration



## 7.4. Test Results

## (1) A, B Band

## 1) Setting 6 (692.10MHz)

| Spurious Emission Frequency (MHz) | Spectrum Analyzer Reading |                 | RF Meter Reading |                | Antenna Gain (dB ) | Cable Loss (dB) | ERP (dBm) | Spurious Attenuation (dBc) | Limit (dBc) | Margin (dB) |
|-----------------------------------|---------------------------|-----------------|------------------|----------------|--------------------|-----------------|-----------|----------------------------|-------------|-------------|
|                                   | Horizontal (dBuV)         | Vertical (dBuV) | Horizontal (dBm) | Vertical (dBm) |                    |                 |           |                            |             |             |
| 1384.20                           | 43.0                      | 39.5            | -56.3            | -59.8          | 11.7               | 1.3             | -48.0     | -56.7                      | -21.7       | 35.0        |
| 2076.30                           | 49.3                      | 47.9            | -60.6            | -62.0          | 15.7               | 1.6             | -48.6     | -57.3                      | -21.7       | 35.6        |
| 2768.40                           | 48.9                      | 45.3            | -61.8            | -65.4          | 17.9               | 1.9             | -47.9     | -56.6                      | -21.7       | 34.9        |
| 3460.50                           | 38.7                      | 37.0            | -71.4            | -73.1          | 19.5               | 2.2             | -56.2     | -64.9                      | -21.7       | 43.2        |
| 4152.60                           | 32.5                      | 35.3            | -75.5            | -72.7          | 20.3               | 2.4             | -56.9     | -65.6                      | -21.7       | 43.9        |
| 4844.70                           | 32.3                      | 33.3            | -73.9            | -72.9          | 20.9               | 2.6             | -56.7     | -65.4                      | -21.7       | 43.7        |
| 5536.80                           | 32.0                      | <30.0           | -81.4            | <-83.4         | 19.2               | 2.8             | -67.1     | -75.8                      | -21.7       | 54.1        |
| 6228.90                           | <30.0                     | <30.0           | <-85.6           | <-85.6         | 21.8               | 3.0             | <-68.9    | <-77.6                     | -21.7       | >55.9       |
| 6921.00                           | <30.0                     | <30.0           | <-85.0           | <-85.0         | 22.0               | 3.4             | <-68.5    | <-77.2                     | -21.7       | >55.5       |

## 2) Setting 7 (717.00MHz)

| Spurious Emission Frequency (MHz) | Spectrum Analyzer Reading |                 | RF Meter Reading |                | Antenna Gain (dB ) | Cable Loss (dB) | ERP (dBm) | Spurious Attenuation (dBc) | Limit (dBc) | Margin (dB) |
|-----------------------------------|---------------------------|-----------------|------------------|----------------|--------------------|-----------------|-----------|----------------------------|-------------|-------------|
|                                   | Horizontal (dBuV)         | Vertical (dBuV) | Horizontal (dBm) | Vertical (dBm) |                    |                 |           |                            |             |             |
| 1434.00                           | 44.2                      | 40.4            | -54.7            | -58.2          | 12.1               | 1.4             | -46.1     | -52.5                      | -19.4       | 33.1        |
| 2151.00                           | 47.7                      | 45.2            | -61.2            | -63.5          | 15.9               | 1.7             | -49.1     | -55.5                      | -19.4       | 36.1        |
| 2868.00                           | 50.4                      | 43.0            | -58.7            | -65.4          | 18.2               | 1.9             | -44.5     | -50.9                      | -19.4       | 31.5        |
| 3585.00                           | 36.7                      | 41.7            | -68.2            | -64.8          | 19.6               | 2.2             | -49.5     | -55.9                      | -19.4       | 36.5        |
| 4302.00                           | 35.3                      | 34.1            | -67.7            | -68.2          | 20.3               | 2.4             | -51.9     | -58.3                      | -19.4       | 38.9        |
| 5019.00                           | 36.7                      | 39.6            | -76.3            | -71.9          | 18.8               | 2.6             | -57.8     | -64.2                      | -19.4       | 44.8        |
| 5736.00                           | 33.8                      | <30.0           | -77.8            | <-80.2         | 19.3               | 2.8             | -63.4     | -69.8                      | -19.4       | 50.4        |
| 6453.00                           | 35.8                      | 31.0            | -75.6            | -79.7          | 21.8               | 3.2             | -59.1     | -65.5                      | -19.4       | 46.1        |
| 7170.00                           | <30.0                     | <30.0           | <-79.3           | <-79.2         | 22.0               | 3.5             | <-62.8    | <-69.2                     | -19.4       | >49.8       |

