



CERTIFICATE OF COMPLIANCE

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


Applicant	Testing Laboratory
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Equipment type	UHF FM TRANSCEIVER
Trademark	KENWOOD
Model(s)	TK-8180-K2
Serial No.	1
FCC ID	K4437313120
IC CN and UPN	282F-37313120
Measurement Method	ANSI/TIA/EIA-603 / RSS-119
Deviation from Standard(s)	No deviation
Test Result	Complied
Report Number	ANKK-104209
Report issue date	August 23, 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
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-8180-K2
Serial number	: 1
Emission Designation	: 16K0F3E(Wide) / 11K0F3E(Narrow) 20K0F7D(Wide) / 11K2F7D(Narrow) 14K4F1D(Wide) / 7K20F1D(Narrow)
Frequency Range	: 400 to 470 MHz
Output Power	: 1 to 30 W
Number of Channel	: 512
Channel Spacing	: 25 kHz (Wide) / 12.5 kHz (Narrow)
Antenna Impedance	: 50 Ω Norminal

TEST PERFORMED	
EUT Received	: August 05, 2004
Test started	: August 06, 2004
Test completed	: August 19, 2004
Temperature	: 20.0 to 24.0 degrees C
Humidity	: 36 to 62 %
Atmospheric	: 101.1 to 102.4 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

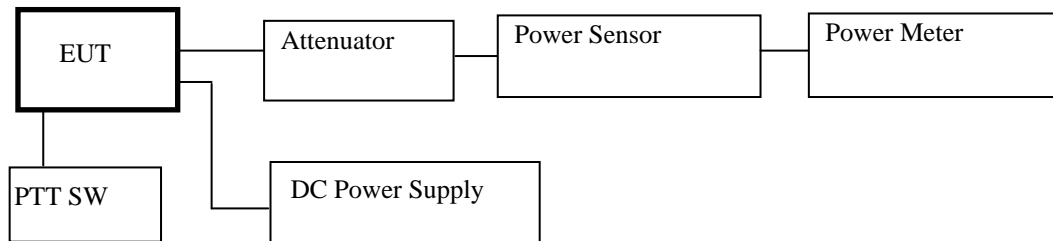
- 1 The EUT and test equipment were set up as shown on the following page.
- 2 The EUT was conducted to a resistive coaxial attenuator of normal load impedance.

RF Power (dBm) = Power Meter reading (dBm) + Attenuator (dB) + Cable loss (dB)
 RF Power (W) = 10^{(RF Power (dBm)/10)}/1000

TEST EQUIPMENTS

No.	Equipment	Manufacture	Model No.	Serial No.	Cal Exp.
1	Power Meter	Giga-tronics	80601A	1831542	Dec-04
2	Power Sensor	Giga-tronics	8541C	1832337	Dec-04
3	Attenuator (20dB)	Weinschel	40-20-34	AA5701	Jul-05
4	Attenuator (20dB)	Radiall	R414720161	03-24	Jul-05
5	Attenuator (10dB)	TME	CFA-05NPJ-10	262843	Jun-05
6	DC Power Supply	KIKUSUI	PAD35-301	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	400.05	Low High Power	30
2	435.05	Mid High Power	30
3	469.95	High High Power	30
4	400.05	Low Low Power	5
5	435.05	Mid Low Power	5
6	469.95	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

