



## CERTIFICATE OF COMPLIANCE

**Regulation :** FCC Part 2, 22, 74, 90, 90.210  
RSS-119 Issue 6(2000)

| Applicant                                                                                                                                      | Testing Laboratory                                                                                                                                                                                                                                                                               |
|------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| KENWOOD CORPORATION<br><br>1-16-2, Hakusan, Midori-ku, Yokohama-shi<br>Kanagawa, 226-8525 Japan<br>Tel.: +81 45 939 6254 Fax.: +81 45 939 7093 | Akzo Nobel K. K. Kashima No.1 , No.10 site<br>FCC Registration Number : 90433<br>IC File Number : IC-2065-1<br>1, Oaza Sunayama, Hasaki-machi, Kashima-gun<br>Ibaraki-ken, 314-0255 Japan<br>Tel.: +81 479 40 1097 Fax.: +81 479 46 1788<br>e-mail: info@akzoemc.co.jp<br>URL: www.akzoemc.co.jp |

|                   |                                      |
|-------------------|--------------------------------------|
| Equipment type    | VHF FM Transceiver                   |
| Trademark         | KENWOOD                              |
| Model(s)          | TK-7180-K                            |
| Serial No.        | 7                                    |
| FCC ID            | K4437303110                          |
| IC CN and UPN     | 282F-37303110                        |
| Test Procedure(s) | Akzo Nobel Document number 03-10-401 |
| Deviation         | No deviation                         |
| Test Result       | Complied                             |
| Report Number     | ANKK-104091                          |
| Report issue date | May 19, 2004                         |

**This equipment has been shown to be capable of compliance with the applicable standard(s) as indicated in the test report.**

**I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.**

This test report shall not be reproduced partially, or in full, without the prior written approval of Akzo Nobel K. K. The results and statements contained in this report pertain only to the equipment evaluated.

Approved by

Takeshi Yamanaka / [Site Manager]

Tested by

Naoki Ikeda

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**SECTION 1. GENERAL INFORMATION****APPLICANT INFORMATION**

|                  |   |                                                                       |
|------------------|---|-----------------------------------------------------------------------|
| Company          | : | KENWOOD CORPORATION                                                   |
| Address          | : | 1-16-2, Hakusan, Midori-ku, Yokohama-shi, Kanagawa,<br>226-8525 Japan |
| Attenuation      | : | Tamaki Shimamura<br>Manager, Communications Equipment Division        |
| Telephone number | : | +81 45 939 6254                                                       |
| Fax number       | : | +81 45 939 7093                                                       |

**DESCRIPTION OF TEST ITEM**

|                      |   |                                                                                                       |
|----------------------|---|-------------------------------------------------------------------------------------------------------|
| Kind of EUT          | : | Mobile Device                                                                                         |
| Condition of EUT     | : | Pre Production                                                                                        |
| Type                 | : | Mobile                                                                                                |
| Trademark            | : | KENWOOD                                                                                               |
| Model number         | : | TK-7180-K                                                                                             |
| Serial number        | : | 7                                                                                                     |
| Emission Designation | : | 16K0F3E(Wide) / 11K0F3E(Narrow)<br>20K0F7D(Wide) / 11K2F7D(Narrow)<br>14K4F1D(Wide) / 7K20F1D(Narrow) |
| Frequency Range      | : | 136 to 174 MHz                                                                                        |
| Output Power         | : | 1 to 30 W                                                                                             |
| Number of Channel    | : | 512                                                                                                   |
| Channel Spacing      | : | 25kHz (Wide) / 12.5 kHz (Narrow)                                                                      |
| Antenna Impedance    | : | 50 $\Omega$ Norminal                                                                                  |

**TEST PERFORMED**

|                |   |                        |
|----------------|---|------------------------|
| EUT Received   | : | April 20, 2004         |
| Test started   | : | April 21, 2004         |
| Test completed | : | May 15, 2004           |
| Temperature    | : | 20.0 to 23.0 degrees C |
| Humidity       | : | 34 to 60 %             |
| Atmospheric    | : | 101.3 to 102.5 kPa     |
| Voltage        | : | DC 13.6 V              |
| Frequency      | : | None                   |

**TEST TRACABILITY**

Tracability to national standards of test result is achieved by means of calibration tractability to national or international standards.

**ABBREVIATIONS**

|                                             |                               |
|---------------------------------------------|-------------------------------|
| EUT = Equipment Under Test                  | Cal Exp. = Calibration Expire |
| D.R.G. Antenna = Double Rigid Guide Antenna |                               |

## SECTION 2. TEST AND MEASUREMENT DATA

All test and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J and Industry Canada as the following individual parts:

| FCC RULE | TEST ITEM                                                                       | Tested |
|----------|---------------------------------------------------------------------------------|--------|
| Part 21  | Domestic Public Fixed radio Services                                            | N.A.   |
| Part 22  | Non Cellular                                                                    | YES    |
| Part 22  | Public Mobile Services                                                          | N.A.   |
| Part 22  | Subpart H - Cellular Radiotelephone Service                                     | N.A.   |
| Part 22  | Alternative technologies and auxiliary service                                  | N.A.   |
| Part 23  | International Fixed Public Radiocommunication service                           | N.A.   |
| Part 24  | Personal Communications Services                                                | N.A.   |
| Part 74  | Subpart H - Low Power Auxiliary Stations                                        | YES    |
| Part 80  | Stations in the Maritime Services                                               | N.A.   |
| Part 80  | Subpart E - general Technical Standards                                         | N.A.   |
| Part 80  | Subpart F - Equipment Authorization for Compulsory Ships                        | N.A.   |
| Part 80  | Subpart K - Private Coast Stations and Marine Utility Stations                  | N.A.   |
| Part 80  | Subpart S - Compulsory radiotelephone Installations for Small Passenger Boats   | N.A.   |
| Part 80  | Subpart T - Radiotelephone Installation Required for Vessels on the Great Lakes | N.A.   |
| Part 80  | Subpart U - Radiotelephone Installations Required by the Bridge-to-Bridge Act   | N.A.   |
| Part 80  | Subpart V - Emergency Position Indicating Radiobeacons (EPIRB'S)                | N.A.   |
| Part 80  | Subpart W - Global Maritime Distress and Safety System (GMDSS)                  | N.A.   |
| Part 80  | Subpart X - Voluntary Radio Installations                                       | N.A.   |
| Part 87  | Aviation Services                                                               | N.A.   |
| Part 90  | Private Land Mobile radio Services                                              | YES    |
| Part 94  | Private Operational - Fixed Microwave Service                                   | N.A.   |
| Part 95  | Subpart A - General Mobile radio Service                                        | N.A.   |
| Part 95  | Subpart C - Radio Control (R/C) radio Service                                   | N.A.   |
| Part 95  | Subpart D - Citizens Band (CB) Radio Service                                    | N.A.   |
| Part 95  | Subpart E -Family radio Service                                                 | N.A.   |
| Part 95  | Subpart F -Interactive Video and Data Service (IVDS)                            | N.A.   |
| Part 97  | Amateur Radio Service                                                           | N.A.   |
| Part 101 | Fixed Microwave Service                                                         | N.A.   |

| IC RULE | TEST ITEM                                              | Tested |
|---------|--------------------------------------------------------|--------|
| RSS-119 | Land Mobile and Fixed Radio Transmitters and Receivers | YES    |

**SECTION 3. MEASUREMENT RESULT**

| FCC RULE                  | IC RULE | TEST ITEM                                   | RESULTS |
|---------------------------|---------|---------------------------------------------|---------|
| 2.1046 (a)                | 6.2     | Carrier Output Power (Conducted)            | PASS    |
| 2.1051, 90.210            | 6.3     | Unwanted Emissions (Transmitter Conducted)  | PASS    |
| 2.1053 (a), 90.210        | 6.3     | Field Strength of Spurious Radiation        | PASS    |
| 2.1049 (c) (1), 90.210    | 6.4     | Emission Masks (Occupied Bandwidth)         | PASS    |
| 90.214                    | 6.5     | Transient Frequency Behavior                | PASS    |
| 2.1047 (a), 90.242(b)(8)  | 6.6     | Audio Low Pass Filter (Voice Input)         | PASS    |
| 2.1047 (a)                | -       | Audio Frequency Response                    | PASS    |
| 2.1047 (b)                | 6.6     | Modulation Limiting                         | PASS    |
| 2.1055 (a) (1), 90.213(a) | 7       | Frequency Stability (Temperature Variation) | PASS    |
| 2.1055 (d) (1), 90.213(a) | 7       | Frequency Stability (Voltage Variation)     | PASS    |
| -                         | 8       | Receiver Spurious Emissions                 | PASS    |
| 2.202 (g)                 | -       | Necessary Bandwidth and Emission Bandwidth  | PASS    |

**Limitation on Results**

The test result of this report is effective equipment under test itself and under the test configuration described on the report.

This test report does not assure that whether the test result taken in other testing laboratory is compatible or reproducible to the test result on this report or not.

**SECTION 4. TEST DATA****4.1 Carrier Output Power (Conducted)**

|                   |                                                                |
|-------------------|----------------------------------------------------------------|
| REGULATIONS       | : 47 CFR 2.1046 (a) / RSS-119 Section 6.2                      |
| TEST METHOD/GUIDE | : ANSI/TIA/EIA-603-1992, section 2.2.1.2 / RSS-119 Section 6.2 |

**TEST PROCEDURE**

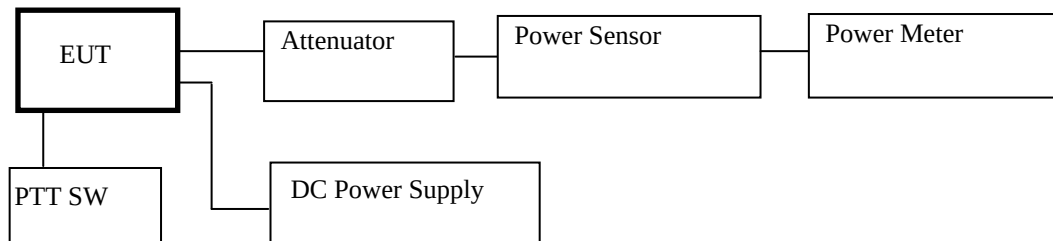
- 1 The EUT and test equipment were set up as shown on the following page.
- 2 The EUT was conducted to a resistive coaxial attenuator of normal load impedance.

RF Power (dBm) = Power Meter reading (dBm) + Attenuator (dB) + Cable loss (dB)

RF Power (W) =  $10^{(\text{RF Power (dBm)}/10)}/1000$

**TEST EQUIPMENTS**

| No.                | Equipment         | Manufacture | Model No.    | Serial No. | Cal Exp. |
|--------------------|-------------------|-------------|--------------|------------|----------|
| VHF FM Transceiver |                   |             |              |            |          |
| 1                  | Power Meter       | HP          | E4418B       | GB38410265 | Jul-05   |
| 2                  | Power Sensor      | HP          | 8482A        | 2607A11551 | Jan-05   |
| 3                  | Attenuator (30dB) | TME         | CFA-100ANP-J | 1008268    | Aug-04   |
| 4                  | DC Power Supply   | ALINCO      | DM-112MV     | None       | None     |

**MEASUREMENT EQUIPMENT CONFIGURATION****UNCERTAINTY**

Measurement uncertainty is +/- 0.5dB (k = 2)

**TEST RESULTS**

Measured for the worst case

| No. | Frequency (MHz) | Setting         | RF Power (W) |
|-----|-----------------|-----------------|--------------|
| 1   | 136.05          | Low High Power  | 30           |
| 2   | 155.05          | Mid High Power  | 30           |
| 3   | 173.95          | High High Power | 30           |
| 4   | 136.05          | Low Low Power   | 5            |
| 5   | 155.05          | Mid Low Power   | 5            |
| 6   | 173.95          | High Low Power  | 5            |

#### 4.2 Unwanted Emissions (Transmitter Conducted)

REGULATIONS : 47 CFR 2.1051, 90.210 / RSS-119 Section 6.3

TEST METHOD/GUIDE : ANSI/TIA/EIA-603-1992, section 2.2.13.2 / RSS-119 Section 6.3