## 3) Setting 8 (741.90MHz)

| Spurious Emission Frequency (MHz) | Spectrum Analyzer Reading |                 | RF Meter Reading |                | Antenna Gain (dB ) | Cable Loss (dB) | ERP (dBm) | Spurious Attenuation (dBc) | Limit (dBc) | Margin (dB) |
|-----------------------------------|---------------------------|-----------------|------------------|----------------|--------------------|-----------------|-----------|----------------------------|-------------|-------------|
|                                   | Horizontal (dBuV)         | Vertical (dBuV) | Horizontal (dBm) | Vertical (dBm) |                    |                 |           |                            |             |             |
| 1483.80                           | 42.8                      | 39.4            | -56.7            | -60.2          | 12.7               | 1.4             | -47.5     | -53.5                      | -19.0       | 34.5        |
| 2225.70                           | 49.8                      | 46.3            | -59.0            | -62.7          | 16.2               | 1.7             | -46.6     | -52.6                      | -19.0       | 33.6        |
| 2967.60                           | 50.8                      | 47.2            | -58.5            | -61.6          | 18.6               | 2.0             | -44.0     | -50.0                      | -19.0       | 31.0        |
| 3709.50                           | 35.5                      | 41.6            | -70.9            | -64.3          | 19.6               | 2.2             | -49.0     | -55.0                      | -19.0       | 36.0        |
| 4451.40                           | 38.4                      | 37.8            | -64.4            | -63.4          | 20.3               | 2.5             | -47.7     | -53.7                      | -19.0       | 34.7        |
| 5193.30                           | 42.8                      | 42.6            | -68.2            | -68.0          | 18.8               | 2.7             | -54.0     | -60.0                      | -19.0       | 41.0        |
| 5935.20                           | 37.0                      | 33.1            | -74.9            | -78.2          | 21.1               | 2.9             | -58.8     | -64.8                      | -19.0       | 45.8        |
| 6677.10                           | 33.9                      | 36.9            | -77.0            | -73.6          | 21.6               | 3.3             | -57.4     | -63.4                      | -19.0       | 44.4        |
| 7419.00                           | 32.0                      | <30.0           | -78.2            | <-80.0         | 22.2               | 3.6             | -61.7     | -67.7                      | -19.0       | 48.7        |



- Continued -

(2) C, D Band

1) Setting 9 (794.10MHz)

