



CERTIFICATE OF COMPLIANCE

Regulation : FCC Part 2, 22, 74, 90, 90.210, 95

Applicant	Testing Laboratory
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Equipment type	UHF FM Transceiver
Trademark	KENWOOD
Model(s)	TK-8180-K
Serial No.	10
FCC ID	K4437313110
Test Procedure(s)	Akzo Nobel Document number 03-10-401
Deviation	No deviation
Test Result	Complied
Report Number	ANKK-104092
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, 226-8525 Japan
Attenuation	:	Tamaki Shimamura Manager, Communications Equipment Division
Telephone number	:	+81 45 939 6254
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DESCRIPTION OF TEST ITEM

Kind of EUT	:	Mobile Device
Condition of EUT	:	Pre Production
Type	:	Mobile
Trademark	:	KENWOOD
Model number	:	TK-8180-K
Serial number	:	10
Emission Designation	:	16K0F3E(Wide) / 11K0F3E(Narrow) 20K0F7D(Wide) / 11K2F7D(Narrow) 14K4F1D(Wide) / 7K20F1D(Narrow)
Frequency Range	:	450 to 520 MHz
Output Power	:	1 to 30 W
Number of Channel	:	512
Channel Spacing	:	25kHz (Wide) / 12.5 kHz (Narrow)
Antenna Impedance	:	50 Ω 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 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	YES
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.

SECTION 3. MEASUREMENT RESULT

FCC RULE	TEST ITEM	RESULTS
2.1046 (a)	Carrier Output Power (Conducted)	PASS
2.1051, 90.210	Unwanted Emissions (Transmitter Conducted)	PASS
2.1053 (a), 90.210	Field Strength of Spurious Radiation	PASS
2.1049 (c) (1), 90.210	Emission Masks (Occupied Bandwidth)	PASS
90.214	Transient Frequency Behavior	PASS
2.1047 (a), 90.242(b)(8)	Audio Low Pass Filter (Voice Input)	PASS
2.1047 (a)	Audio Frequency Response	PASS
2.1047 (b)	Modulation Limiting	PASS
2.1055 (a) (1), 90.213(a)	Frequency Stability (Temperature Variation)	PASS
2.1055 (d) (1), 90.213(a)	Frequency Stability (Voltage Variation)	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)
TEST METHOD/GUIDE	: ANSI/TIA/EIA-603-1992, section 2.2.1.2

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.

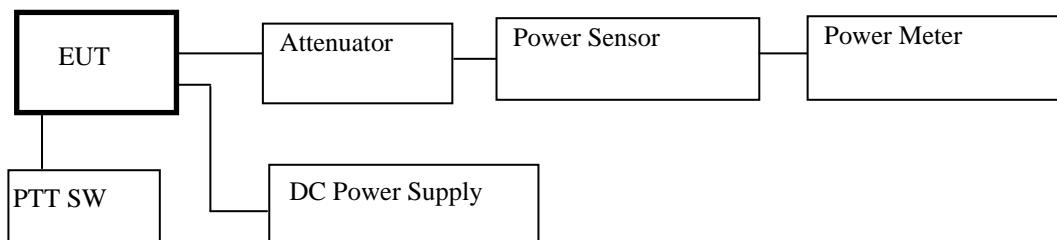
RF Power (dBm) = Power Meter reading (dBm) + Attenuator (dB) + Cable loss (dB)

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

TEST EQUIPMENTS

No.	Equipment	Manufacture	Model No.	Serial No.	Cal Exp.
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	450.05	Low	High Power
2	485.05	Mid	High Power
3	519.95	High	High Power
4	450.05	Low	Low Power
5	485.05	Mid	Low Power
6	519.95	High	Low Power

4.2 Unwanted Emissions (Transmitter Conducted)

REGULATIONS : 47 CFR 2.1051, 90.210

TEST METHOD/GUIDE : ANSI/TIA/EIA-603-1992, section 2.2.13.2

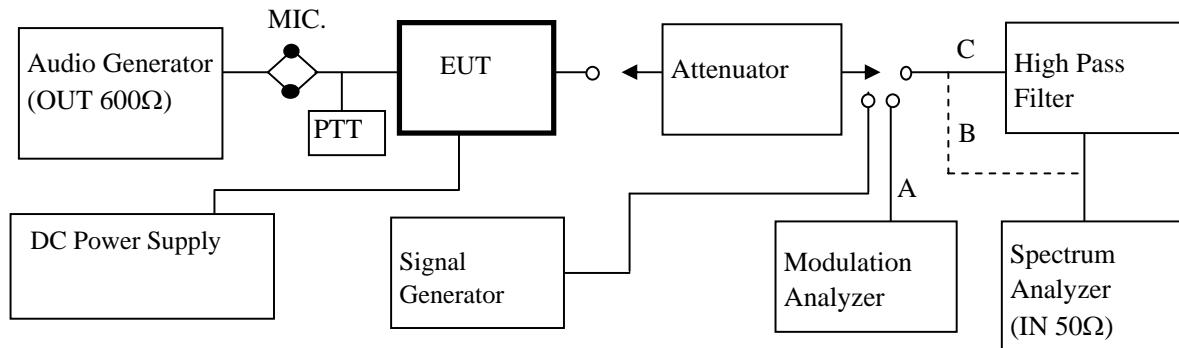
TEST PROCEDURE

- 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	MP526D	6200220657	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 (MHz)		Correct Level (dBm)	Emission Level (dBc)	Limit (dBc)	Margin (dB)
1	1800.20	Low	-32.50	-77.28	-64.77	12.5
2	2250.25	Low	-34.27	-79.04	-64.77	14.3
3	1940.20	Mid	-39.89	-84.66	-64.77	19.9
4	2425.25	Mid	-35.43	-80.20	-64.77	15.4
5	1559.86	High	-32.68	-77.45	-64.77	12.7
6	2599.76	High	-31.48	-76.25	-64.77	11.5

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

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

$$\text{Correct Level (dBm)} = \text{Substitute SG Level (dBm)} + \text{Attenuator loss (dB)}$$

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

$$P = \text{Carrier Level (W)}$$

4.3 Field Strength of Spurious Radiation

REGULATIONS : 47 CFR 2.1053 (a), 90.210

TEST METHOD/GUIDE : ANSI/TIA/EIA-603-1992, section 2.2.12.2

TEST PROCEDURE

- 1 The EUT and test equipment were set up as shown on the following page.
- 2 Adjust the spectrum analyzer for the following setting:
 - a) Resolution Bandwidth : 10 kHz (< 1 GHz), 1 MHz (> 1 GHz).
 - b) Video Bandwidth : 300 kHz (< 1 GHz), 3 MHz (> 1 GHz).
 - c) Sweep Speed : 50ms.
 - d) Detector mode : Positive Peak
- 3 The transmitter was placed on a wooden turntable, and it was transmitting into non-radiating load which was also placed on the turntable.
- 4 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.