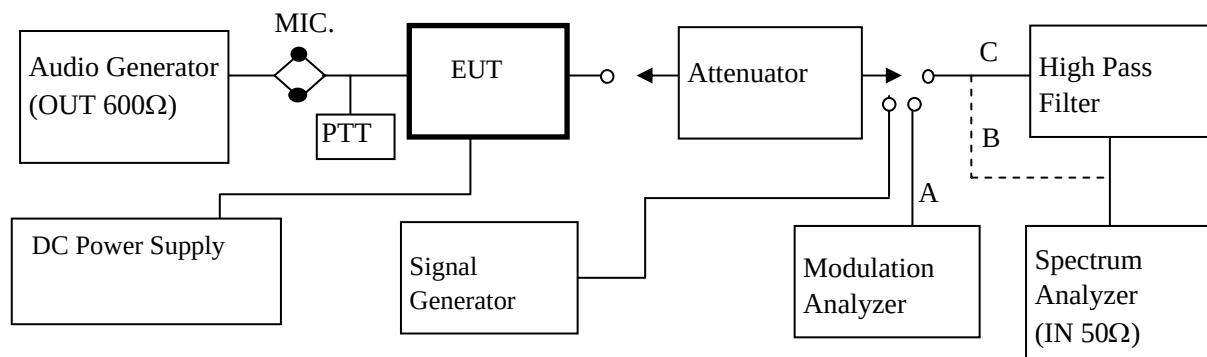
#### TEST PROCEDURE

- 1 The EUT and test equipment were set up as shown on the following page.
- 2 Modulate the transmitter with a 2.5 kHz sine wave at an input Level of 16 dB greater than that necessary to produce 50 % of rated system deviation.
- 3 Adjust the spectrum analyzer for the following setting:
  - a) Resolution Bandwidth : 10 kHz (< 1 GHz), 1 MHz (> 1 GHz).
  - b) Video Bandwidth : 30 kHz (< 1 GHz), 3 MHz (> 1 GHz).
  - c) Sweep Speed : 50 msec.
  - d) Detector mode : Average
- 4 The emissions were measured for the worst case as follows:
  - a) : within a band of frequencies defined by the carrier frequency plus and minus one channel.
  - b) : from the lowest frequency generated in the EUT and to at least the 10th harmonic of the carrier frequency, or 40 GHz, whichever is lower.

#### TEST EQUIPMENTS

| No. | Equipment           | Manufacture     | Model No.    | Serial No. | Cal Exp. |
|-----|---------------------|-----------------|--------------|------------|----------|
| 1   | Audio Generator     | Rohde & Schwarz | APN04        | 8307421004 | Feb-05   |
| 2   | Attenuator (20dB)   | Weinschel       | 40-20-34     | AA5701     | Aug-04   |
| 3   | Attenuator (30dB)   | TME             | CFA-100ANP-J | 1008268    | Aug-04   |
| 4   | Modulation Analyzer | HP              | 8901B        | 4TG-3008   | Sep-04   |
| 5   | High Pass Filter    | ANRITSU         | MP526B       | 6200220636 | Oct-04   |
| 6   | Signal Generator    | Rohde & Schwarz | SMG          | 860289/011 | May-04   |
| 7   | Signal Generator    | Rohde & Schwarz | SMR40        | 834128/028 | Sep-04   |
| 8   | Spectrum Analyzer   | Agilent         | E7403A       | MY42000062 | Jun-04   |
| 9   | DC Power Supply     | ALINCO          | DM-112MV     | None       | None     |

#### MEASUREMENT EQUIPMENT CONFIGURATION



#### UNCERTAINTY

Measurement uncertainty is +/- 1.2 dB (k = 2)

**TEST RESULTS**

Measured for the worst case

State : : High Power / Narrow Band Modulation

| No.                                                           | Frequency<br>(MHz) |      | Correct<br>Level<br>(dBm) | Emission<br>Level<br>(dBc) | Limit<br>(dBc) | Margin<br>(dB) |
|---------------------------------------------------------------|--------------------|------|---------------------------|----------------------------|----------------|----------------|
| 1                                                             | 620.20             | Mid  | -31.00                    | -75.77                     | -64.77         | 11.0           |
| 2                                                             | 347.90             | High | -38.90                    | -83.67                     | -64.77         | 18.9           |
| There is the margin of 20dB over except for the above points. |                    |      |                           |                            |                |                |

Mask D Limit (dBc) =  $-(50+10\log(P))$ 

Correct Level (dBm) = Substitute SG Level (dBm) + Attenuator loss (dB)

Emission Level (dBc) = Correct Level (dBm) -  $10\log(P*1000)$ 

P = Carrier Level (W)

### 4.3 Field Strength of Spurious Radiation

|                   |                                                                 |
|-------------------|-----------------------------------------------------------------|
| REGULATIONS       | : 47 CFR 2.1053 (a), 90.210 / RSS-119 Section 6.2               |
| TEST METHOD/GUIDE | : ANSI/TIA/EIA-603-1992, section 2.2.12.2 / RSS-119 Section 6.2 |

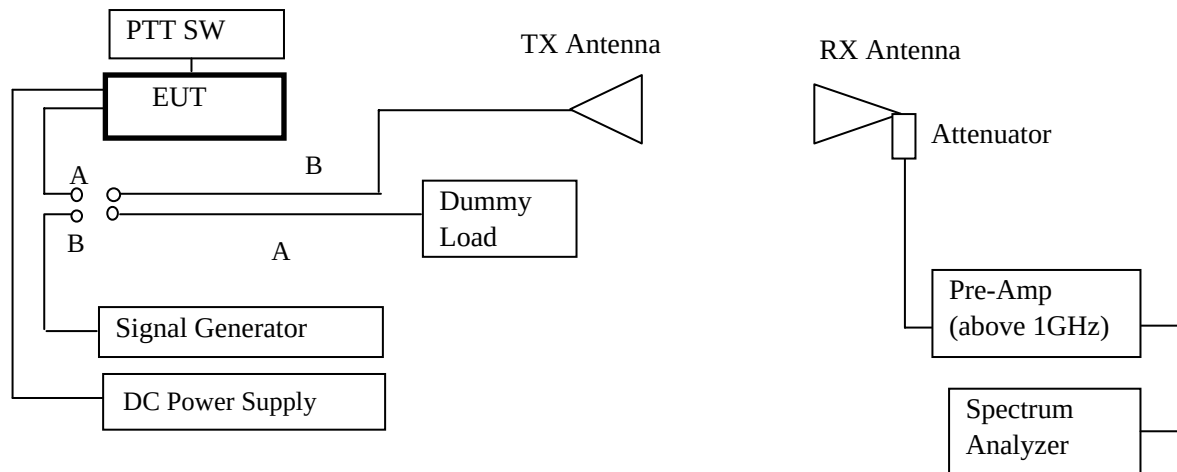
### TEST PROCEDURE

- The EUT and test equipment were set up as shown on the following page.
- Adjust the spectrum analyzer for the following setting:
  - Resolution Bandwidth : 10 kHz (< 1 GHz), 1 MHz (> 1 GHz).
  - Video Bandwidth : 300 kHz (< 1 GHz), 3 MHz (> 1 GHz).
  - Sweep Speed : 50ms.
  - Detector mode : Positive Peak
- The transmitter was placed on a wooden turntable, and it was transmitting into non-radiating load which was also placed on the turntable.
- The measurement antenna was placed at a distance of 3 meters from the EUT.  
During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT.  
The test was performed by placing the EUT on 3-orthogonal axis.
- The frequency range up to tenth harmonic of the fundamental frequency was investigated.
- Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable.  
The absolute levels of the spurious emissions were measured by the substitution.
- Spurious emissions in dB = 10 Log (TX power in Watts/0.001) – the absolute level
- Spurious attenuation Wide Band Modulation limit in dB = 43 + 10 Log10 (power out in Watts)
- Spurious attenuation Narrow Band Modulation limit in dB = 50 + 10 Log10 (power out in Watts)

### TEST EQUIPMENTS

| No. | Equipment            | Manufacture     | Model No.  | Serial No. | Cal Exp. |
|-----|----------------------|-----------------|------------|------------|----------|
| 1   | Dipole Antenna (TX)  | Schwarzbeck     | VHA9103    | None       | Jan-05   |
| 2   | Dipole Antenna (TX)  | Schwarzbeck     | UHA9105    | None       | Jan-05   |
| 3   | D.R.G Antenna (TX)   | Schwarzbeck     | 3115       | 9612-5045  | May-04   |
| 4   | Tri-log Antenna (RX) | Schwarzbeck     | VULB9168WP | 106        | Feb-05   |
| 5   | D.R.G Antenna (RX)   | EMCO            | 3115       | 9612-5044  | Jul-04   |
| 6   | Step Attenuator      | HP              | 8464B      | 2726A14513 | Oct-04   |
| 7   | Pre-Amplifier        | TOYOTECHNICA    | TPA0118-30 | AG0008     | Mar-05   |
| 8   | Attenuator (6dB)     | ANRITSU         | MP721B     | M57593     | Oct-04   |
| 9   | Attenuator (3dB)     | Narda           | 3157846    | 4538       | Aug-04   |
| 10  | Spectrum Analyzer    | Agilent         | E7403A     | MY42000062 | Jun-04   |
| 11  | Signal Generator     | Rohde & Schwarz | SMG        | 860289/011 | May-04   |
| 12  | Signal Generator     | Rohde & Schwarz | SMR40      | 834128/028 | Sep-04   |
| 13  | Dummy Load           | BIRD            | 8401       | 6163       | Jun-04   |
| 14  | DC Power Supply      | ALINCO          | DM-112MV   | None       | None     |

## MEASUREMENT EQUIPMENT CONFIGURATION



## UNCERTAINTY

Measurement uncertainty is +/- 4.2dB (k = 2)

## TEST RESULTS

Measured for the worst case

State : 155.05MHz High Power Narrow Band Modulation

| No | Frequency (MHz) | Pol  | Reading Level (dBm) | SG Out Level (dBm) | Factor* (dB) | Antenna Gain (dBi) | Correct Level (dBm) | Emission Level (dBc) | Limit Level (dBc) | Margin (dB) |
|----|-----------------|------|---------------------|--------------------|--------------|--------------------|---------------------|----------------------|-------------------|-------------|
| 1  | 310.10          | Hor. | -86.40              | -59.70             | 1.34         | 2.15               | -58.9               | -103.7               | -64.8             | 38.9        |
|    |                 | Ver. | -88.24              | -57.90             | 1.34         | 2.15               | -57.1               | -101.9               | -64.8             | 37.1        |
| 2  | 620.20          | Hor. | -74.86              | -36.30             | 1.87         | 2.15               | -36.0               | -80.8                | -64.8             | 16.0        |
|    |                 | Ver. | -73.59              | -34.60             | 1.87         | 2.15               | -34.3               | -79.1                | -64.8             | 14.3        |
| 3  | 775.25          | Hor. | -77.64              | -37.40             | 2.12         | 2.15               | -37.4               | -82.1                | -64.8             | 17.4        |
|    |                 | Ver. | -87.17              | -44.80             | 2.12         | 2.15               | -44.8               | -89.5                | -64.8             | 24.8        |
| 4  | 930.30          | Hor. | -81.49              | -39.10             | 2.33         | 2.15               | -39.3               | -84.1                | -64.8             | 19.3        |
|    |                 | Ver. | -79.64              | -30.20             | 2.33         | 2.15               | -30.4               | -75.2                | -64.8             | 10.4        |
| 5  | 1085.35         | Hor. | -61.20              | -67.90             | 1.00         | 6.50               | -62.4               | -107.2               | -64.8             | 42.4        |
|    |                 | Ver. | -56.77              | -59.10             | 1.00         | 6.50               | -53.6               | -98.4                | -64.8             | 33.6        |
| 6  | 1240.40         | Hor. | -59.94              | -64.40             | 1.07         | 7.40               | -58.1               | -102.8               | -64.8             | 38.1        |
|    |                 | Ver. | -57.83              | -63.30             | 1.07         | 7.40               | -57.0               | -101.7               | -64.8             | 37.0        |
| 7  | 1395.45         | Hor. | -                   | -                  | -            | -                  | -                   | -                    | -64.8             | -           |
|    |                 | Ver. | -59.20              | -66.50             | 1.13         | 8.00               | -59.6               | -104.4               | -64.8             | 39.6        |

There is the margin of 20dB over except for the above points.