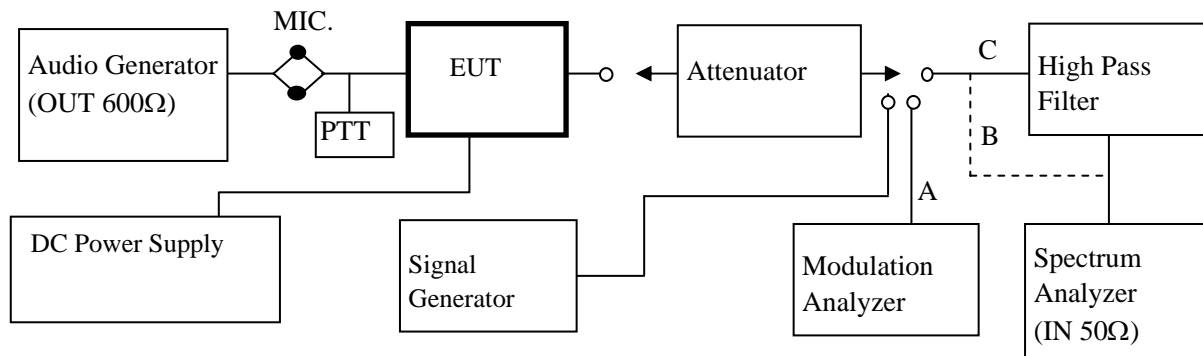
TEST PROCEDURE

- 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	ANRITSU	MG443B	1004468	Jul-05
2	Attenuator (20dB)	Weinschel	40-20-34	AA5701	Jul-05
3	Attenuator (20dB)	Radiall	R414720161	03-24	Jul-05
4	Attenuator (10dB)	TME	CFA-05NPJ-10	262843	Jun-05
5	Modulation Analyzer	HP	8901B	4TG-3008	Sep-04
6	High Pass Filter	ANRITSU	MP526D	6200220657	Jun-05
7	Signal Generator	Rohde & Schwarz	SMG	860289/011	May-05
8	Signal Generator	Rohde & Schwarz	SMR40	834128/028	Sep-04
9	Spectrum Analyzer	Agilent	E7403A	MY42000062	Jul-05
10	DC Power Supply	KIKUSUI	PAD35-301	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	800.10	Low	-26.53	-71.30	-64.77	6.5
2	1200.15	Low	-29.30	-74.07	-64.77	9.3
3	424.35	Mid	-33.23	-78.00	-64.77	13.2
4	870.10	Mid	-27.08	-71.85	-64.77	7.1
5	1305.15	Mid	-38.61	-83.38	-64.77	18.6
6	2175.25	Mid	-34.75	-79.52	-64.77	14.7
7	459.25	High	-33.60	-78.37	-64.77	13.6
8	1409.85	High	-38.71	-83.48	-64.77	18.7
9	1879.80	High	-37.32	-82.09	-64.77	17.3

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

Mask D Limit (dBc) = -(50+10Log(P))

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

Emission Level (dBc) = Correct Level (dBm) - 10Log(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

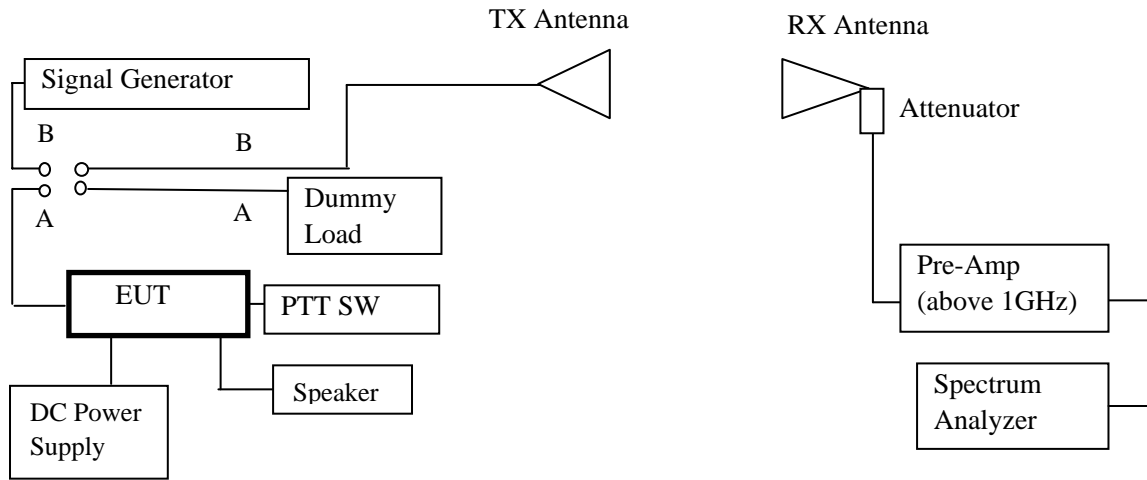
TEST PROCEDURE

- 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 Modulaion limit in dB = 43 + 10 Log10 (power out in Watts)
- 9 Spurious attenuation Narrow Band Modulaion 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	UHA9105	None	Jan-05
2	D.R.G Antenna (TX)	Schwarzbeck	3115	9612-5045	Jun-05
3	Tri-log Antenna (RX)	Schwarzbeck	VULB9168WP	106	Feb-05
4	D.R.G Antenna (RX)	EMCO	3115	9612-5044	Jul-05
5	Step Attenuator	HP	8464B	2726A14513	Oct-04
6	Pre-Amplifier	HP	83051A	3332A00329	Aug-04
7	Attenuator (6dB)	ANRITSU	MP721B	M57593	Oct-04
8	Attenuator (3dB)	Narda	3157846	4538	Aug-04
9	Spectrum Analyzer	Agilent	E7403A	MY42000062	Jul-05
10	Signal Generator	Rohde & Schwarz	SMG	860289/011	Jun-05
11	Signal Generator	Rohde & Schwarz	SMR40	834128/028	Sep-04
12	Dummy Load	BIRD	8401	6163	Jun-05
13	DC Power Supply	DAIWA	PS-3020	None	None