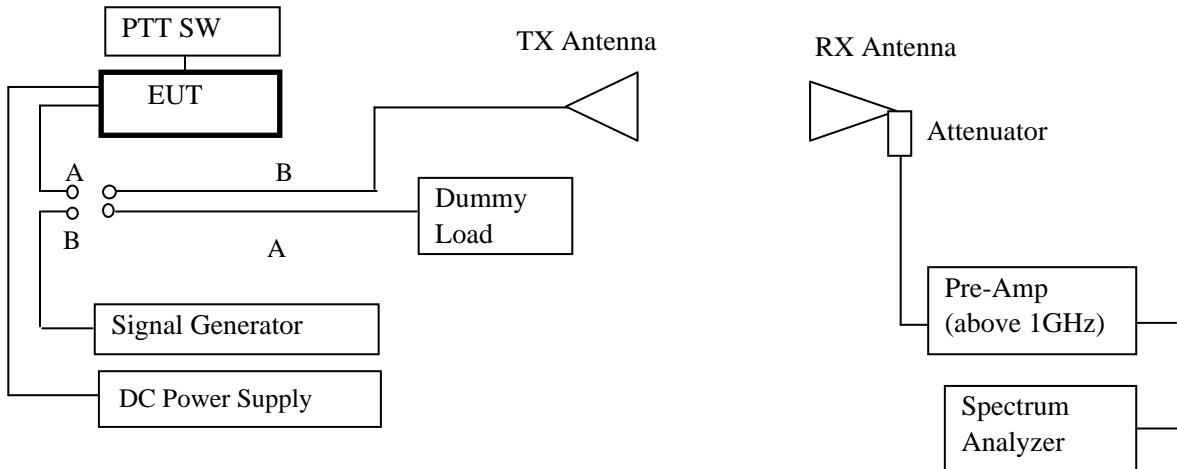
The test was performed by placing the EUT on 3-orthogonal axis.
- 5 The frequency range up to tenth harmonic of the fundamental frequency was investigated.
- 6 Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable.

The absolute levels of the spurious emissions were measured by the substitution.
- 7 Spurious emissions in dB = 10 Log (TX power in Watts/0.001) – the absolute level
- 8 Spurious attenuation Wide Band Modulation limit in dB = 43 + 10 Log10 (power out in Watts)
- 9 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 : 519.95MHz High Power Narrow Band Modulation

No.	Frequency (MHz)	Reading			Antenna Gain (dBi)	Correct Level (dBm)	Emission Level (dBc)		Margin (dB)	
		Pol	Level (dBm)	SG Out Level (dBm)			Level (dBc)	Level (dBc)		
1	1039.98	Hor.	-36.33	-40.3	0.99	6.40	-34.9	-79.7	-64.8	14.9
		Ver.	-41.55	-45.9	0.99	6.40	-40.5	-85.3	-64.8	20.5
2	1559.83	Hor.	-36.94	-40.8	1.21	8.50	-33.5	-78.3	-64.8	13.5
		Ver.	-34.38	-38.2	1.21	8.50	-30.9	-75.7	-64.8	10.9
3	2599.83	Hor.	-40.07	-40.5	1.52	10.20	-31.8	-76.6	-64.8	11.8
		Ver.	-34.99	-32.6	1.52	10.20	-23.9	-68.7	-64.8	3.9
4	5199.50	Hor.	-53.32	-45.6	2.26	11.10	-36.8	-81.5	-64.8	16.8
		Ver.	-50.48	-44.0	2.26	11.10	-35.2	-79.9	-64.8	15.2

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

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

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

$$\text{Correct Level (dBm)} = \text{Substitute SG Level (dBm)} + \text{ANT Gain (dBi)} - \text{Cable loss (dB)}$$

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

$$P = \text{Carrier Level (W)}$$

4.4 Emission Masks (Occupied Bandwidth)

REGULATIONS : 47 CFR 2.1049 (c) (1), 90.210

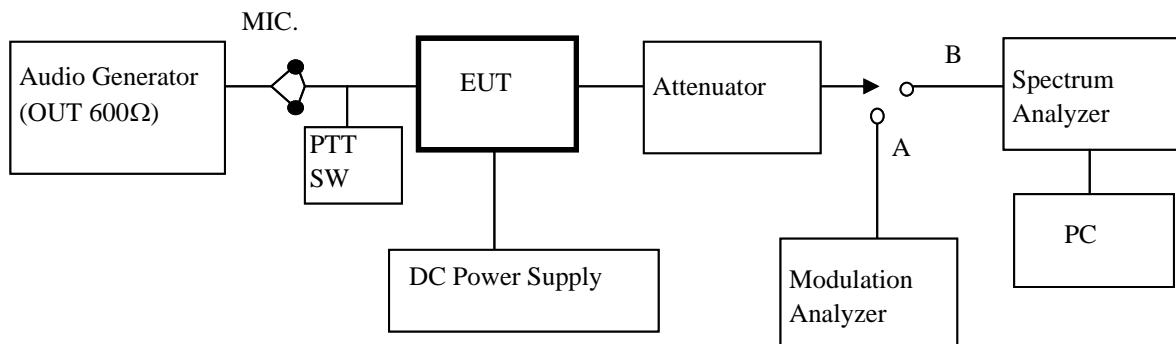
TEST METHOD/GUIDE : ANSI/TIA/EIA-603-1992, section 2.2.11.2