\* Factor = Attenuator (dB) + Cable Loss (dB)

Mask D Limit (dBc) =  $-(50+10\log(P))$

Correct Level (dBm) = Substitute SG Level (dBm) + ANT Gain (dBi) - Cable loss (dB)

Emission Level (dBc) = Correct Level (dBm) -  $10\log(P*1000)$

P = Carrier Level (W)

#### 4.4 Emission Masks (Occupied Bandwidth)

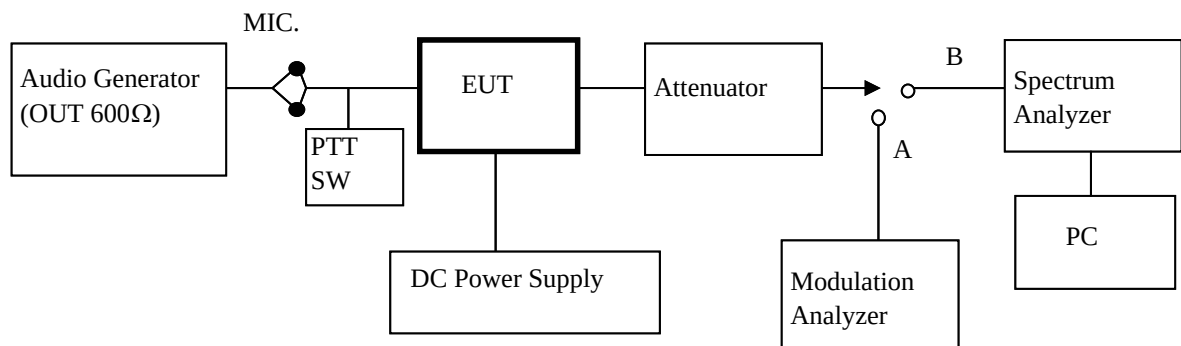
|                   |                                                                 |
|-------------------|-----------------------------------------------------------------|
| REGULATIONS       | : 47 CFR 2.1049 (c) (1), 90.210 / RSS-119 Section 6.4           |
| TEST METHOD/GUIDE | : ANSI/TIA/EIA-603-1992, section 2.2.11.2 / RSS-119 Section 6.4 |

#### TEST PROCEDURE

- 1 The EUT and test equipment were set up as shown on the following page.
- 2 For EUT supporting audio modulation, the audio signal generator was adjusted to the frequency of maximum response and with output level set for +/- 2.5 kHz or +/- 1.25 kHz deviation (or 50 % modulation).
- 3 With level constant, the signal level was increased 16 dB.  
For EUT supporting digital modulation, the digital modulation mode was operated to its maximum extent.
- 4 Adjust the spectrum analyzer for the following setting:
  - a) Resolution Bandwidth : 100 Hz (Nonmodulation), 300 Hz (Wide modulation).
  - b) Video Bandwidth : 300 Hz (Nonmodulation and Narrow band modulation), 3kHz(Wide band modulation).
  - c) Sweep Speed : 8 sec.
  - d) Sampling Time : 10 times
- 5 The occupied Bandwidth was measured with the Spectrum Analyzer controls set as shown on the test results.

#### TEST EQUIPMENTS

| No. | Equipment           | Manufacture     | Model No.       | Serial No. | Cal Exp. |
|-----|---------------------|-----------------|-----------------|------------|----------|
| 1   | Audio Generator     | Rohde & Schwarz | APN04           | 830742/004 | Feb-05   |
| 2   | Attenuator (30dB)   | TME             | CFA-100ANP-J-30 | 1008268    | Aug-04   |
| 3   | Attenuator (20dB)   | Weinschel       | 40-20-34        | AA5701     | Aug-04   |
| 4   | Modulation Analyzer | HP              | 8901B           | 4TG-3008   | Sep-04   |
| 5   | Spectrum Analyzer   | Agilent         | E7403A          | MY42000062 | June-04  |
| 6   | DC Power Supply     | ALINCO          | DM-112MV        | None       | None     |



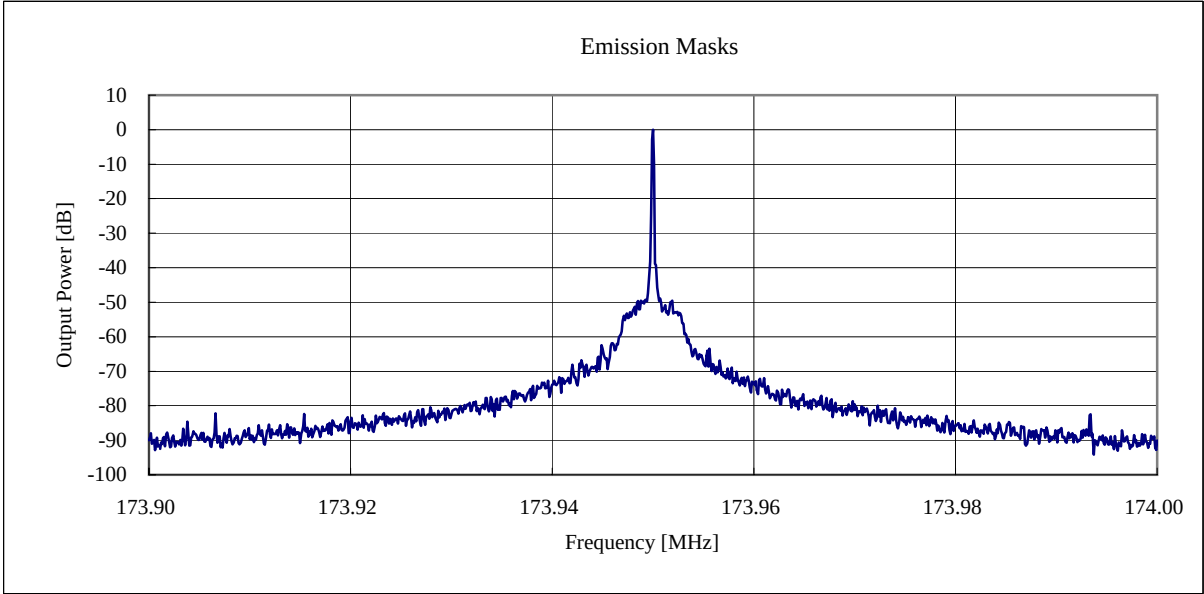
#### UNCERTAINTY

Measurement uncertainty is +/- 1.2dB (k = 2)

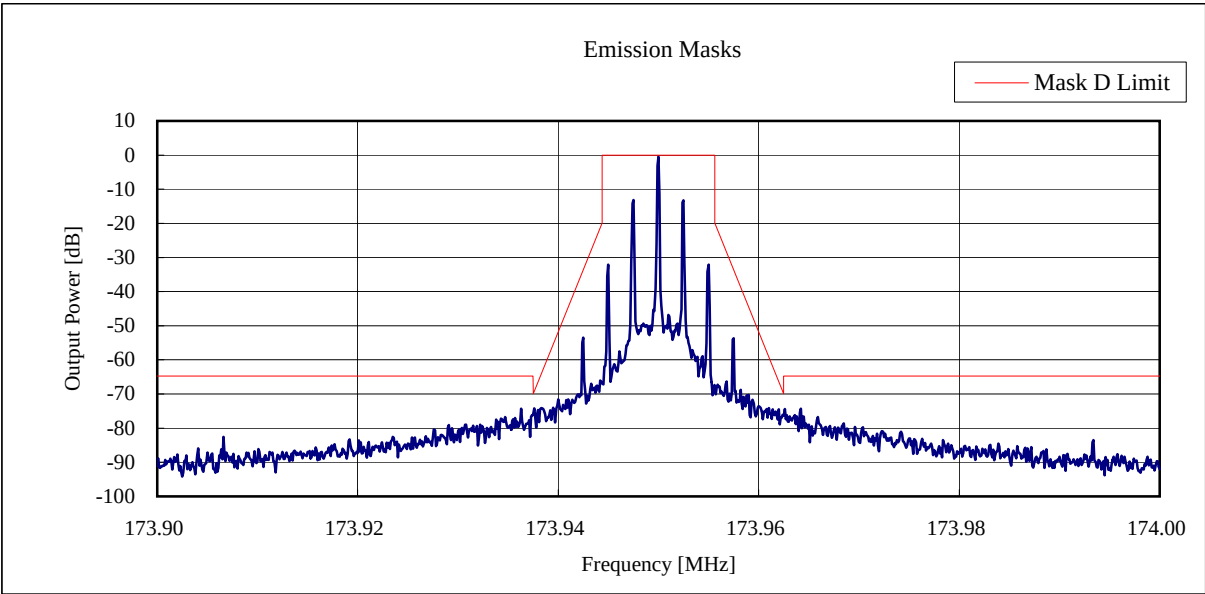
TEST RESULTS

Measured for the worst case

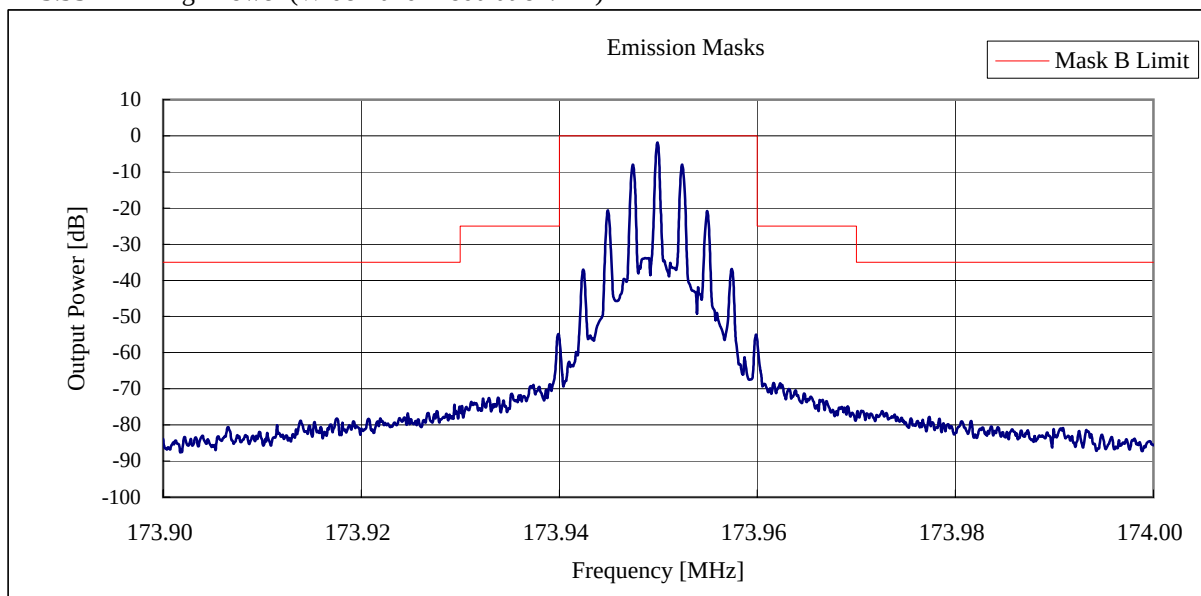
State : 173.95MHz High Power (None Modulation:FM)



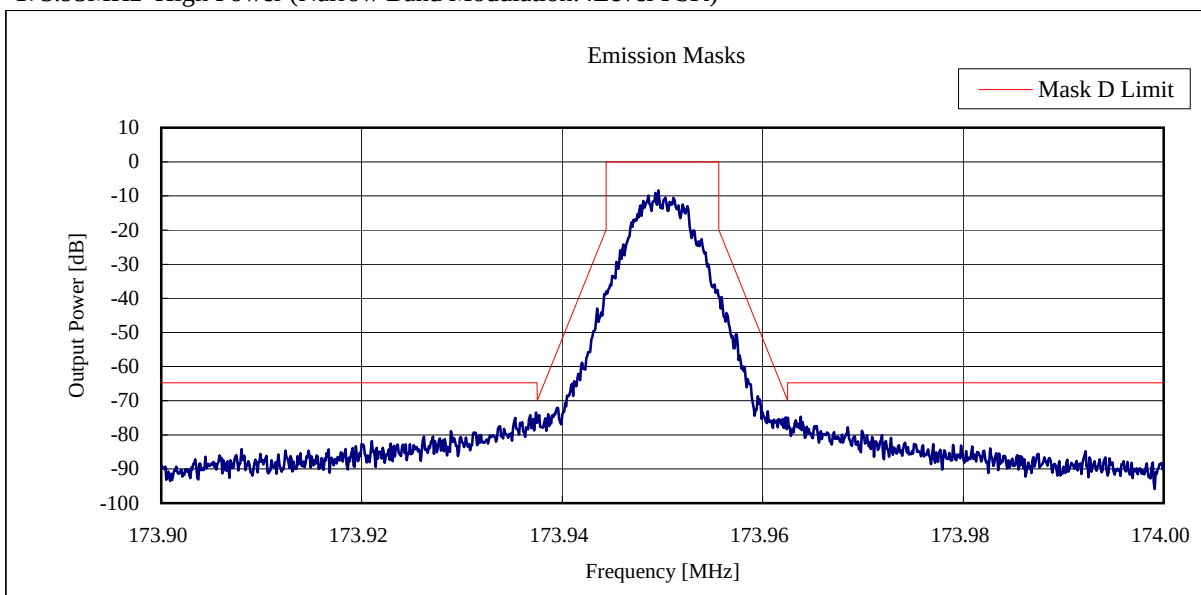
State : 173.95MHz High Power (Narrow Band Modulation:FM)