MEASUREMENT EQUIPMENT CONFIGURATION



UNCERTAINTY

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

TEST RESULTS

Measured for the worst case

State : 400.05MHz High Power / Narrow Band Modulation

No	Frequency (MHz)	Pol	Reading Level (dBm)	SG Out Level (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Correct Level (dBm)	Emission Level (dBc)	Limit Level (dBc)	Margin (dB)
1	800.10	Hor.	-78.40	-37.50	2.16	2.15	-37.5	-84.5	-64.8	19.7
		Ver.	-76.15	-31.10	2.16	2.15	-31.1	-78.1	-64.8	13.3
2	1200.15	Hor.	-50.50	-47.00	1.62	7.30	-41.3	-88.3	-64.8	23.5
		Ver.	-51.10	-48.70	1.62	7.30	-43.0	-90.0	-64.8	25.2
3	1600.20	Hor.	-51.80	-50.70	1.87	8.90	-43.7	-90.7	-64.8	25.9
		Ver.	-48.50	-47.60	1.87	8.90	-40.6	-87.6	-64.8	22.8
4	2000.25	Hor.	-58.70	-54.00	2.10	8.90	-47.2	-94.2	-64.8	29.4
		Ver.	-55.50	-49.00	2.10	8.90	-42.2	-89.2	-64.8	24.4
5	2400.30	Hor.	-52.00	-45.80	2.32	9.60	-38.5	-85.5	-64.8	20.7
		Ver.	-49.30	-41.20	2.32	9.60	-33.9	-80.9	-64.8	16.1
6	2800.35	Hor.	-51.30	-43.40	2.52	10.00	-35.9	-82.9	-64.8	18.1
		Ver.	-46.50	-37.10	2.52	10.00	-29.6	-76.6	-64.8	11.8
7	3200.40	Hor.	-55.80	-46.20	2.70	10.20	-38.7	-85.7	-64.8	20.9
		Ver.	-54.10	-44.20	2.70	10.20	-36.7	-83.7	-64.8	18.9
8	3600.45	Hor.	-60.20	-51.50	2.92	10.30	-44.1	-91.1	-64.8	26.3
		Ver.	-58.20	-45.80	2.92	10.30	-38.4	-85.4	-64.8	20.6
9	4000.50	Hor.	-63.20	-55.50	3.17	10.40	-48.3	-95.3	-64.8	30.5
		Ver.	-61.90	-50.70	3.17	10.40	-43.5	-90.5	-64.8	25.7

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

Mask D Limit (dBc) = -(50+10Log(P))

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

Emission Level (dBc) = Correct Level (dBm) - 10Log(P*1000)

P = Carrier Level (W)

4.4 Emission Masks (Occupied Bandwidth)

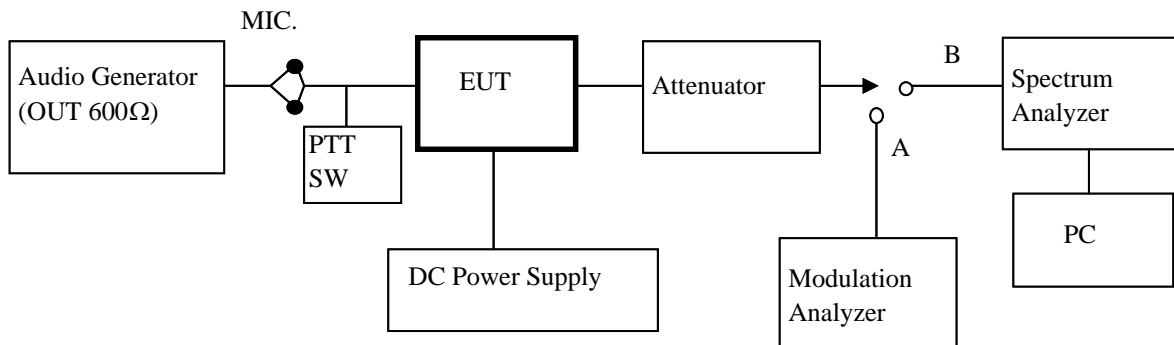
REGULATIONS	: 47 CFR 2.1049 (c) (1), 90.210 / RSS-119 Section 6.4
TEST METHOD/GUIDE	: ANSI/TIA/EIA-603-1992, section 2.2.11.2 / RSS-119 Section 6.4

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 and Narrow modulation), 300 Hz (Wide modulation).
 - b) Video Bandwidth : 100 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	ANRITSU	MG443B	1004468	Jul-05
2	Attenuator (20dB)	Weinschel	40-20-34	AA5701	Jul-05
3	Attenuator (20dB)	Radiall	R414720161	03-24	Jul-05
4	Attenuator (10dB)	TME	CFA-05NPJ-10	262843	Jun-05
5	Modulation Analyzer	HP	8901B	4TG-3008	Sep-04
6	Spectrum Analyzer	Agilent	E7403A	MY42000062	July-05
7	DC Power Supply	KIKUSUI	PAD35-301	None	None