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



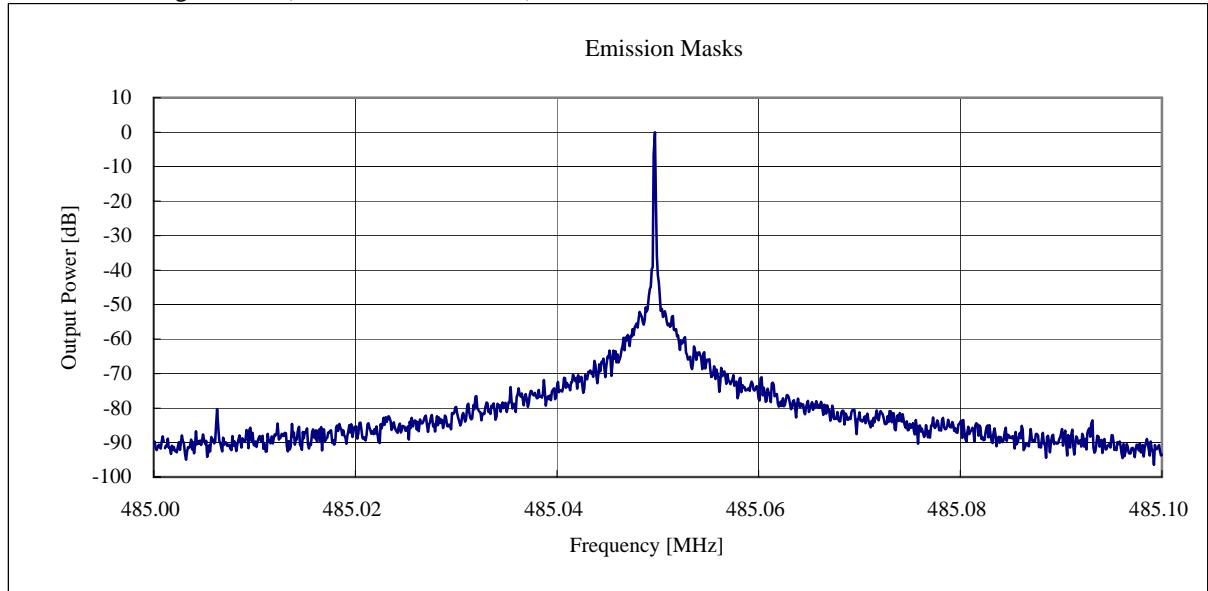
UNCERTAINTY

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

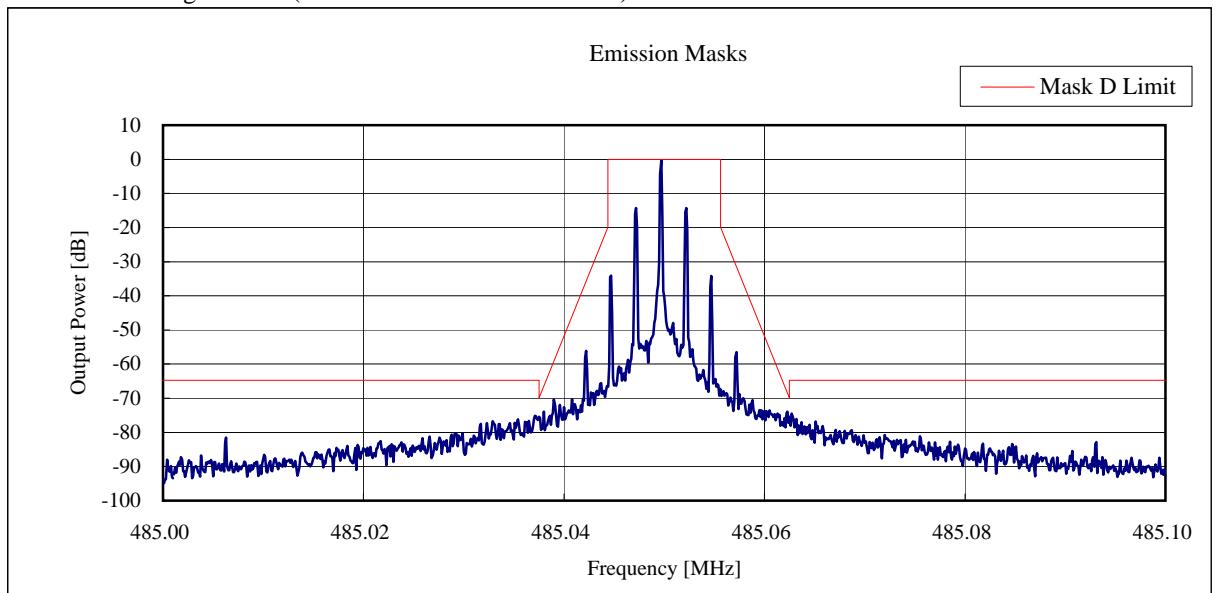
TEST RESULTS

Measured for the worst case

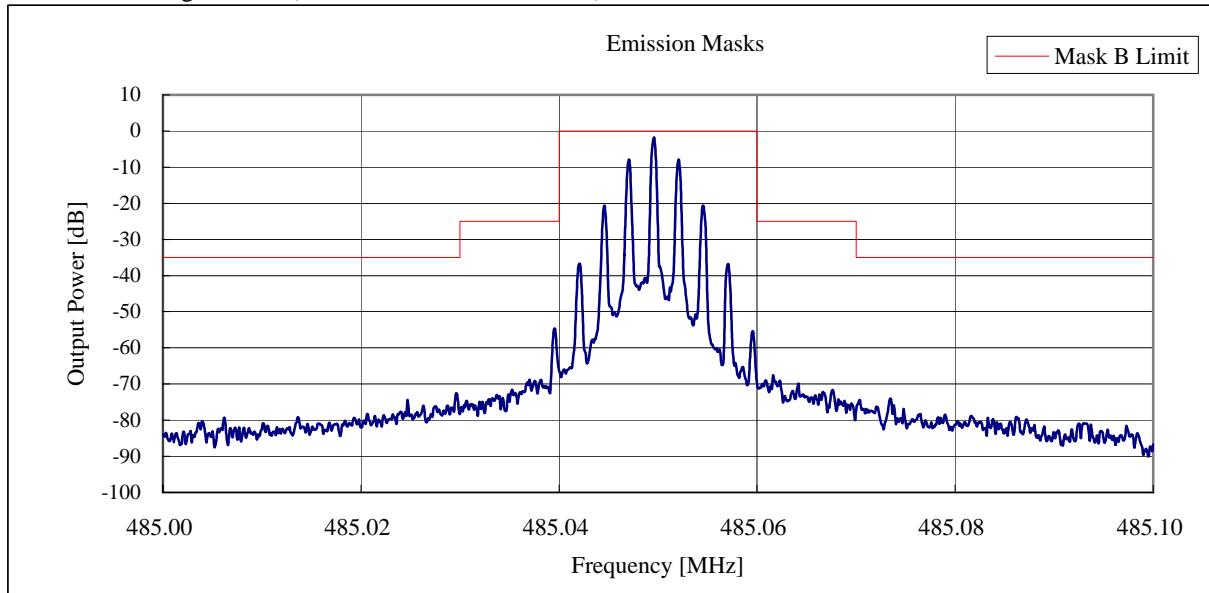
State : 485.05MHz High Power (None Modulation:FM)



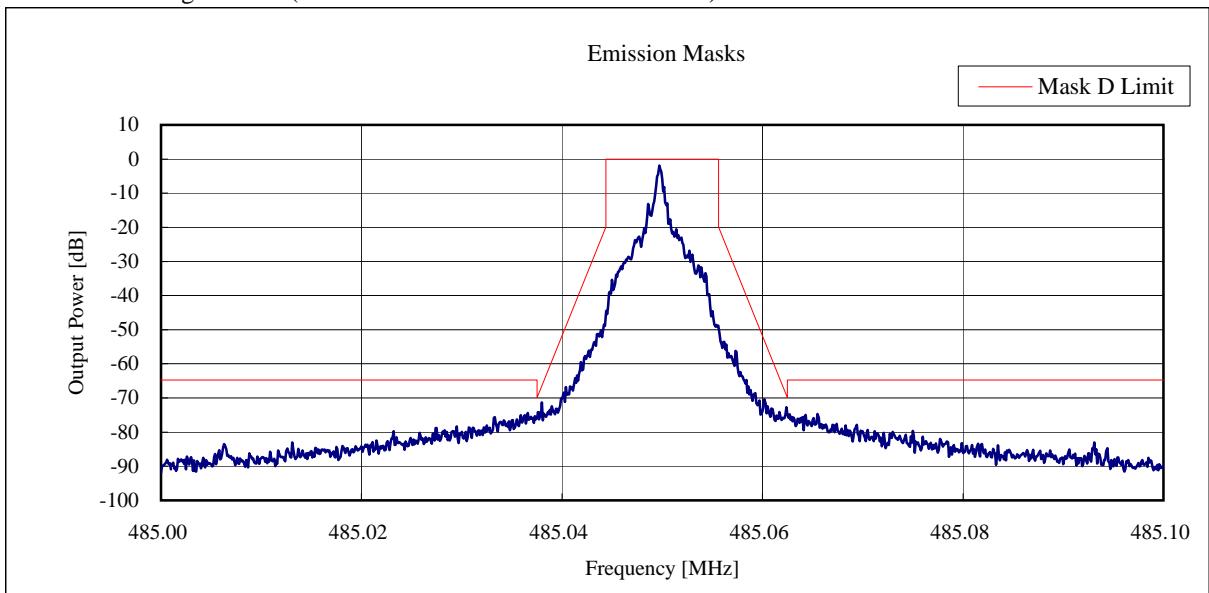
State : 485.05MHz High Power (Narrow Band Modulation:FM)