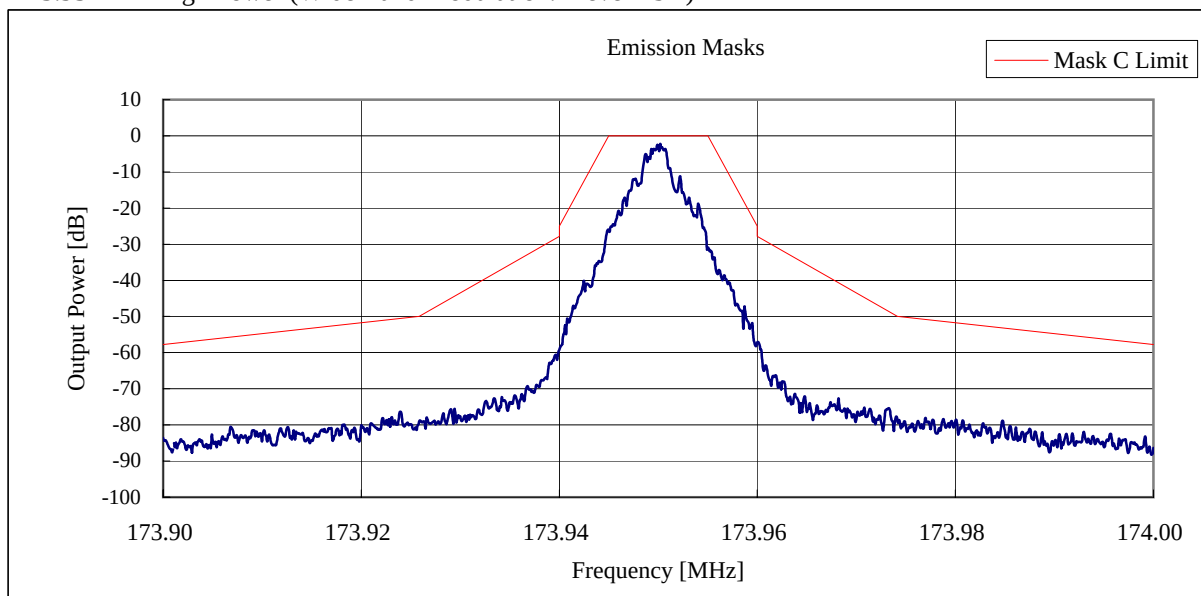
State : 173.95MHz High Power (Wide Band Modulation:FM)



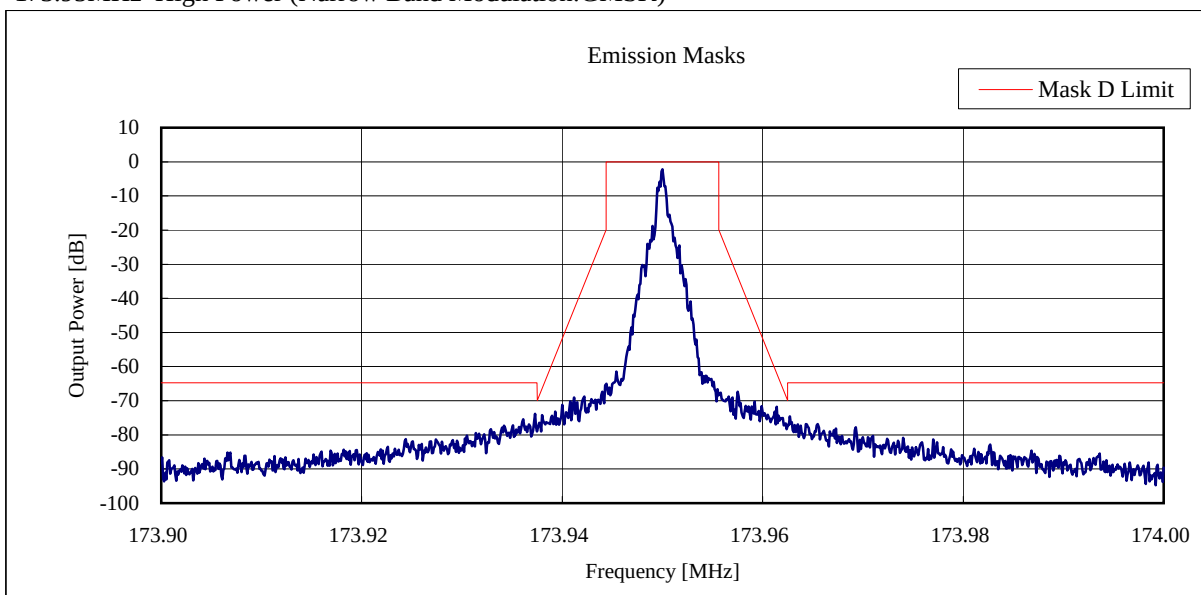
State : 173.95MHz High Power (Narrow Band Modulation:4Level FSK)



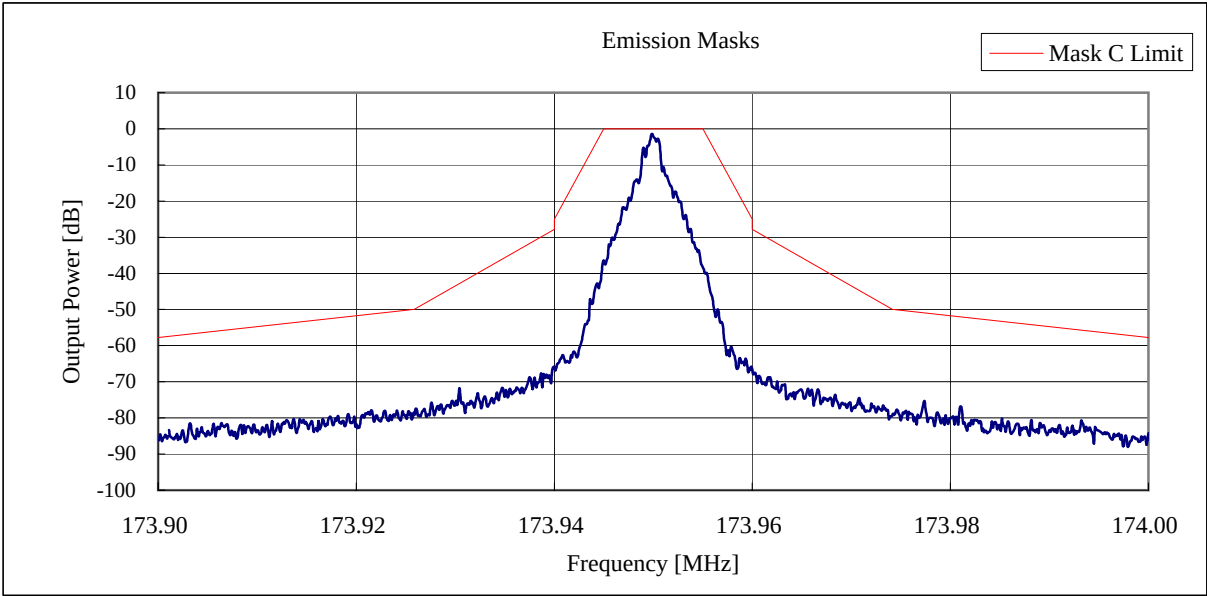
State : 173.95MHz High Power (Wide Band Modulation:4Level FSK)



State : 173.95MHz High Power (Narrow Band Modulation:GMSK)



State : 173.95MHz High Power (Wide Band Modulation:GMSK)



#### 4.5 Transient Frequency Behavior

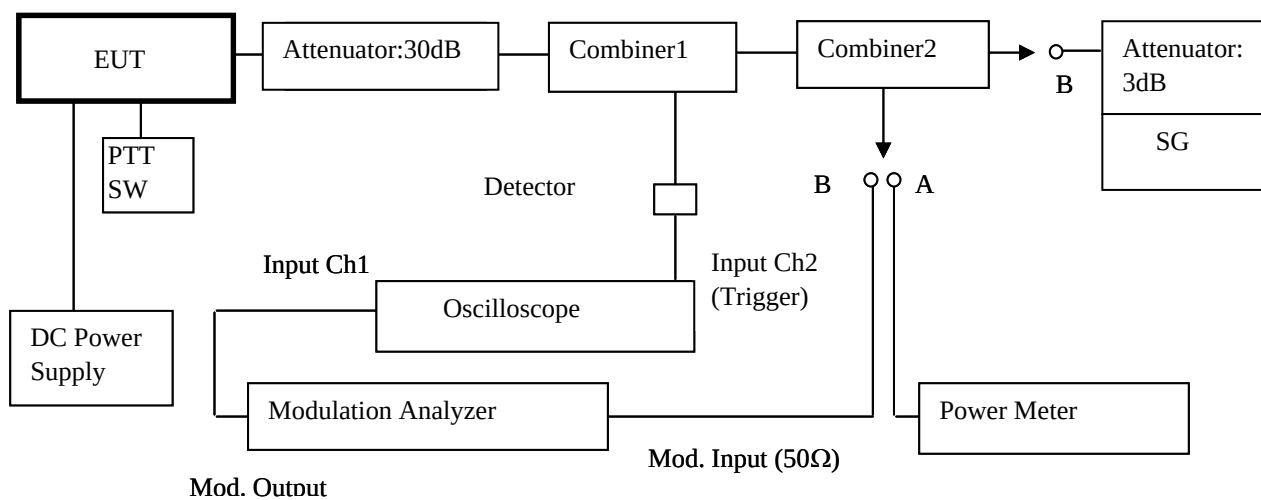
|                   |                                                                 |
|-------------------|-----------------------------------------------------------------|
| REGULATIONS       | : 47 CFR 90.214 / RSS-119 Section 6.5                           |
| TEST METHOD/GUIDE | : ANSI/TIA/EIA-603-1992, section 2.2.19.3 / RSS-119 Section 6.5 |

#### TEST PROCEDURE

- 1 The EUT and test equipment were set up as shown on the following page.
- 2 The transmitter was turned on.
- 3 Sufficient attenuation was provided so that the transmitter carrier level measured at the output of the combiner was 40 dB below the maximum input level of the test receiver.  
This level was recorded as step f.
- 4 The transmitter was turned off.
- 5 An RF signal generator (1) modulated with a 1 kHz tone at either 25 kHz or 12.5 kHz deviation, and set to the same frequency as the assigned transmitter frequency, (2) was adjusted to a level -20 dB below the level recorded for step f, as measured at the output of the combiner.  
This level was then fixed for the remainder of the test and is recorded at step h.
- 6 The oscilloscope was setup using TIA/EIA-603 steps j and k as a guide, and to 10 msec./div.
- 7 The transmitter was turned on, and the level of the carrier at the output of the combiner was recorded as step l.
- 8 The carrier on-time as referenced in TIA/EIA-603 steps m, n, and o was captured and plotted.
- 9 The carrier off-time as referenced in TIA/EIA-603 steps p, q, r, and s was captured and plotted.