| Spurious Emission Frequency (MHz) | Spectrum Analyzer Reading |                 | RF Meter Reading |                | Antenna Gain (dB ) | Cable Loss (dB) | ERP (dBm) | Spurious Attenuation (dBc) | Limit (dBc) | Margin (dB) |
|-----------------------------------|---------------------------|-----------------|------------------|----------------|--------------------|-----------------|-----------|----------------------------|-------------|-------------|
|                                   | Horizontal (dBuV)         | Vertical (dBuV) | Horizontal (dBm) | Vertical (dBm) |                    |                 |           |                            |             |             |
| 1588.20                           | 36.4                      | 33.5            | -64.9            | -67.8          | 13.7               | 1.4             | -54.7     | -67.6                      | -25.9       | 41.7        |
| 2382.30                           | 51.3                      | 50.7            | -59.5            | -60.1          | 16.7               | 1.8             | -46.7     | -59.6                      | -25.9       | 33.7        |
| 3176.40                           | 54.8                      | 50.2            | -55.4            | -60.0          | 18.9               | 2.1             | -40.7     | -53.6                      | -25.9       | 27.7        |
| 3970.50                           | 42.9                      | 37.0            | -66.1            | -72.0          | 20.0               | 2.3             | -50.5     | -63.4                      | -25.9       | 37.5        |
| 4764.60                           | 39.8                      | 37.9            | -66.1            | -68.0          | 20.9               | 2.6             | -49.9     | -62.8                      | -25.9       | 36.9        |
| 5558.70                           | 45.6                      | 40.5            | -67.6            | -72.7          | 19.3               | 2.8             | -53.2     | -66.1                      | -25.9       | 40.2        |
| 6352.80                           | 32.0                      | 35.5            | -82.9            | -79.4          | 21.8               | 3.1             | -62.8     | -75.7                      | -25.9       | 49.8        |
| 7146.90                           | <30.0                     | 31.0            | <-84.1           | -83.1          | 22.0               | 3.5             | -66.7     | -79.6                      | -25.9       | 53.7        |
| 7941.00                           | <30.0                     | <30.0           | <-83.2           | <-83.2         | 22.2               | 3.6             | <-66.7    | <-79.6                     | -25.9       | >53.7       |

2) Setting A (800.00MHz)

| Spurious Emission Frequency (MHz) | Spectrum Analyzer Reading |                 | RF Meter Reading |                | Antenna Gain (dB ) | Cable Loss (dB) | ERP (dBm) | Spurious Attenuation (dBc) | Limit (dBc) | Margin (dB) |
|-----------------------------------|---------------------------|-----------------|------------------|----------------|--------------------|-----------------|-----------|----------------------------|-------------|-------------|
|                                   | Horizontal (dBuV)         | Vertical (dBuV) | Horizontal (dBm) | Vertical (dBm) |                    |                 |           |                            |             |             |
| 1600.00                           | 35.8                      | 33.3            | -64.9            | -67.7          | 13.8               | 1.4             | -54.6     | -62.9                      | -21.3       | 41.6        |
| 2400.00                           | 48.8                      | 50.5            | -59.4            | -58.7          | 16.7               | 1.8             | -45.9     | -54.2                      | -21.3       | 32.9        |
| 3200.00                           | 51.4                      | 53.7            | -55.7            | -54.6          | 18.9               | 2.1             | -39.9     | -48.2                      | -21.3       | 26.9        |
| 4000.00                           | 40.1                      | 41.3            | -63.7            | -61.2          | 20.1               | 2.3             | -45.5     | -53.8                      | -21.3       | 32.5        |
| 4800.00                           | 35.4                      | 39.9            | -67.0            | -62.2          | 20.9               | 2.6             | -46.0     | -54.3                      | -21.3       | 33.0        |
| 5600.00                           | 45.9                      | 41.4            | -64.3            | -69.8          | 19.3               | 2.8             | -49.9     | -58.2                      | -21.3       | 36.9        |
| 6400.00                           | 31.5                      | 35.0            | -79.8            | -75.8          | 21.7               | 3.1             | -59.3     | -67.6                      | -21.3       | 46.3        |
| 7200.00                           | 30.5                      | 32.0            | -79.2            | -77.5          | 22.0               | 3.5             | -61.1     | -69.4                      | -21.3       | 48.1        |
| 8000.00                           | 30.5                      | <30.0           | -78.3            | <-78.1         | 22.3               | 3.6             | <-61.5    | <-69.8                     | -21.3       | >48.5       |