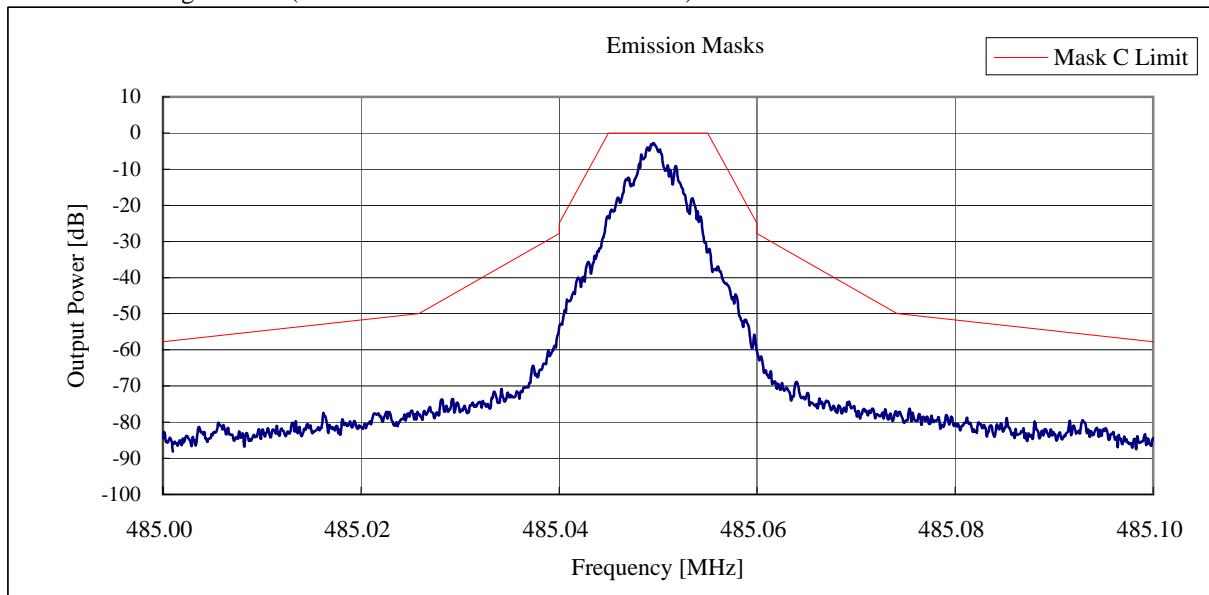
State : 485.05MHz High Power (Wide Band Modulation:FM)



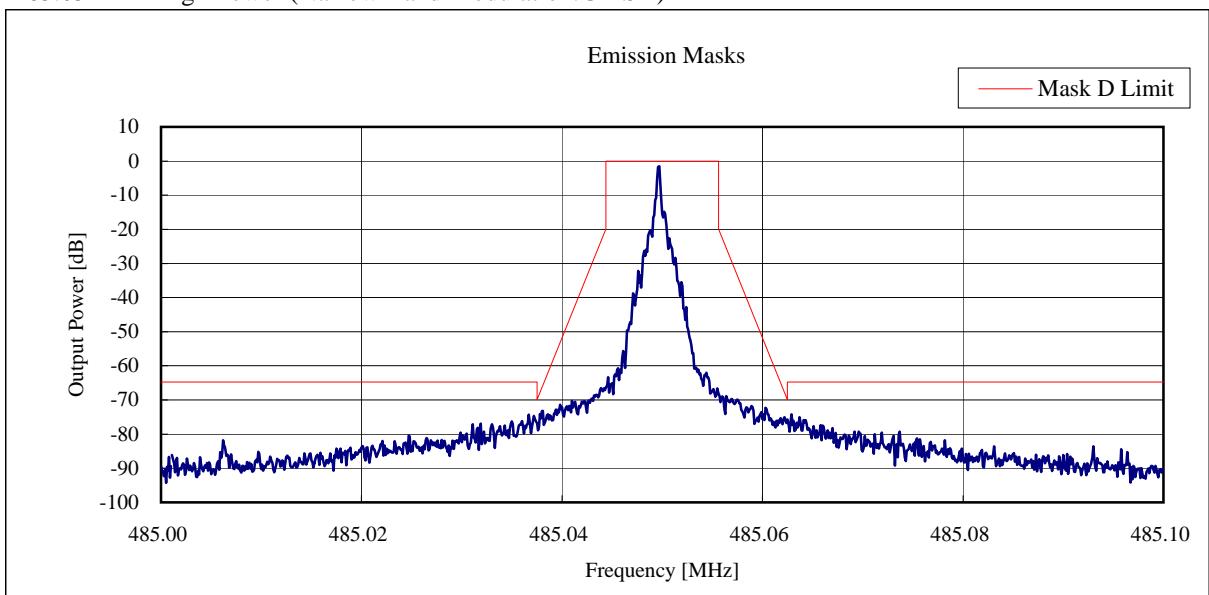
State : 485.05MHz High Power (Narrow Band Modulation:4Level FSK)



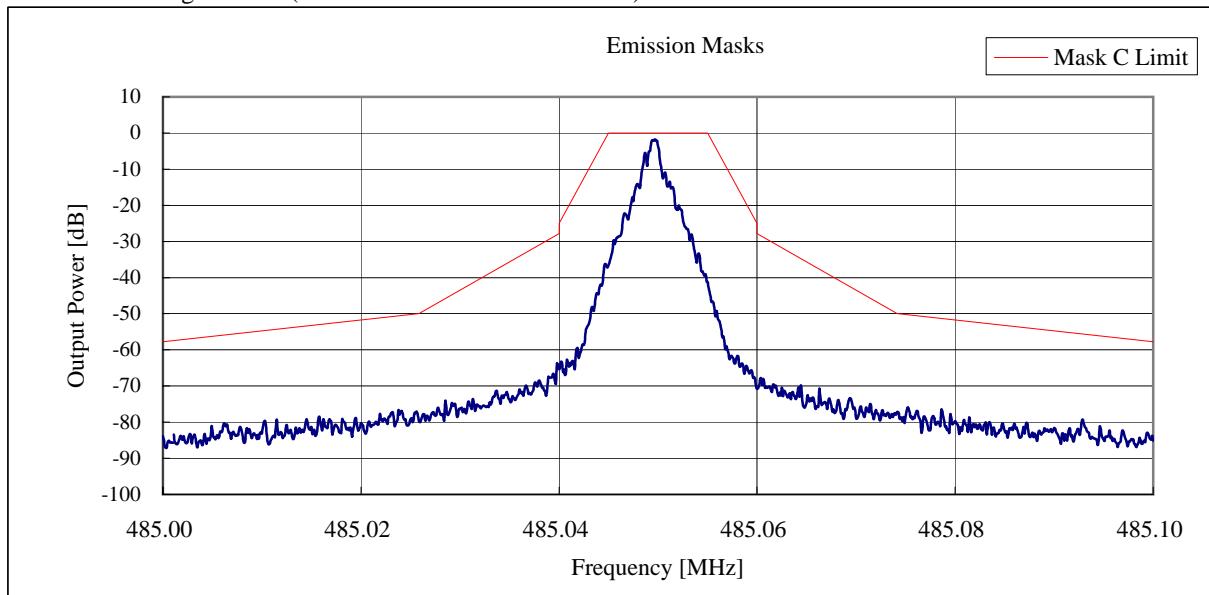
State : 485.05MHz High Power (Wide Band Modulation:4Level FSK)



State : 485.05MHz High Power (Narrow Band Modulation:GMSK)



State : 485.05MHz High Power (Wide Band Modulation:GMSK)