#### TEST EQUIPMENTS

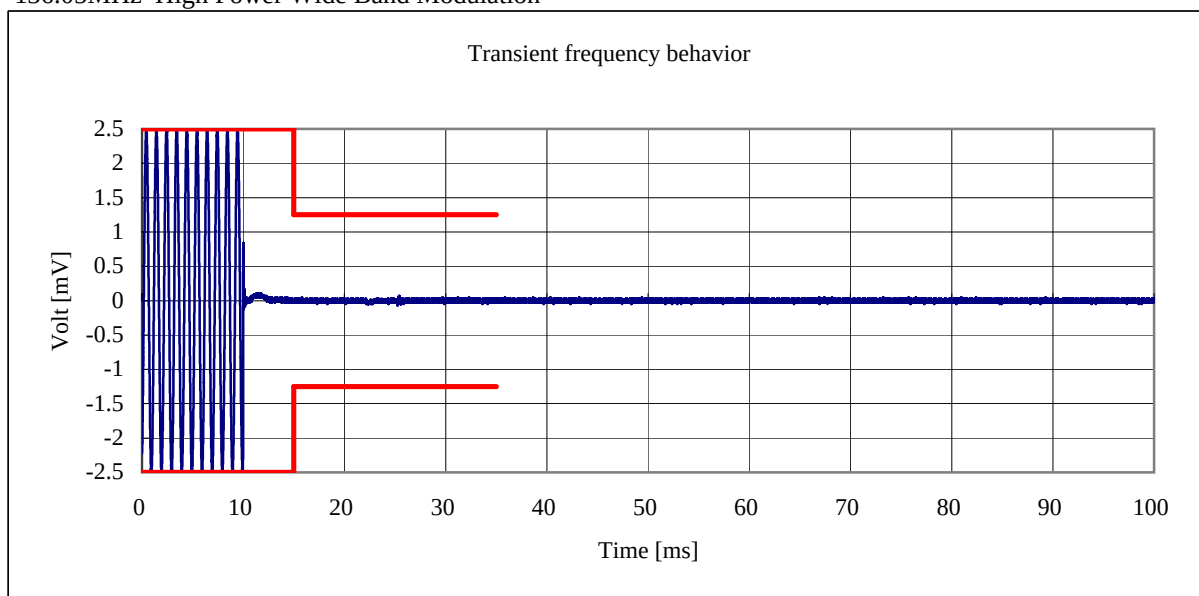
| No. | Equipment           | Manufacture     | Model No.       | Serial No. | Cal Exp. |
|-----|---------------------|-----------------|-----------------|------------|----------|
| 1   | Signal Generator    | Rohde & Schwarz | SMG             | 860289/011 | May-04   |
| 2   | Oscilloscope        | IWATSU - LeCroy | LT342           | 00922      | Feb-05   |
| 3   | Spectrum Analyzer   | HP              | 3585A           | 1750A07394 | Oct-04   |
| 4   | Attenuator (30dB)   | TME             | CFA-100ANP-J-30 | 1008268    | Aug-04   |
| 5   | Attenuator (3dB)    | TME             | CFA20NRT-3      | 679701     | Aug-04   |
| 6   | Modulation Analyzer | HP              | 8901B           | 4TG-3008   | Sep-04   |
| 7   | Combiner            | ANRITSU         | M89249          | None       | Aug-04   |
| 8   | Combiner            | ANRITSU         | M89249          | None       | Aug-04   |
| 9   | Power Meter         | HP              | E4418B          | GB38410265 | Jul-04   |
| 10  | Power Sensor        | HP              | 8482A           | 2607A11551 | Jul-04   |
| 11  | DC Power Supply     | ALINCO          | DM-112MV        | None       | None     |



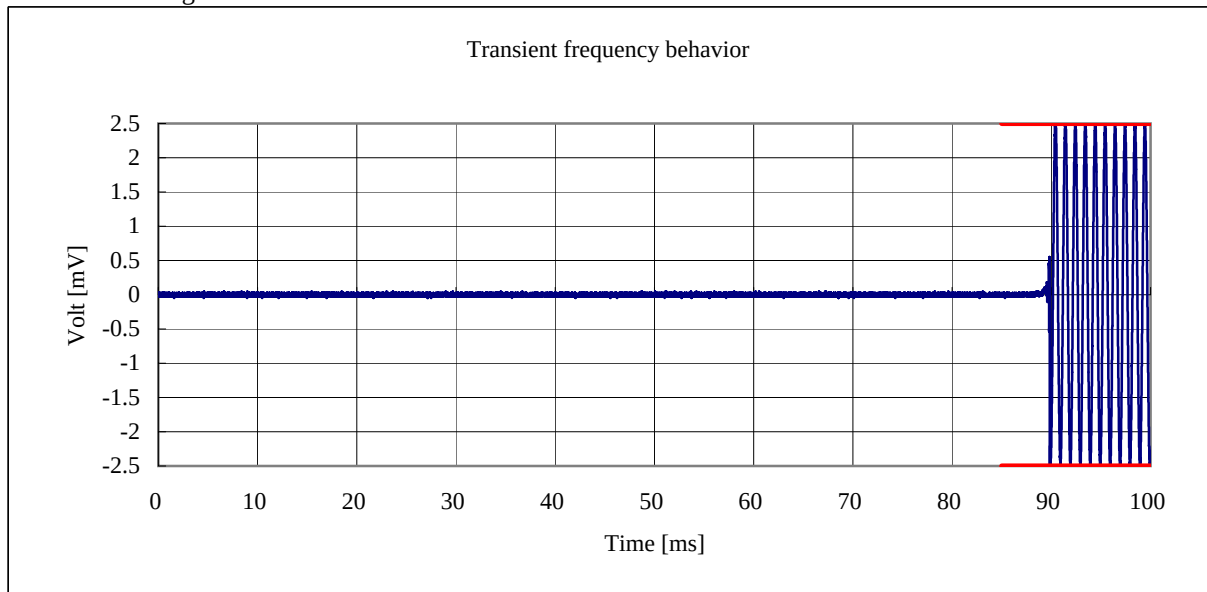
Measurement uncertainty is +/- 1.3dB (k = 2)

Measured for the worst case

State : 136.05MHz High Power Wide Band Modulation



State : 136.05MHz High Power Wide Band Modulation PTT: ON-OFF



**4.6 Audio Frequency Response / Audio Low Pass Filter (Voice Input)**

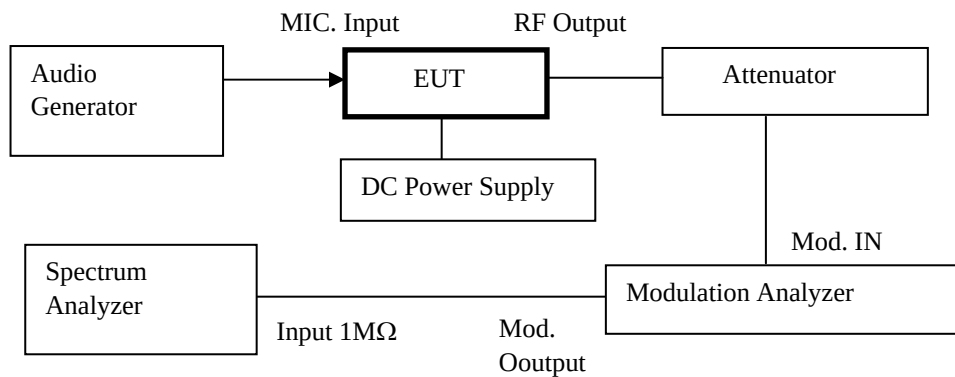
|                   |                                                                           |
|-------------------|---------------------------------------------------------------------------|
| REGULATIONS       | : 47 CFR 2.1047 (a) / RSS-119 Section 6.6                                 |
| TEST METHOD/GUIDE | : ANSI/TIA/EIA-603-1992, section 2.2.6.2.2, 3.2.6.2 / RSS-119 Section 6.6 |

**TEST PROCEDURE**

- 1 The EUT and test equipment were set up as shown on the following page.
- 2 Adjust the Modulation Analyzer for the following setting:
  - a) High-pass filter : 50 Hz
  - b) Low-pass filter : 15 kHz
  - c) Detector : positive peak
  - d) Function : FM
- 3 The audio signal input was adjusted to obtain 20 % modulation at 1 kHz, and this point was taken as the 0 dB reference level.
- 4 With input levels held constant and below limiting at all frequencies, the audio signal generator was varied from 300 Hz to 5 kHz.
- 5 The response in dB relative to 1 kHz was then measured, using the Modulation Analyzer.

**TEST EQUIPMENTS**

| No. | Equipment           | Manufacture     | Model No.       | Serial No. | Cal Exp. |
|-----|---------------------|-----------------|-----------------|------------|----------|
| 1   | Audio Generator     | Rohde & Schwarz | APN04           | 830742/004 | Feb-05   |
| 2   | Attenuator (30dB)   | TME             | CFA-100ANP-J-30 | 1008268    | Aug-04   |
| 3   | Attenuator (20dB)   | Weinschel       | 40-20-34        | AA5701     | Aug-04   |
| 4   | Modulation Analyzer | HP              | 8901B           | 4TG-3008   | Sep-04   |
| 5   | Spectrum Analyzer   | HP              | 3585A           | 1750A07394 | Sep-04   |
| 6   | DC Power Supply     | ALINCO          | DM-112MV        | None       | None     |

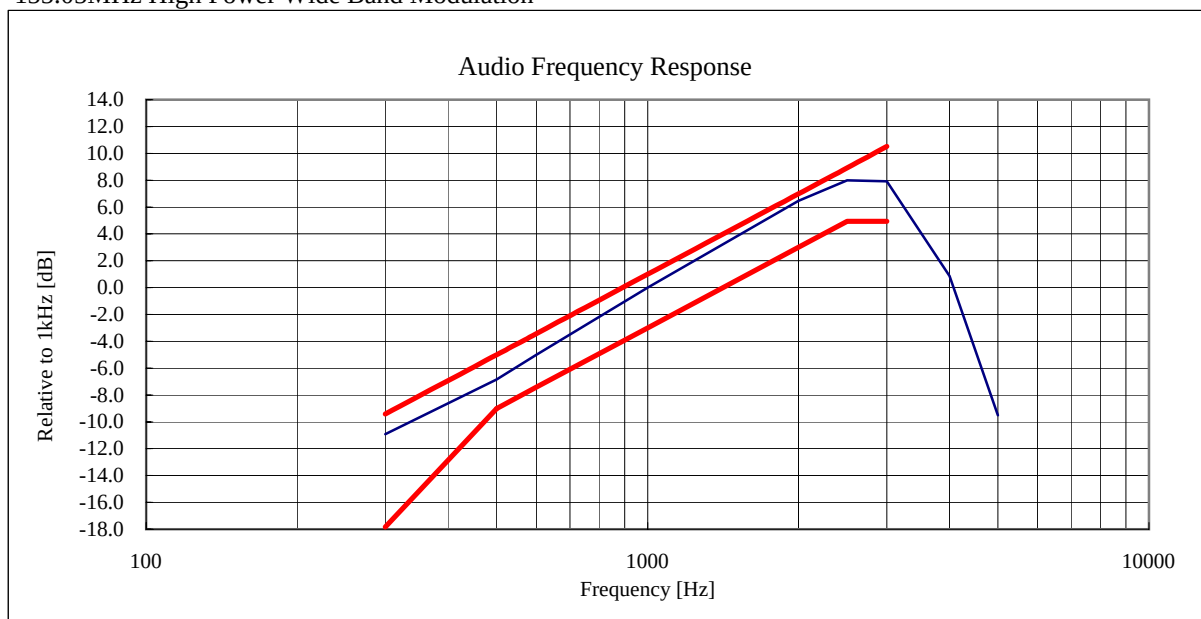
**MEASUREMENT EQUIPMENT CONFIGURATION****UNCERTAINTY**

Measurement uncertainty is +/- 1.2dB (k = 2)

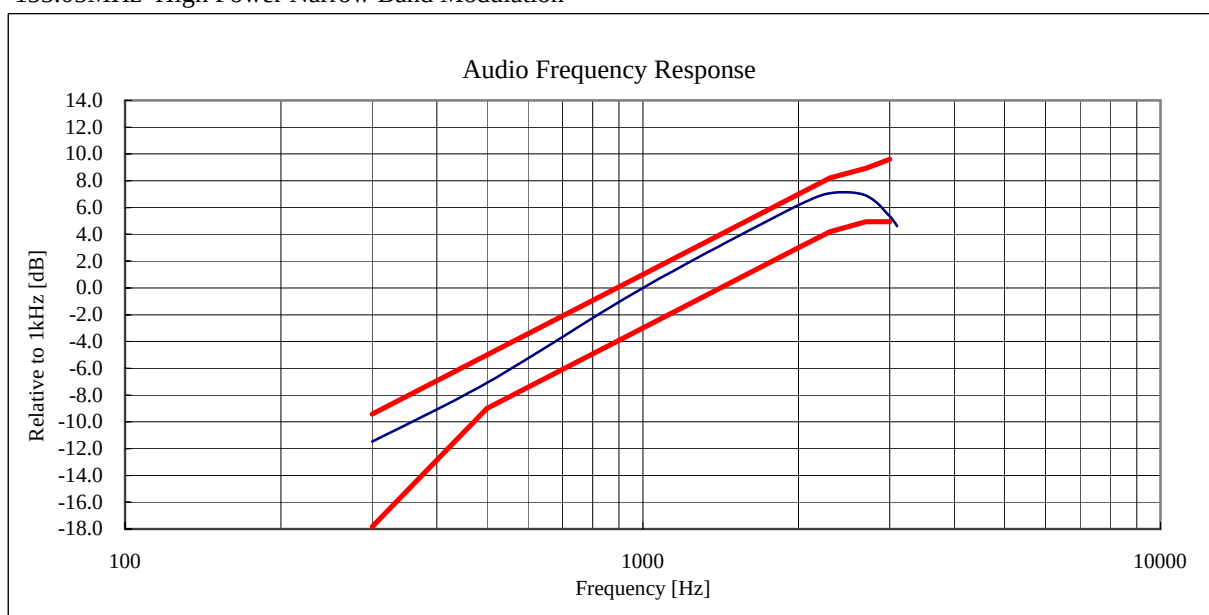
## TEST RESULTS

Measured for the worst case

State : 155.05MHz High Power Wide Band Modulation



State : 155.05MHz High Power Narrow Band Modulation



Note:

Audio Filter of the above result is substituted with the same structure as Audio Frequency Resonse.