3) Setting B (805.90MHz)

| Spurious Emission Frequency (MHz) | Spectrum Analyzer Reading |                 | RF Meter Reading |                | Antenna Gain (dB ) | Cable Loss (dB) | ERP (dBm) | Spurious Attenuation (dBc) | Limit (dBc) | Margin (dB) |
|-----------------------------------|---------------------------|-----------------|------------------|----------------|--------------------|-----------------|-----------|----------------------------|-------------|-------------|
|                                   | Horizontal (dBuV)         | Vertical (dBuV) | Horizontal (dBm) | Vertical (dBm) |                    |                 |           |                            |             |             |
| 1611.80                           | 35.0                      | 33.1            | -65.5            | -67.6          | 13.8               | 1.4             | -55.2     | -62.8                      | -20.6       | 42.2        |
| 2417.70                           | 49.4                      | 49.2            | -58.3            | -59.6          | 16.8               | 1.8             | -45.4     | -53.0                      | -20.6       | 32.4        |
| 3223.60                           | 53.6                      | 49.9            | -53.7            | -58.3          | 19.0               | 2.1             | -38.9     | -46.5                      | -20.6       | 25.9        |
| 4029.50                           | 41.4                      | 40.3            | -62.0            | -62.0          | 20.1               | 2.3             | -46.3     | -53.9                      | -20.6       | 33.3        |
| 4835.40                           | 36.5                      | 36.6            | -66.3            | -65.7          | 20.9               | 2.6             | -49.5     | -57.1                      | -20.6       | 36.5        |
| 5641.30                           | 43.5                      | 45.3            | -68.3            | -65.2          | 19.3               | 2.8             | -50.8     | -58.4                      | -20.6       | 37.8        |
| 6447.20                           | 32.5                      | 34.4            | -77.9            | -76.0          | 21.8               | 3.2             | -59.5     | -67.1                      | -20.6       | 46.5        |
| 7253.10                           | 32.0                      | 31.0            | -77.9            | -78.6          | 22.0               | 3.5             | -61.5     | -69.1                      | -20.6       | 48.5        |
| 8059.00                           | 31.0                      | <30.0           | -77.9            | <-78.3         | 22.3               | 3.7             | -61.4     | -69.0                      | -20.6       | 48.4        |

- Continued -

[Calculation method]

Effective Radiated Power (Horizontal or Vertical Polarization) [dBm]

$$= \text{Meter Reading (Horizontal or Vertical Polarization) [dBm]} + \text{Tx Ant. Gain [dBi]} - 2.2 \text{ [dBi]} (*) \\ - \text{Cable loss [dB]}$$

\* : Half wave dipole antenna isotropic gain

[Calculation of Limit]

$$43 + 10 \log_{10} P \text{ (W) dB}$$

- For 692.10MHz  
Limit =  $43 + (8.7 - 30) = 21.7\text{dB} (-21.7\text{dBc})$
- For 717.00MHz  
Limit =  $43 + (6.4 - 30) = 19.4\text{dB} (-19.4\text{dBc})$
- For 741.90MHz  
Limit =  $43 + (6.0 - 30) = 19.0\text{dB} (-19.0\text{dBc})$
- For 794.10MHz  
Limit =  $43 + (12.9 - 30) = 25.9\text{dB} (-25.9\text{dBc})$
- For 800.00MHz  
Limit =  $43 + (6.8 - 30) = 21.3\text{dB} (-21.3\text{dBc})$
- For 805.90MHz  
Limit =  $43 + (5.8 - 30) = 20.6\text{dB} (-20.6\text{dBc})$

[Environment]

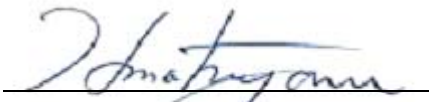
Temperature: 23 °C

Humidity: 50 %

[Tested Date / Tester]