4.5 Transient Frequency Behavior

REGULATIONS : 47 CFR 90.214

TEST METHOD/GUIDE : ANSI/TIA/EIA-603-1992, section 2.2.19.3

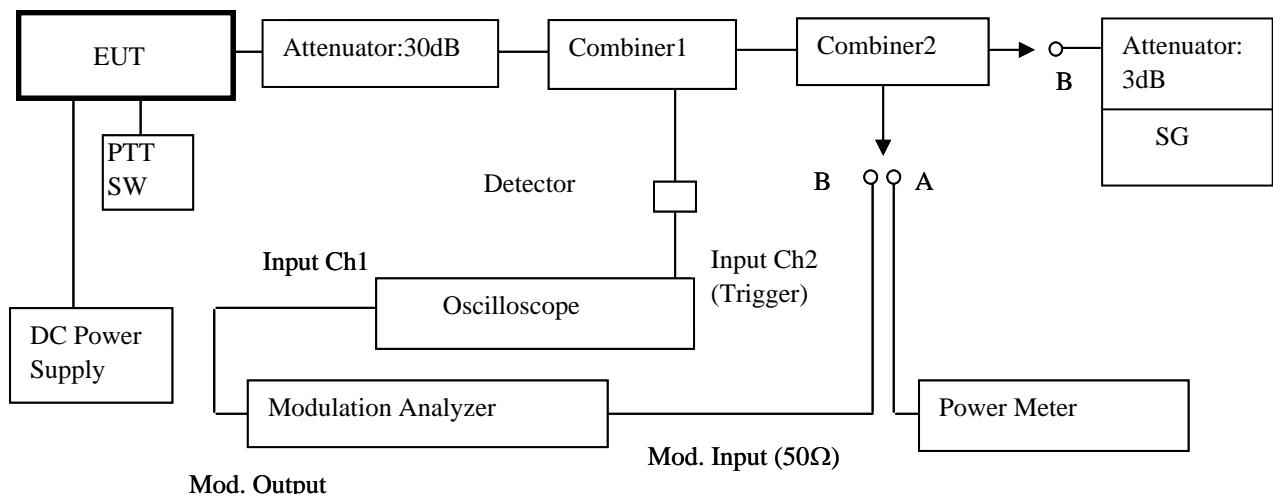
TEST PROCEDURE

- 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 EQUIPMENT CONFIGURATION



UNCERTAINTY

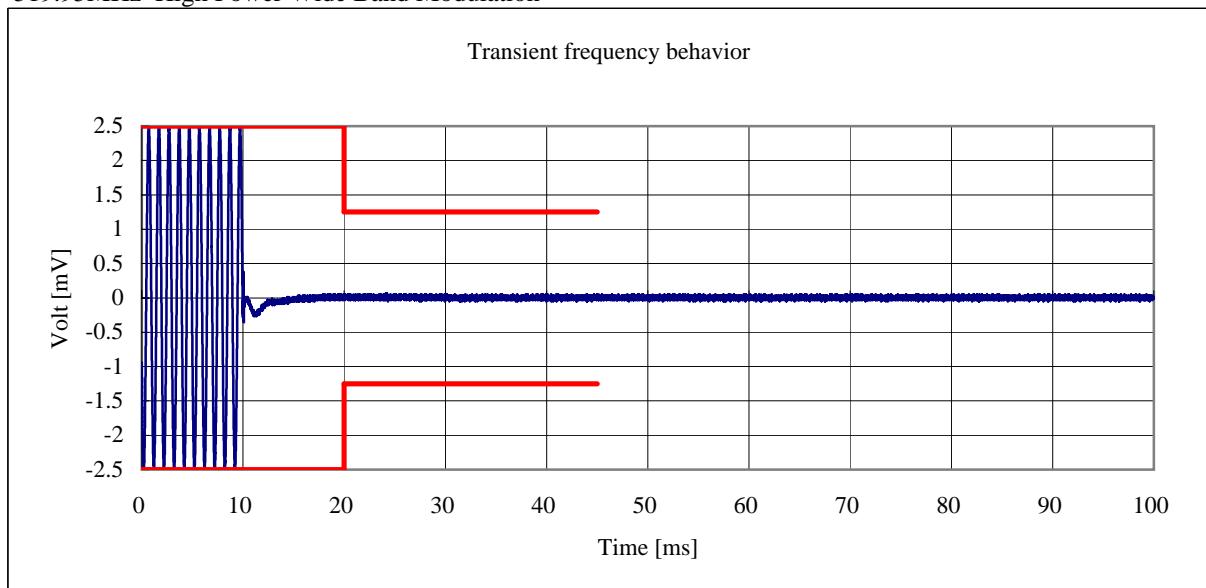
Measurement uncertainty is $\pm 1.3\text{dB}$ ($k = 2$)

TEST RESULTS

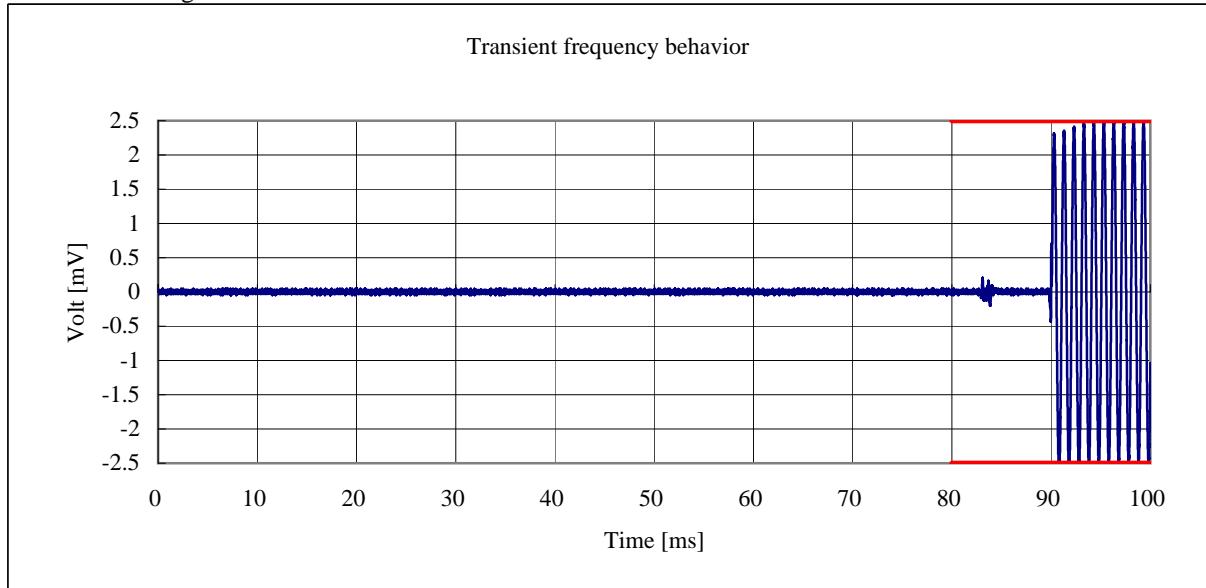
Measured for the worst case

PTT: OFF-ON

State : 519.95MHz High Power Wide Band Modulation



State : 519.95MHz 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)

TEST METHOD/GUIDE

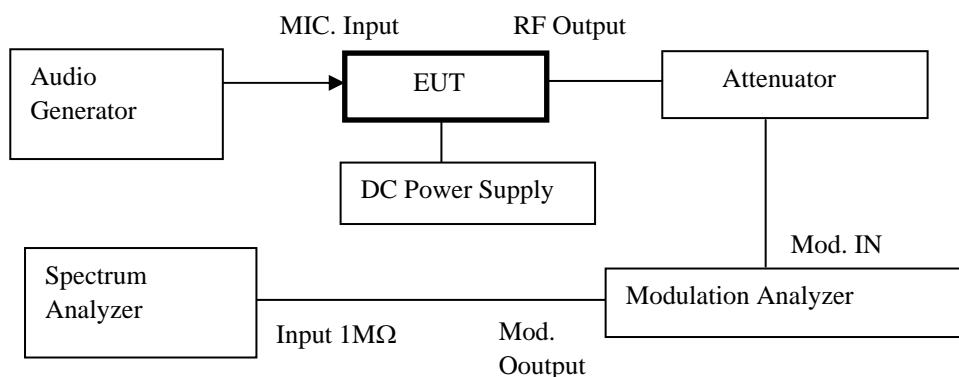
: ANSI/TIA/EIA-603-1992, section 2.2.6.2.2, 3.2.6.2