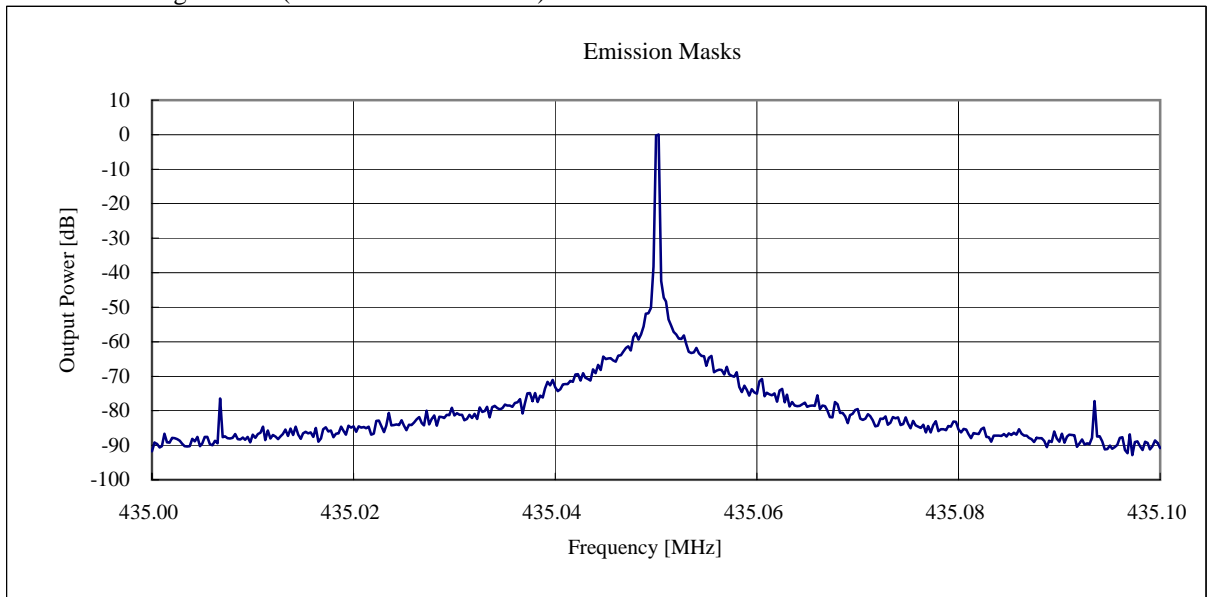
UNCERTAINTY

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

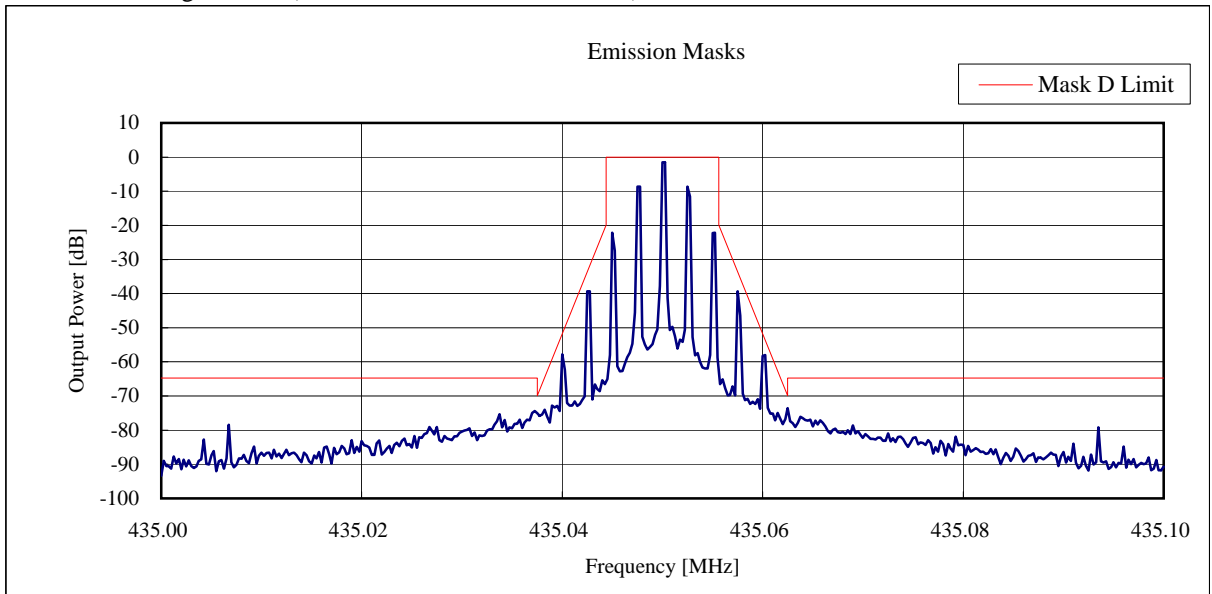
TEST RESULTS

Measured for the worst case

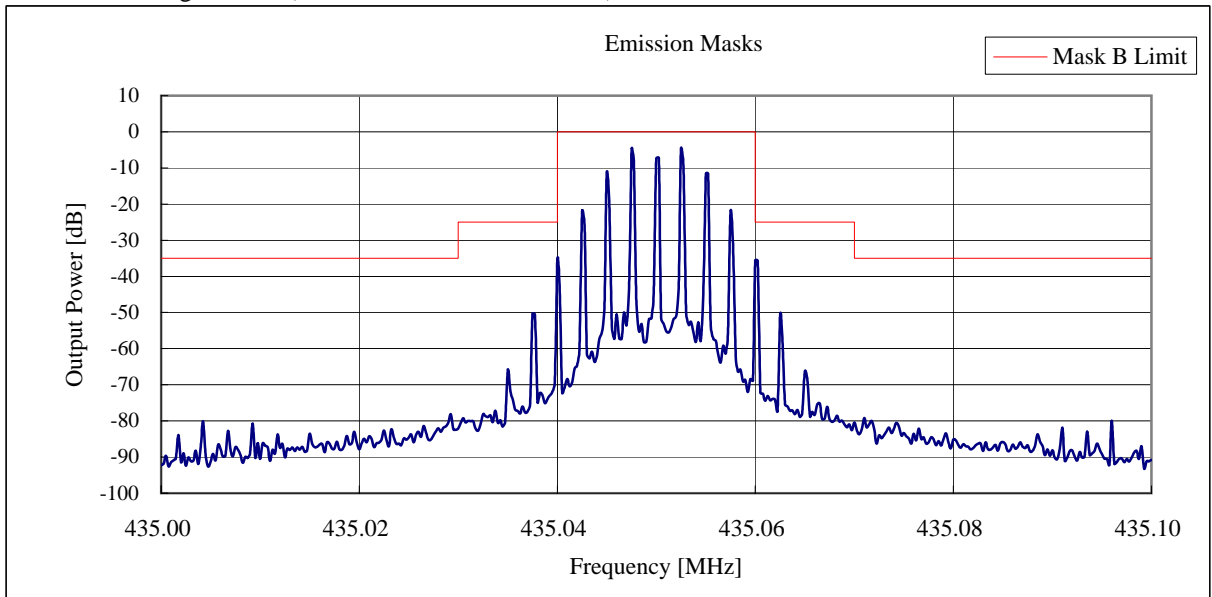
State : 435.05MHz High Power (None Modulation : FM)