4 November 2006

Signature

  
Hironobu Matsuyama

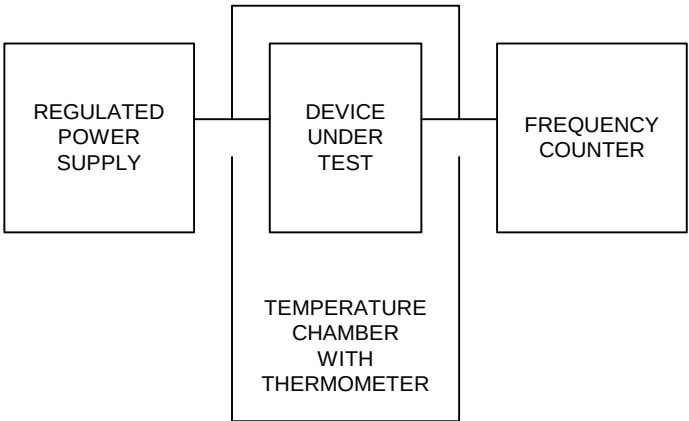
8. FREQUENCY STABILITY MEASUREMENT

8.1. Reference Rule and Specification

FCC Rule Part 74 Subpart H [Section 743.861 (e) (4)] and Part 2 Subpart J [Section 2.1055]

8.2. Frequency vs Temperature Test

Test Setup Diagram



(1) A, B Band

1) Setting 6 (692.10MHz)

Test Voltage : 1.50V

| REFERENCE<br>FREQUENCY<br>[ MHz ] | TEMPERATURE<br>[ °C ] | FREQUENCY<br>DRIFT<br>[ % ] | LIMIT<br>[ % ] |
|-----------------------------------|-----------------------|-----------------------------|----------------|
| 692.10                            | -30                   | -0.000136                   | ±0.005         |
|                                   | -20                   | 0.000390                    |                |
|                                   | -10                   | 0.000650                    |                |
|                                   | 0                     | 0.000743                    |                |
|                                   | +10                   | 0.000623                    |                |
|                                   | +20                   | 0.000355                    |                |
|                                   | +30                   | 0.000001                    |                |
|                                   | +40                   | -0.000371                   |                |
|                                   | +50                   | -0.000577                   |                |

- Continued -

2) Setting 7 (717.00MHz)

**Test Voltage : 1.50V**

| REFERENCE<br>FREQUENCY<br>[ MHz ] | TEMPERATURE<br>[ °C ] | FREQUENCY<br>DRIFT<br>[ % ] | LIMIT<br>[ % ] |
|-----------------------------------|-----------------------|-----------------------------|----------------|
| 717.00                            | -30                   | -0.000141                   | ±0.005         |
|                                   | -20                   | 0.000389                    |                |
|                                   | -10                   | 0.000649                    |                |
|                                   | 0                     | 0.000742                    |                |
|                                   | +10                   | 0.000621                    |                |
|                                   | +20                   | 0.000358                    |                |
|                                   | +30                   | -0.000003                   |                |
|                                   | +40                   | -0.000370                   |                |
|                                   | +50                   | -0.000579                   |                |

3) Setting 8 (741.90MHz)

**Test Voltage : 1.50V**

| REFERENCE<br>FREQUENCY<br>[ MHz ] | TEMPERATURE<br>[ °C ] | FREQUENCY<br>DRIFT<br>[ % ] | LIMIT<br>[ % ] |
|-----------------------------------|-----------------------|-----------------------------|----------------|
| 741.90                            | -30                   | -0.000139                   | ±0.005         |
|                                   | -20                   | 0.000388                    |                |
|                                   | -10                   | 0.000651                    |                |
|                                   | 0                     | 0.000741                    |                |
|                                   | +10                   | 0.000623                    |                |
|                                   | +20                   | 0.000359                    |                |
|                                   | +30                   | -0.000003                   |                |
|                                   | +40                   | -0.000372                   |                |
|                                   | +50                   | -0.000576                   |                |

- Continued -

(2) C, D Band

1) Setting 9 (794.10MHz)