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

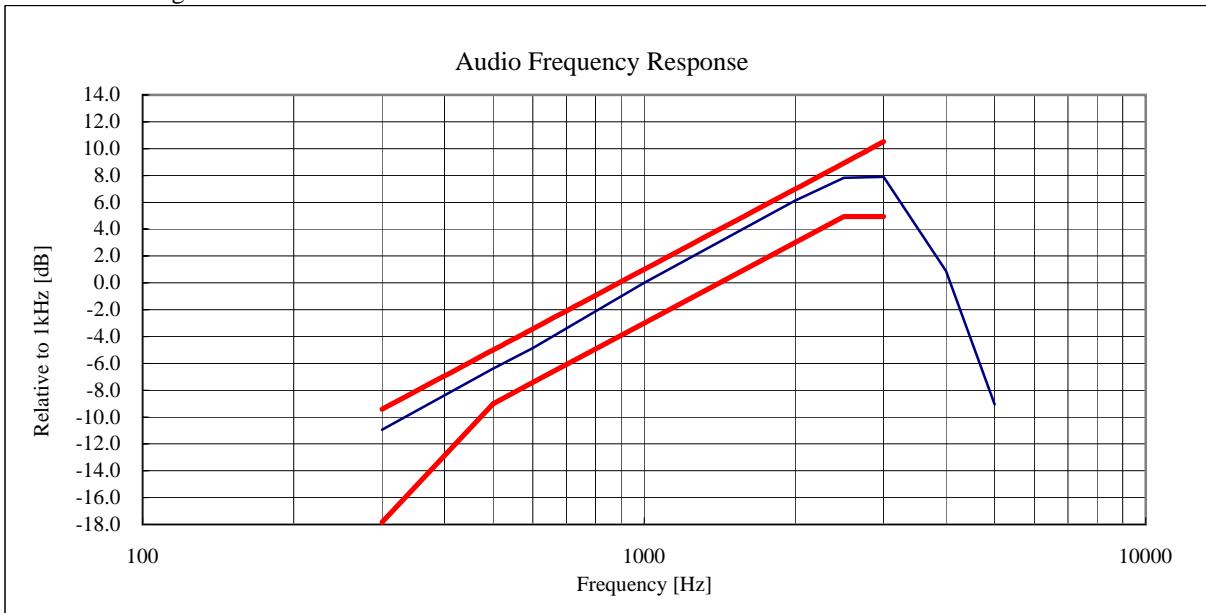
MEASUREMENT EQUIPMENT CONFIGURATION**UNCERTAINTY**

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

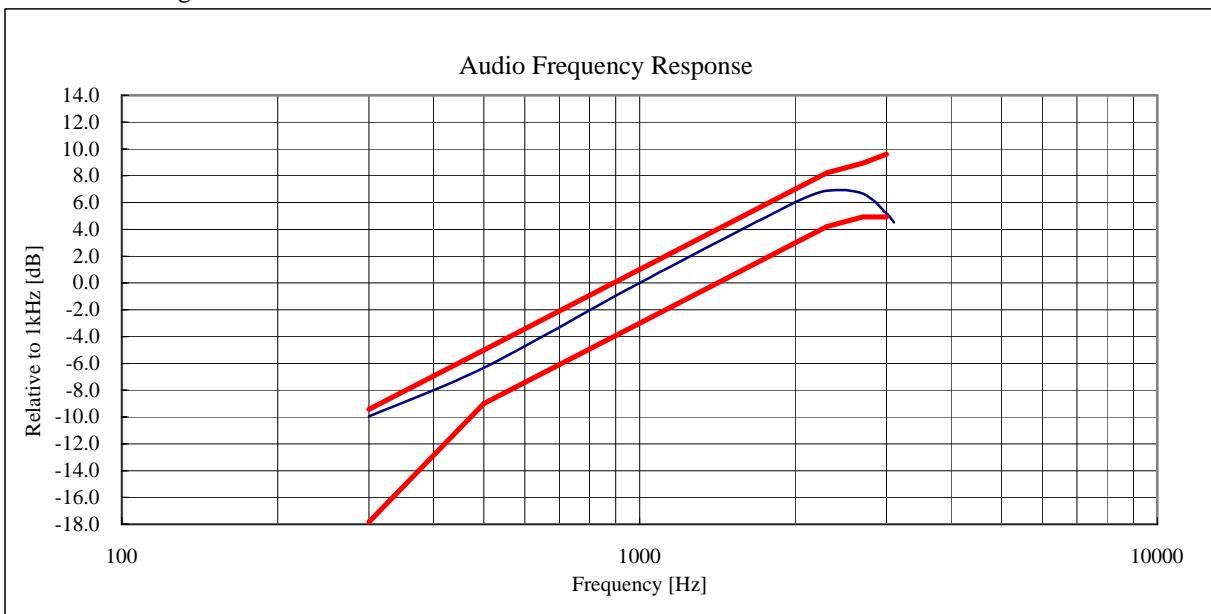
TEST RESULTS

Measured for the worst case

State : 519.95MHz High Power Wide Band Modulation



State : 519.95MHz High Power Narrow Band Modulation



Note:

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

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)
TEST METHOD/GUIDE	: ANSI/TIA/EIA-603-1992, section 2.2.3.2, 1.3.4.4

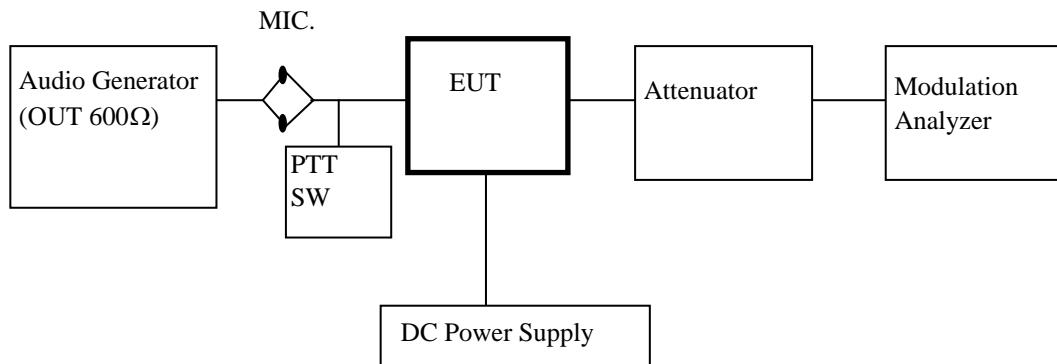
TEST PROCEDURE

- 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 moduralating 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