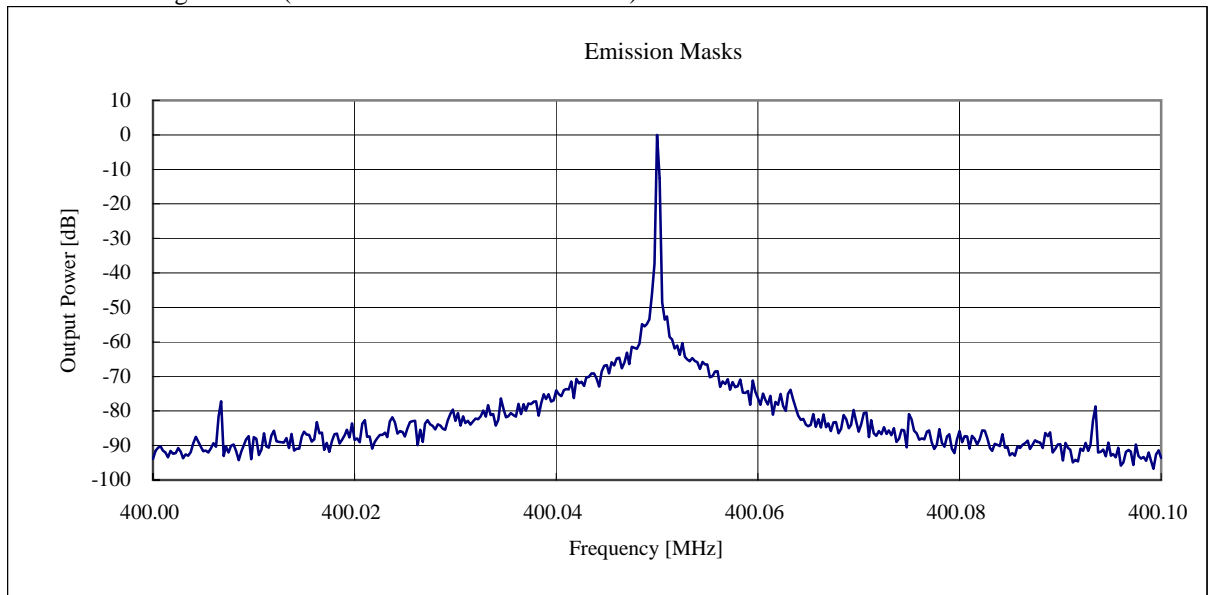
State : 435.05MHz High Power (Narrow Band Modulation : FM)



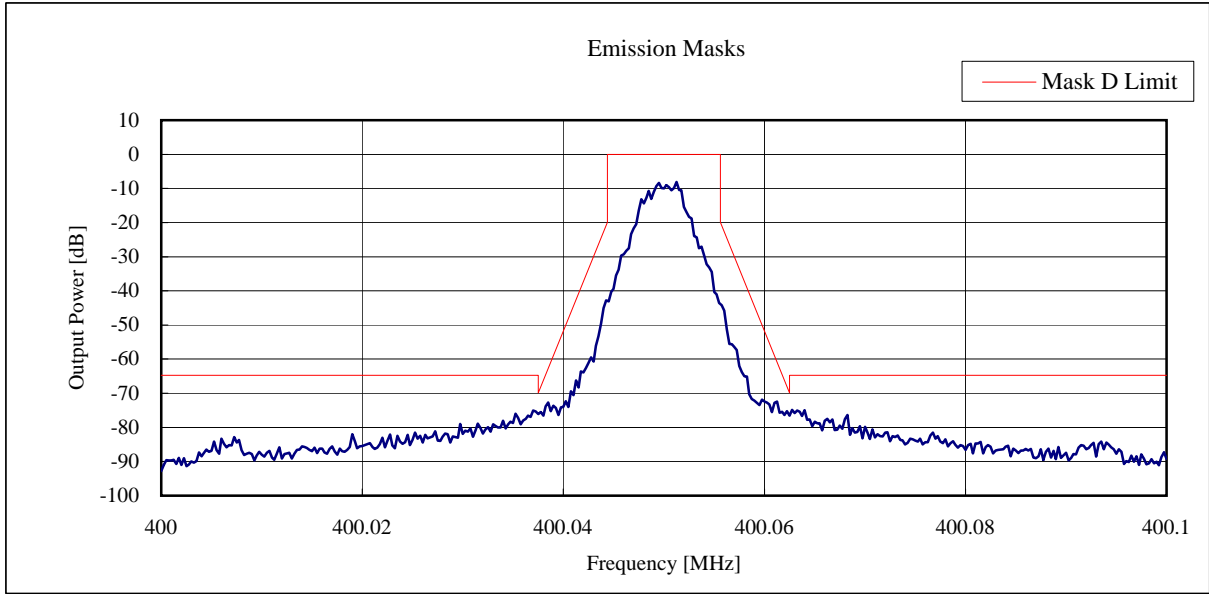
State : 435.05MHz High Power (Wide Band Modulation : FM)