**Test Voltage : 1.50V**

| REFERENCE<br>FREQUENCY<br>[ MHz ] | TEMPERATURE<br>[ °C ] | FREQUENCY<br>DRIFT<br>[ % ] | LIMIT<br>[ % ] |
|-----------------------------------|-----------------------|-----------------------------|----------------|
| 794.10                            | -30                   | 0.000237                    | ±0.005         |
|                                   | -20                   | 0.000763                    |                |
|                                   | -10                   | 0.000990                    |                |
|                                   | 0                     | 0.000981                    |                |
|                                   | +10                   | 0.000787                    |                |
|                                   | +20                   | 0.000445                    |                |
|                                   | +30                   | 0.000001                    |                |
|                                   | +40                   | -0.000471                   |                |
|                                   | +50                   | -0.000870                   |                |

2) Setting A (800.00MHz)

**Test Voltage : 1.50V**

| REFERENCE<br>FREQUENCY<br>[ MHz ] | TEMPERATURE<br>[ °C ] | FREQUENCY<br>DRIFT<br>[ % ] | LIMIT<br>[ % ] |
|-----------------------------------|-----------------------|-----------------------------|----------------|
| 800.00                            | -30                   | 0.000239                    | ±0.005         |
|                                   | -20                   | 0.000761                    |                |
|                                   | -10                   | 0.000991                    |                |
|                                   | 0                     | 0.000980                    |                |
|                                   | +10                   | 0.000788                    |                |
|                                   | +20                   | 0.000445                    |                |
|                                   | +30                   | -0.000002                   |                |
|                                   | +40                   | -0.000471                   |                |
|                                   | +50                   | -0.000861                   |                |

- Continued -

3) Setting B (805.90MHz)

Test Voltage : 1.50V

| REFERENCE<br>FREQUENCY<br>[ MHz ] | TEMPERATURE<br>[ °C ] | FREQUENCY<br>DRIFT<br>[ % ] | LIMIT<br>[ % ] |
|-----------------------------------|-----------------------|-----------------------------|----------------|
| 805.90                            | -30                   | 0.000237                    | ±0.005         |
|                                   | -20                   | 0.000762                    |                |
|                                   | -10                   | 0.000990                    |                |
|                                   | 0                     | 0.000982                    |                |
|                                   | +10                   | 0.000788                    |                |
|                                   | +20                   | 0.000445                    |                |
|                                   | +30                   | -0.000002                   |                |
|                                   | +40                   | -0.000470                   |                |
|                                   | +50                   | -0.000859                   |                |

[Environment]

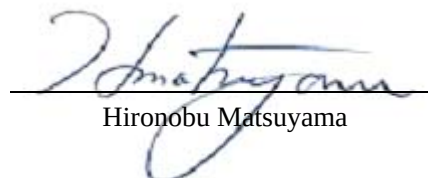
Temperature: 22 °C

Humidity: 50 %

[Tested Date / Tester]

7 October 2006

Signature

  
Hironobu Matsuyama

## 8.3. Frequency vs Voltage Test

(1) A, B Band

1) Setting 6 (692.10MHz)

**Test Voltage : 1.13V**

| REFERENCE<br>FREQUENCY<br>[ MHz ] | TEMPERATURE<br>[ °C ] | FREQUENCY<br>DRIFT<br>[ % ] | LIMIT<br>[ % ] |
|-----------------------------------|-----------------------|-----------------------------|----------------|
| 692.10                            | -10                   | 0.000652                    | ±0.005         |
|                                   | +20                   | 0.000357                    |                |
|                                   | +50                   | -0.000579                   |                |

[Note]

The test voltage is the lowest voltage of the manufacturer specification.

2) Setting 7 (717.00MHz)

**Test Voltage : 1.13V**

| REFERENCE<br>FREQUENCY<br>[ MHz ] | TEMPERATURE<br>[ °C ] | FREQUENCY<br>DRIFT<br>[ % ] | LIMIT<br>[ % ] |
|-----------------------------------|-----------------------|-----------------------------|----------------|
| 717.00                            | -10                   | 0.000650                    | ±0.005         |
|                                   | +20                   | 0.000358                    |                |
|                                   | +50                   | -0.000582                   |                |

[Note]

The test voltage is the lowest voltage of the manufacturer specification.