On the transmission condition below 3kHz, Transceiver shows pre-emphasis condition of transmission function.

On the transmission condition above 3kHz, Transceiver shows Audio Low Pass Filter.

#### 4.7 Modulation Limiting

|                   |                                                                         |
|-------------------|-------------------------------------------------------------------------|
| REGULATIONS       | : 47 CFR 2.1047 (b) / RSS-119 Section 6.6                               |
| TEST METHOD/GUIDE | : ANSI/TIA/EIA-603-1992, section 2.2.3.2, 1.3.4.4 / RSS-119 Section 6.6 |

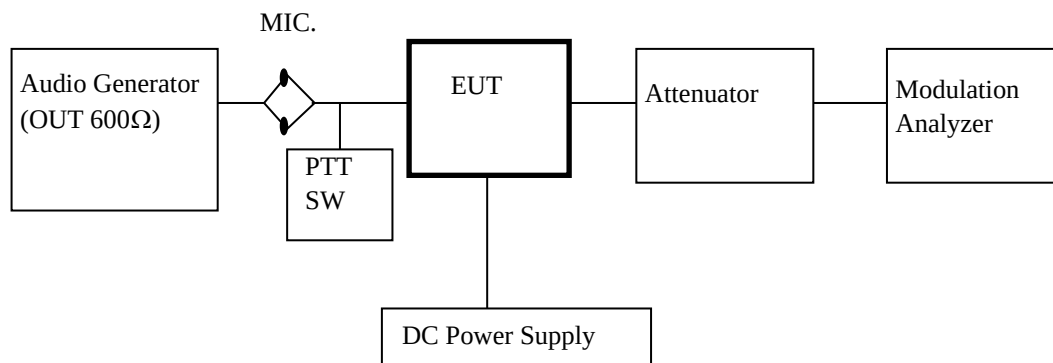
#### TEST PROCEDURE

- 1 The EUT and test equipment were set up as shown on the following page.
- 2 Adjust the Modulation Analyzer for the following setting:
  - a) High-pass filter : off
  - b) Low-pass filter : 15 kHz
  - c) Detector : positive peak
  - d) Function : FM
- 3 Apply a 1kHz modulating signal to the transmitter from the audio generator, and adjust the level to obtain 60% of full rated system deviation.
- 4 Measure the modulation frequency that was showed on the Modulation Analyzer when the output levels of the Audio Generator were changed from -20 dB to +50 dB by 10 dB.
- 5 Set the output frequencies of the Audio Generator 300 Hz and 3 kHz, and repeat test procedure 4.
- 6 Set the the Detector of the Modulation Analyzer Negative Peak.
- 7 Repeat test procedure 4 and 5.

#### TEST EQUIPMENTS

| No. | Equipment           | Manufacture     | Model No.    | Serial No. | Cal Exp. |
|-----|---------------------|-----------------|--------------|------------|----------|
| 1   | Audio Generator     | Rohde & Schwarz | APN04        | 830742/004 | Feb-05   |
| 2   | Attenuator (30dB)   | TME             | CFA-100ANP-J | 1008268    | Aug-04   |
| 3   | Attenuator (20dB)   | Weinschel       | 40-20-34     | AA5701     | Aug-04   |
| 4   | Modulation Analyzer | HP              | 8901B        | 4TG-3008   | Sep-04   |
| 5   | DC Power Supply     | ALINCO          | DM-112MV     | None       | None     |

#### MEASUREMENT EQUIPMENT CONFIGURATION



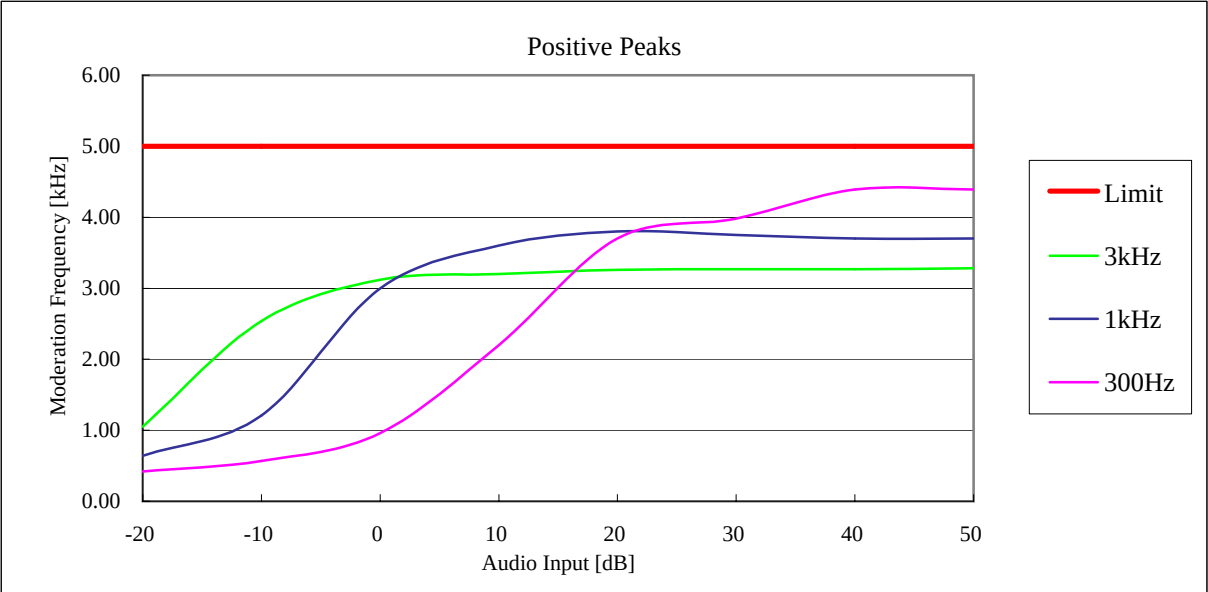
#### UNCERTAINTY

Measurement uncertainty is +/- 0.8dB (k = 2)

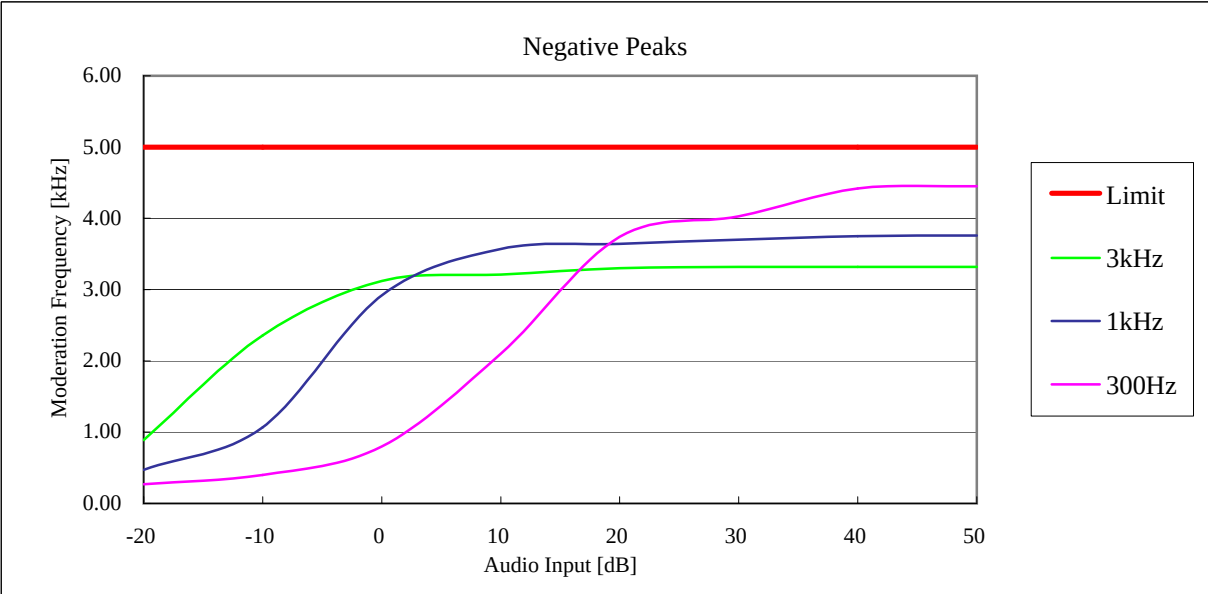
TEST RESULTS

Measured for the worst case

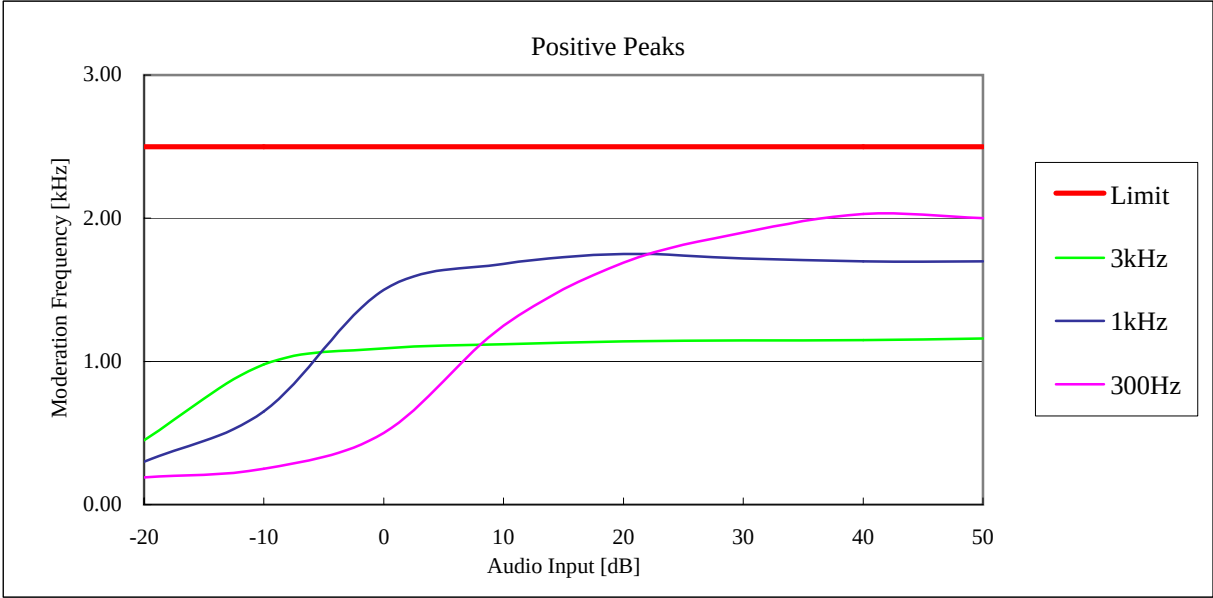
State : 136.05MHz High Power Wide Band Modulation