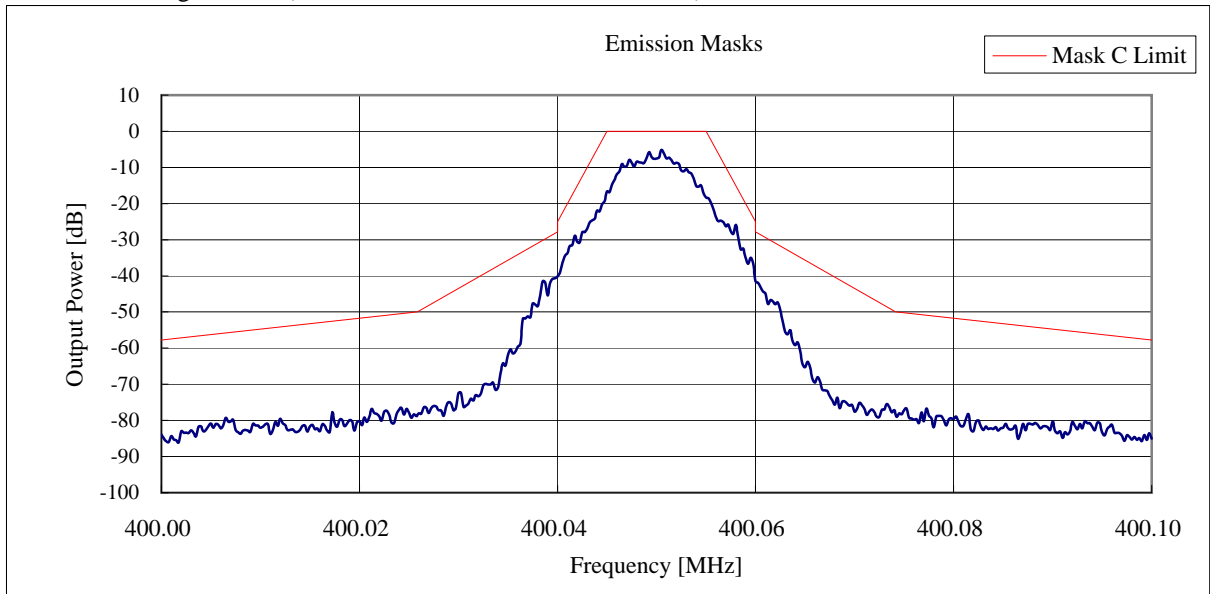
State : 400.05MHz High Power (None Modulation : 4Level FSK)



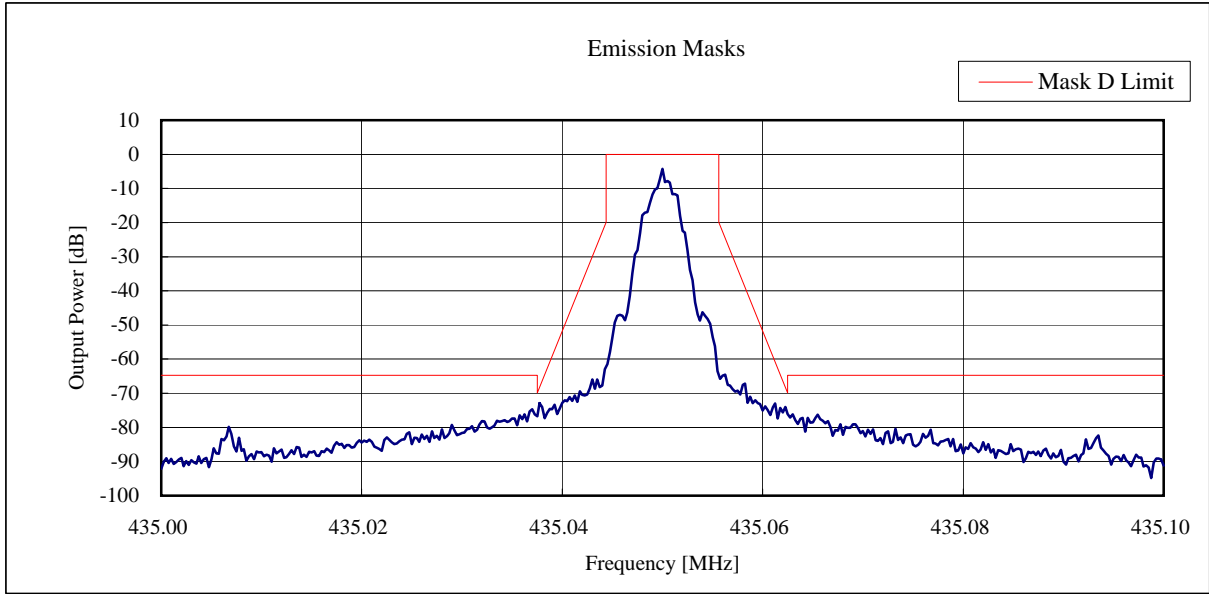
State : 400.05MHz High Power (Narrow Band Modulation : 4Level FSK)