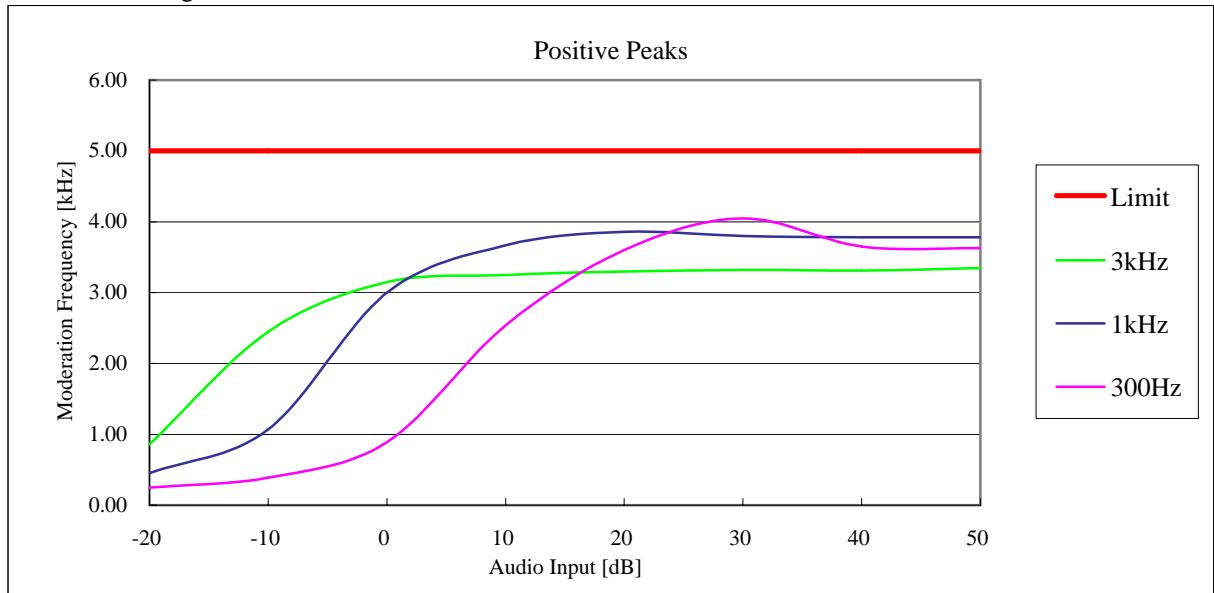
UNCERTAINTY

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

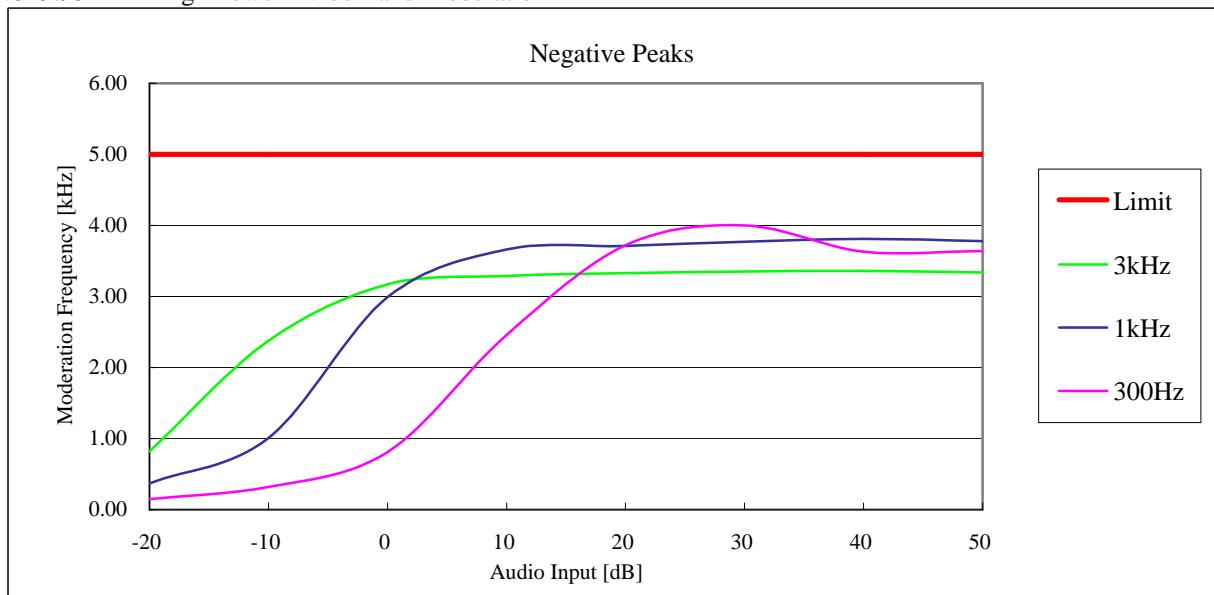
TEST RESULTS

Measured for the worst case

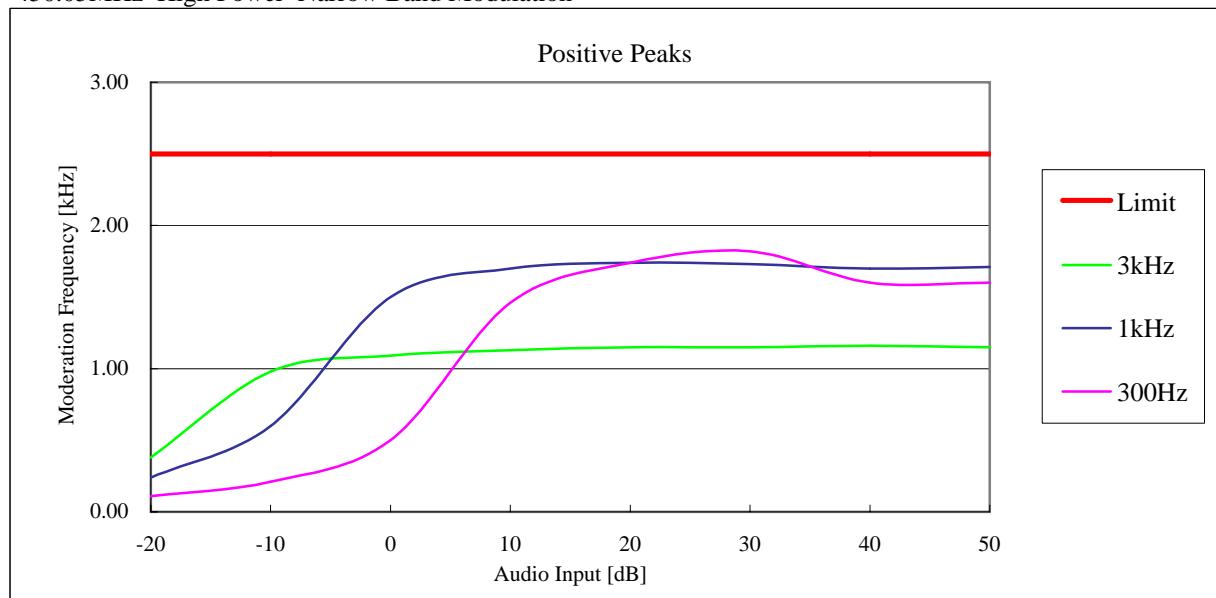
State : 519.95MHz High Power Wide Band Modulation



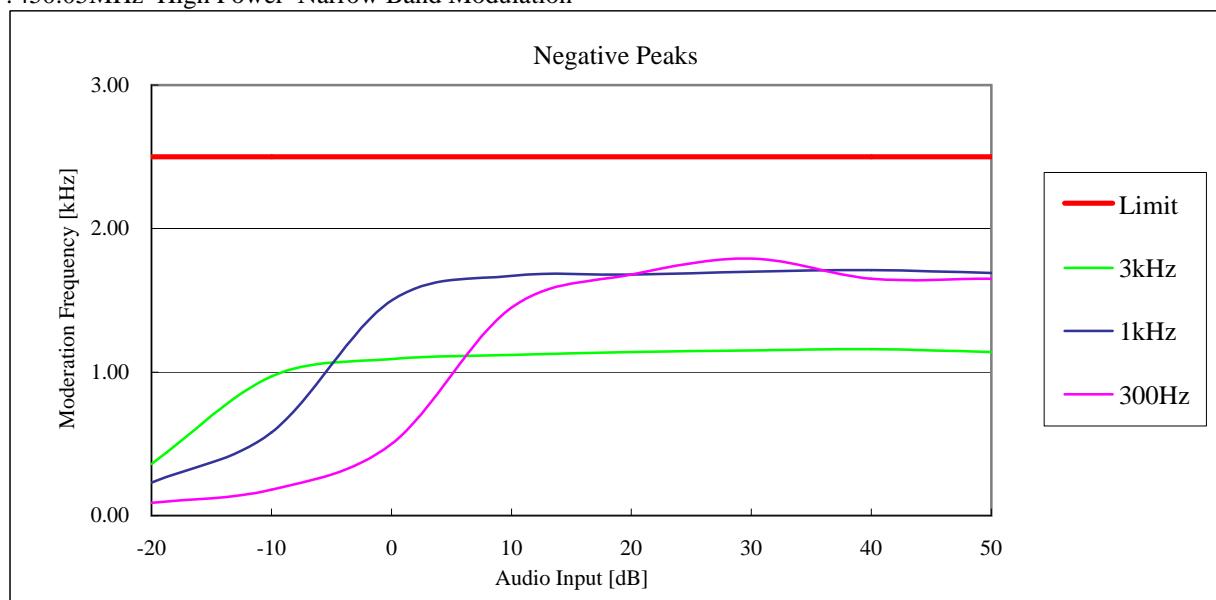
State : 519.95MHz High Power Wide Band Modulation