3) Setting 8 (741.90MHz)

**Test Voltage : 1.13V**

| REFERENCE<br>FREQUENCY<br>[ MHz ] | TEMPERATURE<br>[ °C ] | FREQUENCY<br>DRIFT<br>[ % ] | LIMIT<br>[ % ] |
|-----------------------------------|-----------------------|-----------------------------|----------------|
| 741.90                            | -10                   | 0.000650                    | ±0.005         |
|                                   | +20                   | 0.000356                    |                |
|                                   | +50                   | -0.000570                   |                |

[Note]

The test voltage is the lowest voltage of the manufacturer specification.

- Continued -

(2) C, D Band

1) Setting 9 (794.10MHz)

**Test Voltage : 1.13V**

| REFERENCE<br>FREQUENCY<br>[ MHz ] | TEMPERATURE<br>[ °C ] | FREQUENCY<br>DRIFT<br>[ % ] | LIMIT<br>[ % ] |
|-----------------------------------|-----------------------|-----------------------------|----------------|
| 794.10                            | -10                   | 0.000991                    | ±0.005         |
|                                   | +20                   | 0.000443                    |                |
|                                   | +50                   | -0.000866                   |                |

[Note]

The test voltage is the lowest voltage of the manufacturer specification.

2) Setting A (800.00MHz)

**Test Voltage : 1.13V**

| REFERENCE<br>FREQUENCY<br>[ MHz ] | TEMPERATURE<br>[ °C ] | FREQUENCY<br>DRIFT<br>[ % ] | LIMIT<br>[ % ] |
|-----------------------------------|-----------------------|-----------------------------|----------------|
| 800.00                            | -10                   | 0.000991                    | ±0.005         |
|                                   | +20                   | 0.000445                    |                |
|                                   | +50                   | -0.000862                   |                |

[Note]

The test voltage is the lowest voltage of the manufacturer specification.

3) Setting B (805.90MHz)

**Test Voltage : 1.13V**

| REFERENCE<br>FREQUENCY<br>[ MHz ] | TEMPERATURE<br>[ °C ] | FREQUENCY<br>DRIFT<br>[ % ] | LIMIT<br>[ % ] |
|-----------------------------------|-----------------------|-----------------------------|----------------|
| 805.90                            | -10                   | 0.000990                    | ±0.005         |
|                                   | +20                   | 0.000444                    |                |
|                                   | +50                   | -0.000859                   |                |

[Note]

The test voltage is the lowest voltage of the manufacturer specification.

[Environment]

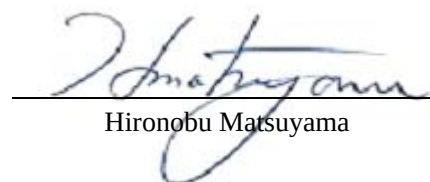
Temperature: 22 °C

Humidity: 50 %

[Tested Date / Tester]