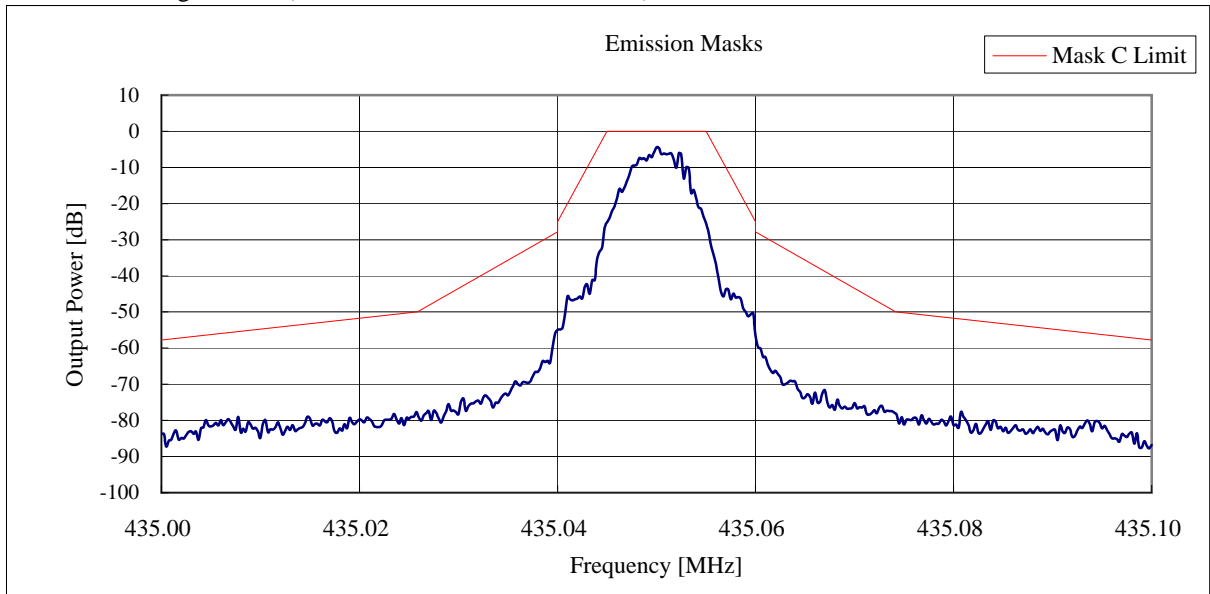
State : 400.05MHz High Power (Wide Band Modulation : 4Level FSK)



State : 435.05MHz High Power (Narrow Band Modulation : GMSK)



State : 435.05MHz 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

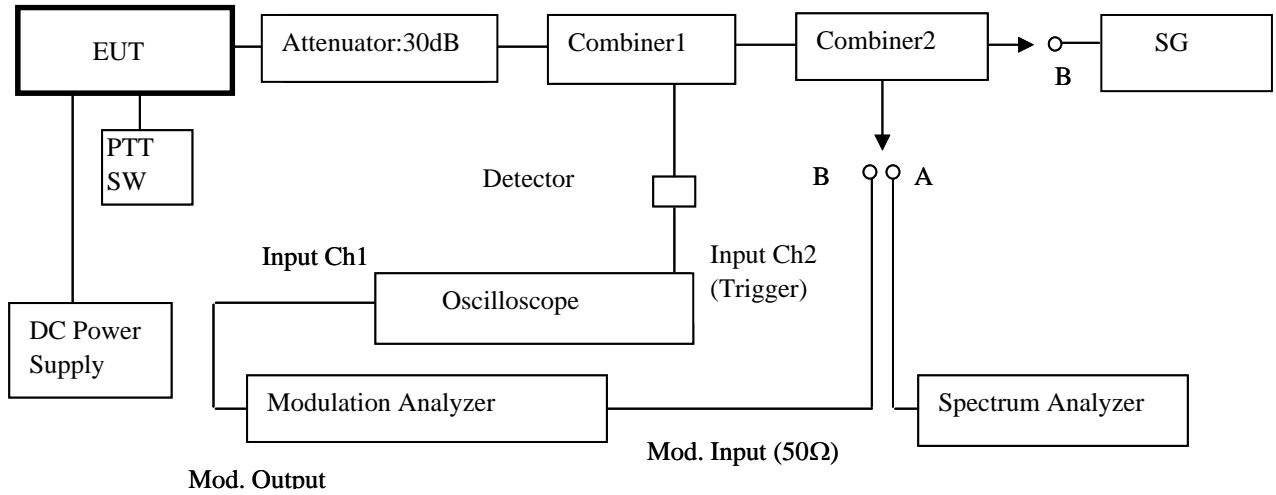
TEST PROCEDURE

- 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	Jun-05
2	Oscilloscope	IWATSU - LeCroy	LT342	00922	Feb-05
3	Spectrum Analyzer	Agilent	E7403A	MY42000062	Jul-05
4	Attenuator (30dB)	TME	CFA-100ANPJ-30	1008268	Jun-05
5	Modulation Analyzer	HP	8901B	4TG-3008	Sep-04
6	Combiner	ANRITSU	M89249	None	Jul-05
7	Combiner	ANRITSU	M89249	None	Jul-05
8	Spectrum Analyzer	Agilent	E7403A	MY42000062	Jun-05
9	DC Power Supply	KIKUSUI	PAD35-301	None	None