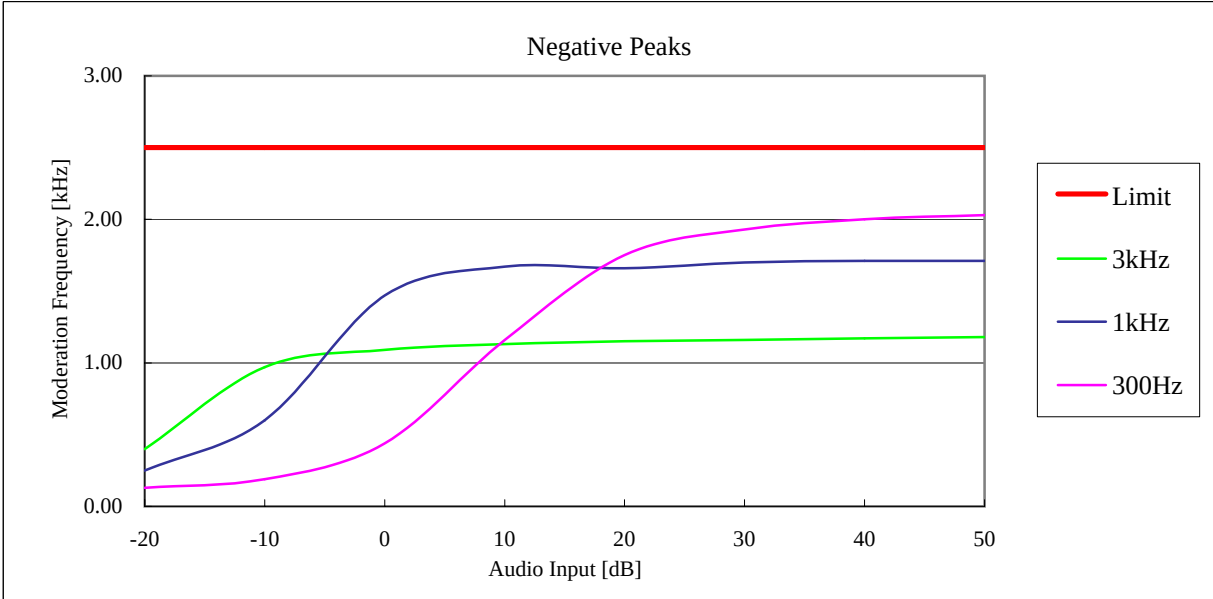
State : :136.05MHz High Power Wide Band Modulation



State : 136.05MHz High Power Narrow Band Modulation



State : :136.05MHz High Power Narrow Band Modulation



#### 4.8 Frequency Stability (Temperature Variation)

REGULATIONS : 47 CFR 2.1055 (a) (1), 90.213(a) / RSS-119 Section 7

TEST METHOD/GUIDE : ANSI/TIA/EIA-603-1992, section 2.2.2.2 / RSS-119 Section 7

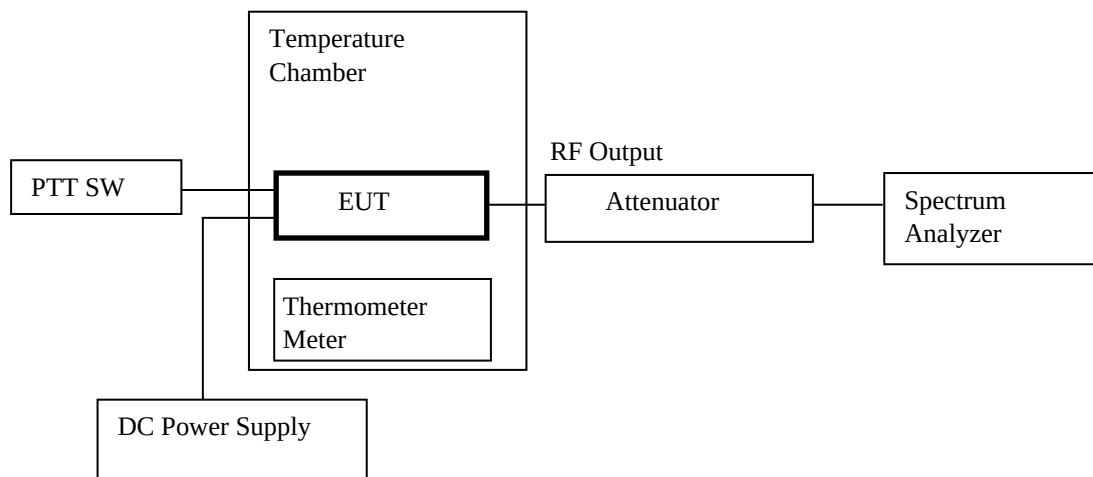
#### TEST PROCEDURE

- 1 The EUT and test equipment were set up as shown on the following page.
- 2 Set the temperature -30 degrees C.
- 3 Leave the EUT for 1 hour after it became the temperature that was set up.
- 4 Make the EUT the transmitting state.  
One minute later, measure the output frequency.
- 5 Make the EUT the receiving state.
- 6 Set the temperature 50 degrees C by 10 degrees C.  
And repeat test procedure 3 to 5.

#### TEST EQUIPMENTS

| No. | Equipment           | Manufacture | Model No.       | Serial No.  | Cal Exp. |
|-----|---------------------|-------------|-----------------|-------------|----------|
| 1   | Spectrum Analyzer   | Agilent     | E7401A          | US399440256 | May-05   |
| 2   | Attenuator (30dB)   | TME         | CFA-100ANP-J-30 | 1008268     | Aug-04   |
| 3   | Attenuator (20dB)   | Weinschel   | 40-20-34        | AA5701      | Aug-04   |
| 4   | DC Power Supply     | ALINCO      | DM-112MV        | None        | None     |
| 5   | Temperature Chamber | TABAI       | PL-3F           | 5103661     | None     |
| 6   | Temperature Meter   | SATO KEIRYO | PC-5000TRH-II   | A03999973   | Jan-05   |

#### MEASUREMENT EQUIPMENT CONFIGURATION



#### UNCERTAINTY

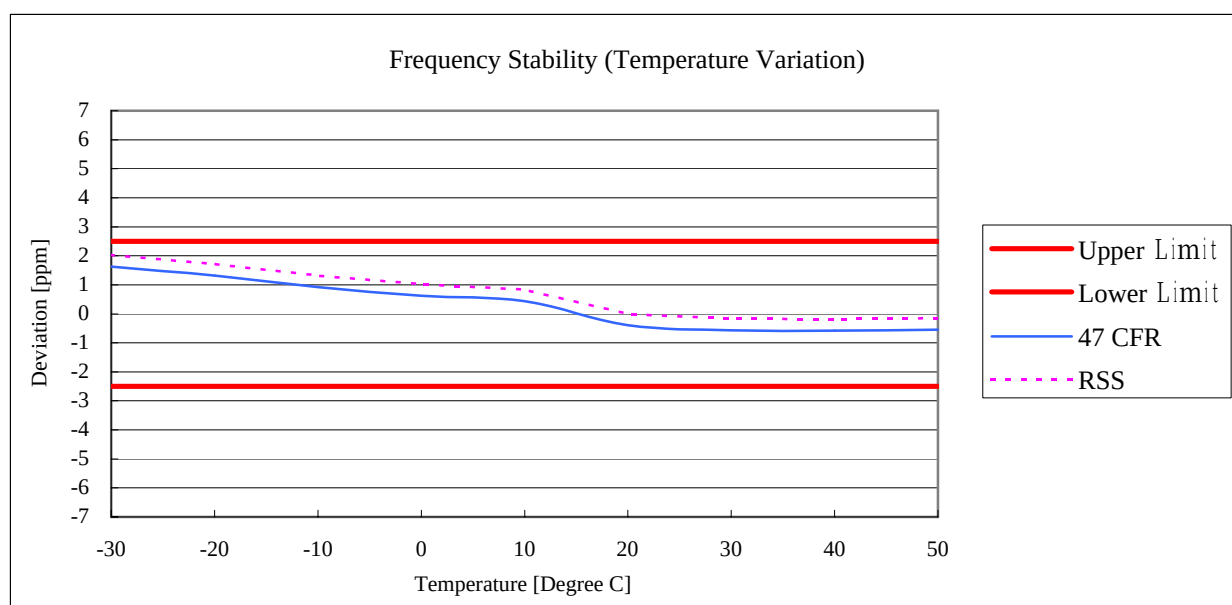
Measurement uncertainty is +/- 3.6%

**TEST RESULTS**

Measured for the worst case

State : 173.95MHz Narrow Band High Power

| No. | Temperature<br>(Degree C) | Frequency<br>(MHz) | 47 CRF<br>Deviation (ppm) | RSS<br>Deviation (ppm) | Limit<br>(ppm) |
|-----|---------------------------|--------------------|---------------------------|------------------------|----------------|
| 1   | -30                       | 173.950283         | 1.626904                  | 2.023571               | 2.5            |
| 2   | -20                       | 173.950229         | 1.316470                  | 1.713137               | 2.5            |
| 3   | -10                       | 173.950160         | 0.919805                  | 1.316471               | 2.5            |
| 4   | 0                         | 173.950109         | 0.626617                  | 1.023283               | 2.5            |
| 5   | 10                        | 173.950075         | 0.431158                  | 0.827824               | 2.5            |
| 6   | 20                        | 173.949931         | -0.396666                 | 0.000000               | 2.5            |
| 7   | 30                        | 173.949901         | -0.569129                 | -0.172463              | 2.5            |
| 8   | 40                        | 173.949900         | -0.574878                 | -0.178212              | 2.5            |
| 9   | 50                        | 173.949905         | -0.546134                 | -0.149468              | 2.5            |



**4.9 Frequency Stability (Voltage Variation)**

REGULATIONS : 47 CFR 2.1055 (d) (1), 90.213(a) / RSS-119 Section 7

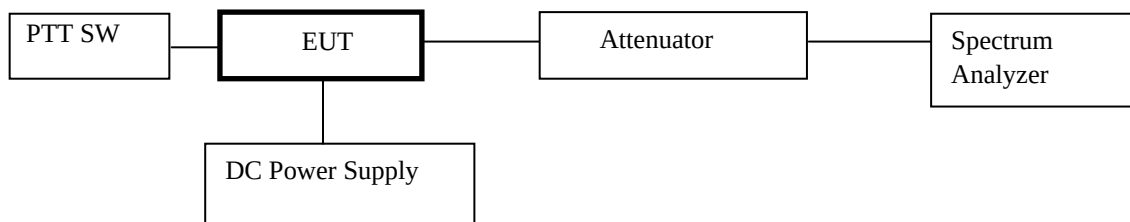
TEST METHOD/GUIDE : ANSI/TIA/EIA-603-1992, section 2.2.2.2 / RSS-119 Section 7

**TEST PROCEDURE**

- 1 The EUT and test equipment were set up as shown on the following page.
- 2 The power supply voltage to the EUT was varied from 85 % to 115 % of the nominal value measured at the input to the EUT.