State : 450.05MHz High Power Narrow Band Modulation



State : 450.05MHz High Power Narrow Band Modulation



4.8 Frequency Stability (Temperature Variation)

REGULATIONS : 47 CFR 2.1055 (a) (1), 90.213(a)

TEST METHOD/GUIDE : ANSI/TIA/EIA-603-1992, section 2.2.2.2

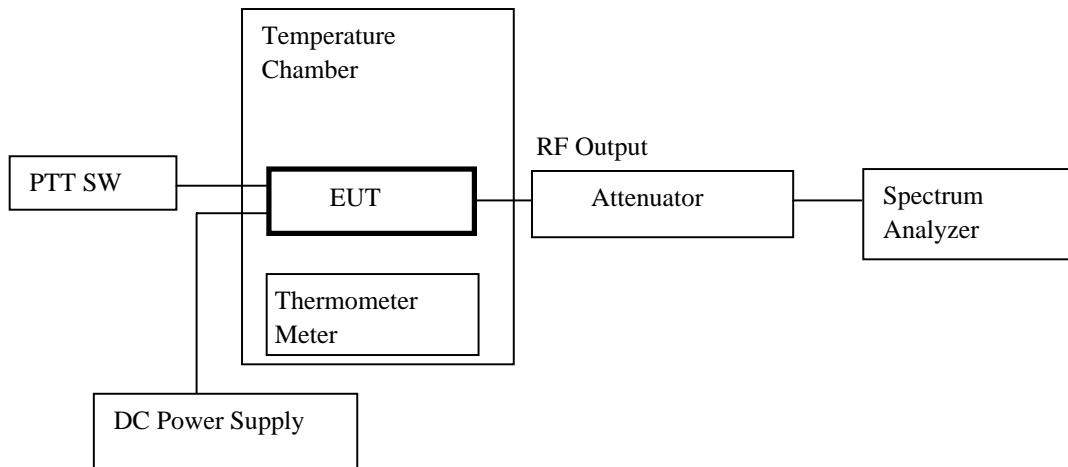
TEST PROCEDURE

- 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

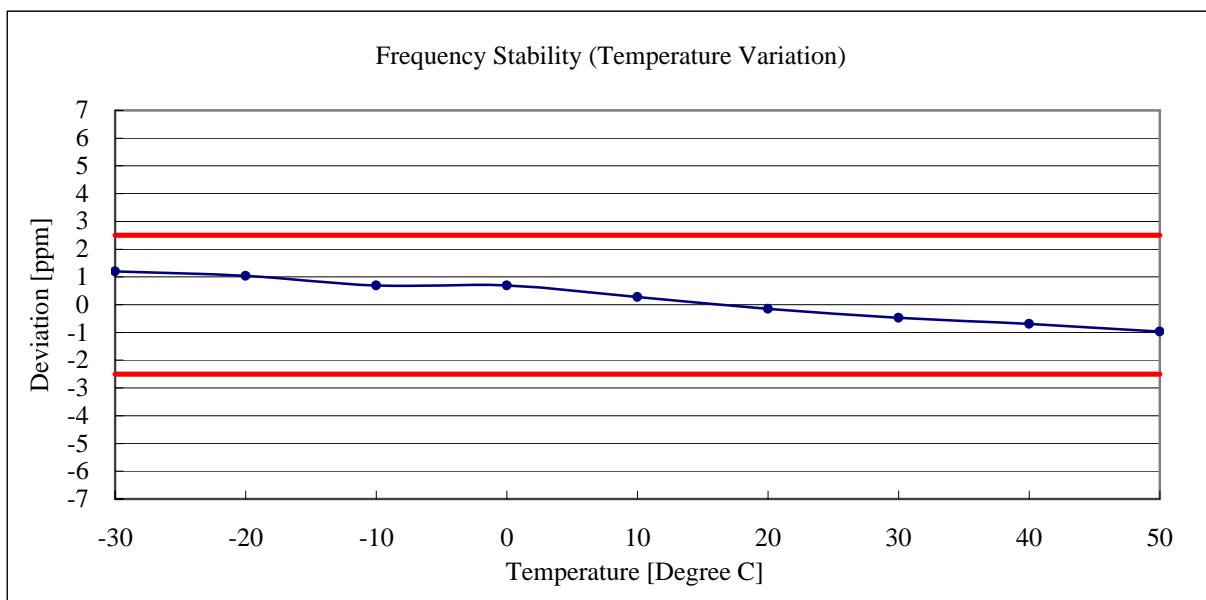
Measurement uncertainty is +/- 3.6%

TEST RESULTS

Measured for the worst case

State : 450.05MHz Wide Band High Power

No.	Temperature (Degree C)	Frequency (MHz)	Deviation (ppm)	Limit (ppm)
1	-30	450.050541	1.202089	2.5
2	-20	450.050468	1.039884	2.5
3	-10	450.050312	0.693256	2.5
4	0	450.050311	0.691034	2.5
5	10	450.050123	0.273303	2.5
6	20	450.049931	-0.153316	2.5
8	30	450.049786	-0.475503	2.5
9	40	450.049689	-0.691034	2.5
10	50	450.049566	-0.964337	2.5



4.9 Frequency Stability (Voltage Variation)

REGULATIONS : 47 CFR 2.1055 (d) (1), 90.213(a)

TEST METHOD/GUIDE : ANSI/TIA/EIA-603-1992, section 2.2.2.2

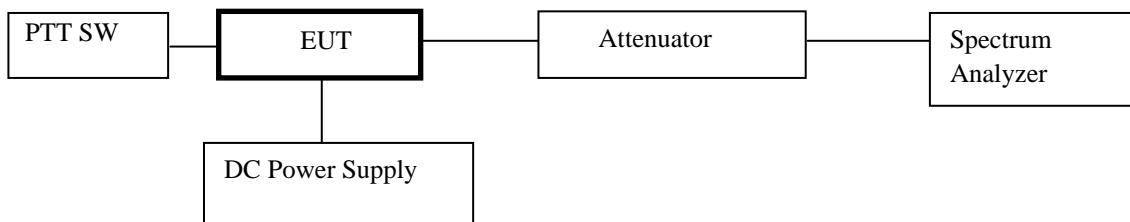
TEST PROCEDURE

- 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 : 450.05MHz High Power Wide Band Modulation

No.	Deviation (%)	Voltage (V)	Frequency (MHz)	Deviation (ppm)	Limit (ppm)
1	85	11.6	450.049780	-0.488835	2.5
2	100	13.6	450.049834	-0.368848	2.5
3	115	15.6	450.049807	-0.428841	2.5

4.10 Necessary Bandwidth and Emission Bandwidth

REGULATIONS : 47 CFR 2.202 (g) & 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

$$Bn = (2xM) + (2xDxK)$$

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

$$Bn = (2xM) + (2xDxK)$$

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

$$Bn = (R/\log_2 S) + 2xDxK$$

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

$$Bn = (R/\log_2 S) + 2xDxK$$

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

$$Bn = (R/\log_2 S) + 2xDxK$$

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

$$Bn = (R/\log_2 S) + 2xDxK$$

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.