7 October 2006

Signature

  
Hironobu Matsuyama



## 9. USED TEST EQUIPMENTS AND CALIBRATION STATUS

| KEC No.  | Equipment              | Manufacturer         | Model No.           | Last Cal. | Next Cal. |
|----------|------------------------|----------------------|---------------------|-----------|-----------|
| SA-046   | Spectrum Analyzer      | Anritu               | MS8608A             | 2006/08   | 2007/08   |
| SA-054   |                        | Agilent              | E4403B              | 2006/03   | 2007/03   |
| SA-039   |                        | Hewlett Packard      | 8564E               | 2006/04   | 2007/04   |
| AN-180   | Biconical Antenna      | Schwarzbeck          | VHA9103/<br>BBA9106 | 2006/02   | 2007/02   |
| AN-215   | Log-Periodic           | Schwarzbeck          | UHALP9107           | 2006/02   | 2007/02   |
| AN-135   | Tuned Dipole Antenna   | Kyoritsu             | KBA-511AS           | 2005/02   | 2007/02   |
| AN-137   |                        |                      | KBA-611S            | 2005/02   | 2007/02   |
| AT-034-3 | Fixed Attenuator       | Weinschel            | 44-3                | 2006/03   | 2007/03   |
| AT-044-1 |                        | Anritsu              | MP721A              | 2006/03   | 2007/03   |
| FS-081   | Test Receiver          | Rhode& Schwarz       | ESVS10              | 2006/03   | 2007/03   |
| MM-211   | RF Relay Matrix Unit   | Techno Science Japan | RFM-E321            | 2006/03   | 2007/03   |
| AM-069   | Pre-Amplifier          | SONOMA Instrument    | 310N                | 2006/07   | 2007/07   |
| AM-052   |                        | Hewlett Packard      | 8449B               | 2006/02   | 2007/02   |
| AN-167   | Std. Gain Horn Antenna | Ravan                | 91888-2             | 2005/03   | 2007/03   |
| AN-211   |                        |                      |                     | 2005/10   | 2007/10   |
| AN-168   |                        |                      | 91889-2             | 2005/03   | 2007/03   |
| AN-212   |                        |                      |                     | 2005/10   | 2007/10   |
| AN-231   |                        | Scientific Atlanta   | 12-3.9              | 2005/03   | 2007/03   |
| AN-142   |                        |                      |                     | 2005/10   | 2007/10   |
| AN-143   |                        |                      | 12-5.8              | 2005/03   | 2007/03   |
| AN-104   |                        |                      |                     | 2005/10   | 2007/10   |

- Continued -

| KEC No.  | Equipment                            | Manufacturer             | Model No.   | Last Cal. | Next Cal. |
|----------|--------------------------------------|--------------------------|-------------|-----------|-----------|
| CL-042   | Coaxial Cable                        | Suhner                   | SUCOFLEX104 | 2006/03   | 2007/03   |
| CL-046   |                                      |                          |             | 2006/03   | 2007/03   |
| CL-03-05 |                                      |                          | SUCOFLEX100 | 2006/03   | 2007/03   |
| VV-039   | Power Meter                          | Hewlett Packard          | E4419B      | 2006/10   | 2007/10   |
| VV-039-1 | Power Sensor                         | Hewlett Packard          | E4412A      | 2006/10   | 2007/10   |
| SF-004   | Regulated DC Power Supply            | Kikusui                  | PAS40-9     | —         | —         |
| CH-031   | Temperature Chamber With Thermometer | Tabai Mfg.               | MC-710      | 2006/07   | 2007/07   |
| CH-017   | Frequency Counter                    | Anritsu                  | MF2412B     | 2006/06   | 2007/06   |
| MM-091   | Multimeter                           | John Fluke               | 37          | 2006/02   | 2007/02   |
| SG-038   | Signal Generator                     | Willtron                 | 6759A-10    | 2005/12   | 2006/12   |
| MG-041   | Synthesized Level Generator          | Anritsu                  | MG443B      | 2005/11   | 2006/11   |
| MM-054   | FM Linear Detector                   | Anritsu                  | MS61A       | 2006/04   | 2007/04   |
| AT-020   | Variable Attenuator                  | Tamagawa Electronics     | TRA-603D    | 2006/04   | 2007/04   |
| VV-019   | AC Voltmeter                         | Matsushita Communication | VP-9690A    | 2006/06   | 2007/06   |
| VV-020   |                                      |                          | VP-9631A    | 2006/06   | 2007/06   |
| AX-062   | Directional Coupler                  | Hewlett Packard          | 86205A      | 2006/08   | 2007/08   |

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.