**TEST EQUIPMENTS**

| No. | Equipment         | Manufacture | Model No.    | Serial No.  | Cal Exp. |
|-----|-------------------|-------------|--------------|-------------|----------|
| 1   | Spectrum Analyzer | Agilent     | E7401A       | US399440256 | May-05   |
| 2   | Attenuator (30dB) | TME         | CFA-100ANP-J | 1008268     | Aug-04   |
| 3   | Attenuator (20dB) | Weinschel   | 40-20-34     | AA5701      | Aug-04   |
| 4   | DC Power Supply   | ALINCO      | DM-112MV     | None        | None     |

**MEASUREMENT EQUIPMENT CONFIGURATION****UNCERTAINTY**

Measurement uncertainty is +/- 3.6%

**TEST RESULTS**

Measured for the worst case

State : 173.95MHz High Power Wide Band Modulation

| No. | Diviation (%) | Voltage (V) | Frequency (MHz) | Deviation (ppm) | Limit (ppm) |
|-----|---------------|-------------|-----------------|-----------------|-------------|
| 1   | 85            | 11.6        | 173.949925      | -0.431158       | 2.5         |
| 2   | 100           | 13.6        | 173.949920      | -0.459902       | 2.5         |
| 3   | 115           | 15.6        | 173.949902      | -0.563380       | 2.5         |

**4.10 Receiver Spurious Emissions(Radiated)**

REGULATIONS : RSS-119, Section 8

TEST METHOD/GUIDE : RSS-119, Section 8

**TEST PROCEDURE**

- 1 The EUT and test equipment were set up as shown on the following page.
- 2 Tabletop Equipment  
EUT is placed on the wooden table, the top of which is 0.8meter above the metal ground plane(turntable).
- 3 Interconnecting Cables  
Excess part of the interconnecting cables longer than 1 meter are bundled in the center.  
Cables that hang closer than 40 cm to the ground plane is folded back and forth forming bundle 30 to 40 cm long,
- 4 Measuring Instruments  
Measuring instruments list and their calibration schedule are shown on Measurement Equipment Configuration.  
The brief description are as follows;
- 5 Antennas  
The broadband Bi-cog antenna is used for measurement on the frequency range 30 – 1000 MHz.  
The Double ridged guide antenna is used for frequency higher than 1000 MHz
- 6 Pre-amplifier  
The broadband pre-amplifier is used for radiated emission measurement.  
The signal to noise ratio is improved by using pre-amplifier.
- 7 Spectrum Analyzer  
The spectrum analyzer is used for preliminary measurement of frequency range 30 – 1000 MHz, and also used for final measurement of higher than 1000 MHz (Resolution bandwidth : 1 MHz).
- 8 EMI Test Receiver  
The Quasi-peak detector (IF bandwidth : 120 kHz) built in test receiver is used for final measurement of the frequency 30 – 1000 MHz.  
The test receiver is complied with the specification of the CISPR publication 16.
- 9 Turntable  
The turntable is capable for EUT weight and rotatable 0 to 360 degree horizontally by remote control in the test room.

**10 Antenna Mast**

The antenna mast is attachable to all antennas described on antenna height is adjustable 1 to 4 meters continuously by remote control at the test room, and antenna polarization is also changed by the remote control.

**Preliminary Measurement****11 EUT is tested on all operating conditions.**

The spectrum analyzer is set max-hold mode and swept during turntable was rotated 0 to 360 degree. Then spectrum chart are plotted out to find the worst emission conditions in configuration, operating mode, or ambient noise notation.

**12 Final Measurement**

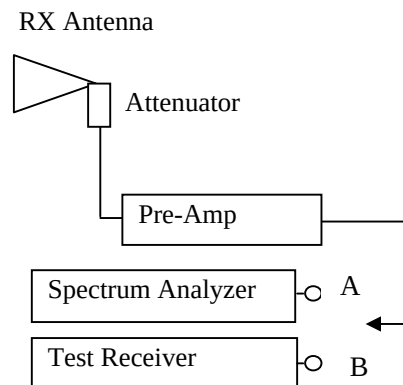
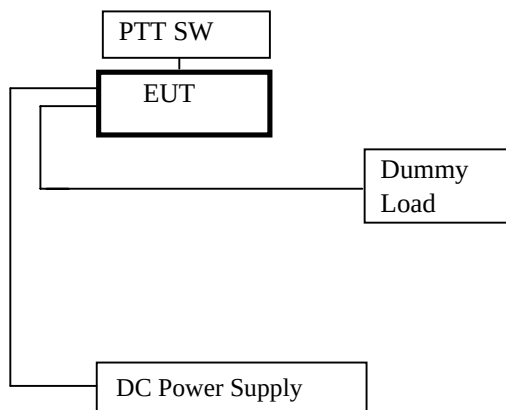
The EUT operated in the condition where maximum emission is found in the preliminary test.

The turntable azimuth(EUT direction) and antenna height are adjusted the position so that maximum field strength is obtained for each frequency spectrum to be measured. The equipment and cables are arranged or manipulated within the range of the test standard in the above condition.

When the uncertain result was obtained, the measurement is retried by using the half wave dipole antenna instead of the broadband antenna

**TEST EQUIPMENTS**

| No. | Equipment         | Manufacture     | Model No.  | Serial No. | Cal Exp. |
|-----|-------------------|-----------------|------------|------------|----------|
| 1   | Tri-log Antenna   | Schwarzbeck     | VULB9168WP | 106        | Feb-05   |
| 2   | D.R.G Antenna     | EMCO            | 3115       | 9612-5044  | Jul-04   |
| 3   | Step Attenuator   | HP              | 8464B      | 2726A14513 | Oct-04   |
| 4   | Pre-Amplifier     | HP              | 8447D      | 1937A03130 | Oct-05   |
| 5   | Pre-Amplifier     | TOYOTECHNICA    | TPA0118-30 | AG0008     | Mar-05   |
| 6   | Attenuator (6dB)  | ANRITSU         | MP721B     | M57593     | Oct-04   |
| 7   | Attenuator (3dB)  | Narda           | 3157846    | 4538       | Aug-04   |
| 8   | Spectrum Analyzer | Agilent         | E7403A     | MY42000062 | Jun-04   |
| 9   | Test Receiver     | Rohde & Schwarz | ESS        | 842123/005 | Sep-04   |
| 10  | Dummy Load        | BIRD            | 8401       | 6163       | Jun-04   |
| 11  | DC Power Supply   | ALINCO          | DM-112MV   | None       | None     |

**MEASUREMENT EQUIPMENT CONFIGURATION****UNCERTAINTY**

Measurement uncertainty is +/- 3.6dB (k = 2)

**TEST RESULTS**

Measured for the worst case

State : 155.05MHz Receiver Condition

| No.                                                           | Frequency<br>(MHz) | Pol  | Reading Level<br>(dBuv) | Factor*<br>(dB) | Emission Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Level | Margin<br>(dB) |
|---------------------------------------------------------------|--------------------|------|-------------------------|-----------------|----------------------------|-------------------|-------|----------------|
| 1                                                             | 364.94             | Hor. | 35.30                   | -3.00           | 32.30                      | 46.0              |       | 13.7           |
|                                                               |                    | Ver. | -                       | -3.00           | -                          | 46.0              |       | -              |
| 2                                                             | 376.02             | Hor. | 40.80                   | -2.60           | 38.20                      | 46.0              |       | 7.8            |
|                                                               |                    | Ver. | 28.00                   | -2.60           | 25.40                      | 46.0              |       | 20.6           |
| 3                                                             | 387.07             | Hor. | 40.90                   | -2.40           | 38.50                      | 46.0              |       | 7.5            |
|                                                               |                    | Ver. | 29.40                   | -2.40           | 27.00                      | 46.0              |       | 19.0           |
| 4                                                             | 398.14             | Hor. | 40.70                   | -2.00           | 38.70                      | 46.0              |       | 7.3            |
|                                                               |                    | Ver. | -                       | -2.00           | -                          | 46.0              |       | -              |
| 5                                                             | 399.79             | Hor. | 44.00                   | -2.00           | 42.00                      | 46.0              |       | 4.0            |
|                                                               |                    | Ver. | -                       | -2.00           | -                          | 46.0              |       | -              |
| 6                                                             | 409.20             | Hor. | 35.40                   | -1.70           | 33.70                      | 46.0              |       | 12.3           |
|                                                               |                    | Ver. | -                       | -1.70           | -                          | 46.0              |       | -              |
| There is the margin of 20dB over except for the above points. |                    |      |                         |                 |                            |                   |       |                |
| * Factor = Antenna,Antenna Pad,Cable,Preamp                   |                    |      |                         |                 |                            |                   |       |                |
| Emission Level = Reading Level + Factor                       |                    |      |                         |                 |                            |                   |       |                |

Note:

- 1 Measurement distance is 3 metres.
- 2 Scanned frequency is 30-2000 MHz.
- 3 Maximum local oscillator frequency is 44.395MHz.

**4.11 Necessary Bandwidth and Emission Bandwidth**

REGULATIONS : 47 CFR 2.202 (g) &amp; Federal Register/ Vol.68, No236

**CALCULATION RESULTS**

State : 16K0F3E(25kHz channel bandwidth)

| Item                | Mark |       |
|---------------------|------|-------|
| Maximum Modulation  | (M)  | 3kHz  |
| Maximum Deviation   | (D)  | 5kHz  |
| Constant Factor     | (K)  | 1     |
| Necessary Bandwidth | (Bn) | 16kHz |

$$B_n = (2 \times M) + (2 \times D \times K)$$

State : 11K0F3E(12.5kHz channel bandwidth)

| Item                | Mark |        |
|---------------------|------|--------|
| Maximum Modulation  | (M)  | 3kHz   |
| Maximum Deviation   | (D)  | 2.5kHz |
| Constant Factor     | (K)  | 1      |
| Necessary Bandwidth | (Bn) | 16kHz  |

$$B_n = (2 \times M) + (2 \times D \times K)$$

State : 20K0F7D(4Level FSK/19200bps, 25kHz channel bandwidth)

| Item                     | Mark |          |
|--------------------------|------|----------|
| Digital information rate | (R)  | 19200bps |
| Peak frequency deviation | (D)  | 5.2kHz   |
| Signaling states         | (S)  | 4        |
| Numerical factor         | (K)  | 1        |
| Necessary Bandwidth      | (Bn) | 20kHz    |

$$B_n = (R / \log_2 S) + 2 \times D \times K$$

State : 11K2F7D(4Level FSK/9600bps, 12.5kHz channel bandwidth)

| Item                     | Mark |         |
|--------------------------|------|---------|
| Digital information rate | (R)  | 9600bps |
| Peak frequency deviation | (D)  | 3.2kHz  |
| Signaling states         | (S)  | 4       |
| Numerical factor         | (K)  | 1       |
| Necessary Bandwidth      | (Bn) | 11.2kHz |

$$B_n = (R / \log_2 S) + 2 \times D \times K$$

State : 14K4F1D(GMSK/9600bps, 25kHz channel bandwidth)

| Item                     | Mark |         |
|--------------------------|------|---------|
| Digital information rate | (R)  | 9600bps |
| Peak frequency deviation | (D)  | 2.4kHz  |
| Signaling states         | (S)  | 2       |
| Constant Factor          | (K)  | 1       |
| Necessary Bandwidth      | (Bn) | 14.4kHz |

$$B_n = (R / \log_2 S) + 2 \times D \times K$$

State : 7K20F1D(GMSK/4800bps, 12.5kHz channel bandwidth)

| Item                     | Mark |         |
|--------------------------|------|---------|
| Digital information rate | (R)  | 4800bps |
| Peak frequency deviation | (D)  | 1.2kHz  |
| Signaling states         | (S)  | 2       |
| Constant Factor          | (K)  | 1       |
| Necessary Bandwidth      | (Bn) | 7.2kHz  |

$$B_n = (R/\log_2 S) + 2 \times D \times K$$

## 5. VALIDITY OF TEST REPORT

The test result of this report is effective for equipment under test itself and under the test configuration described on the report.

This test report does not assure that whether the test result taken in other testing laboratory is compatible or reproducible to the test result on this report or not.

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## 6. DESCRIPTION OF TEST LABORATORY

| AUTHORIZATION |           | SCOPE             | LAB. CODE     |
|---------------|-----------|-------------------|---------------|
| NVLAP         | USA       | EMC Testing       | 100290-0      |
| NVLAP         | USA       | Calibration       | 100290-0      |
| NVLAP         | USA       | Telecommunication | 100290-0      |
| VLAC          | JAPAN     | EMC Testing       | VLAC-008      |
| BSMI          | TAIWAN    | EMC Testing       | SL2-IN-E-6008 |
| NATA          | AUSTRALIA | Calibration       | 13491         |
| NATA          | AUSTRALIA | Telecommunication | 100290-0      |

| ACCREDITATION       |         | SCOPE       | LAB. CODE   |
|---------------------|---------|-------------|-------------|
| NEMKO               | NORWAY  | EMC Testing | ELA107      |
| ETL SEMKO JAPAN     | SWEDEN  | EMC Testing | 9200202558R |
| TÜV PRODUCT SERVICE | GERMANY | EMC Testing | JPN0304C    |

| FILING |        | SCOPE             | LAB. CODE   |
|--------|--------|-------------------|-------------|
| FCC    | USA    | EMC Testing       | 90433,90434 |
| IC     | CANADA | EMC Testing       | IC-2065     |
| IC     | CANADA | Telecommunication | IC-2065     |
| VCCI   | JAPAN  | EMC Testing       |             |

Note 1 : NVLAP accreditation does not constitute any product endorsement by NVLAP or any agent of the U.S. Government.