MEASUREMENT EQUIPMENT CONFIGURATION



UNCERTAINTY

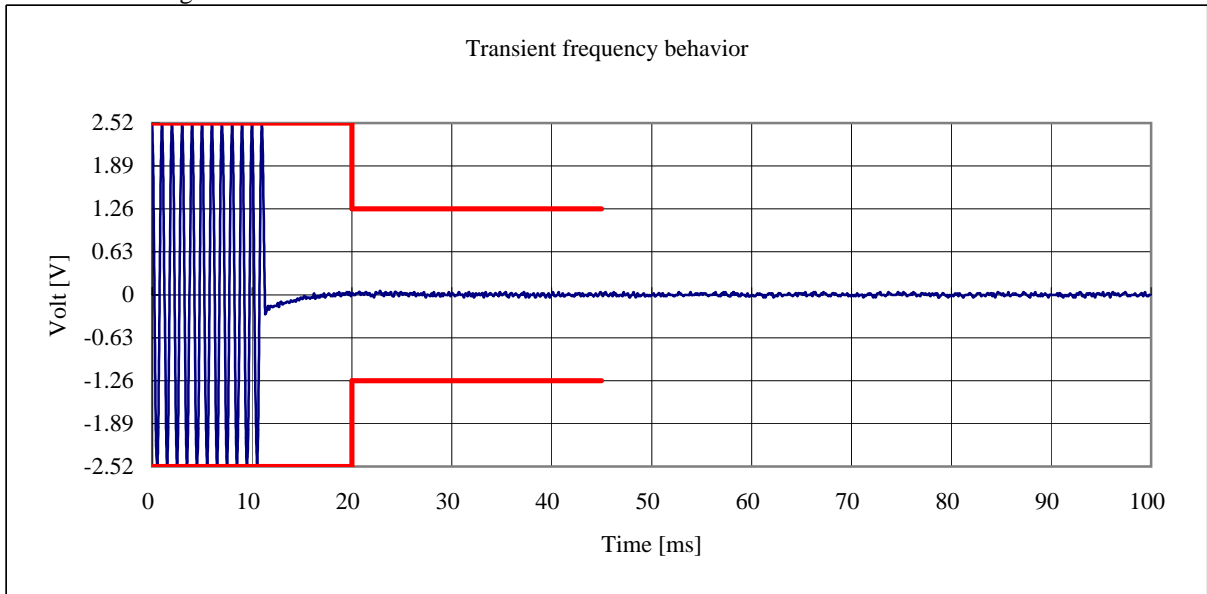
Measurement uncertainty is +/- 1.3dB (k = 2)

TEST RESULTS

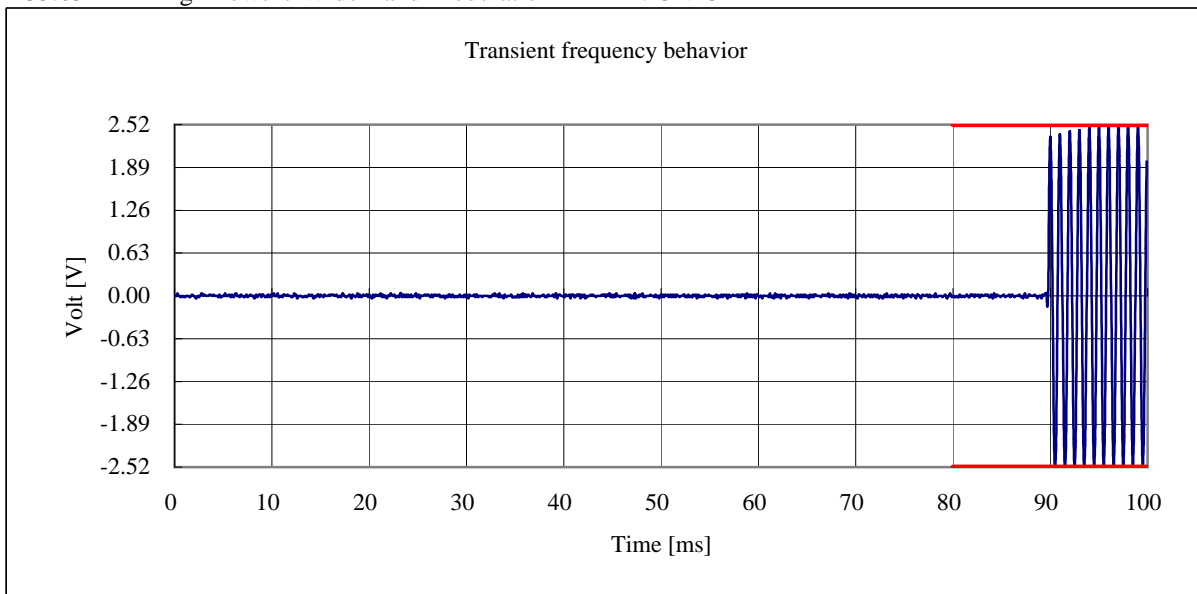
Measured for the worst case

PTT: OFF-ON

State : 435.05MHz High Power / Wide Band Modulation



State : 435.05MHz 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

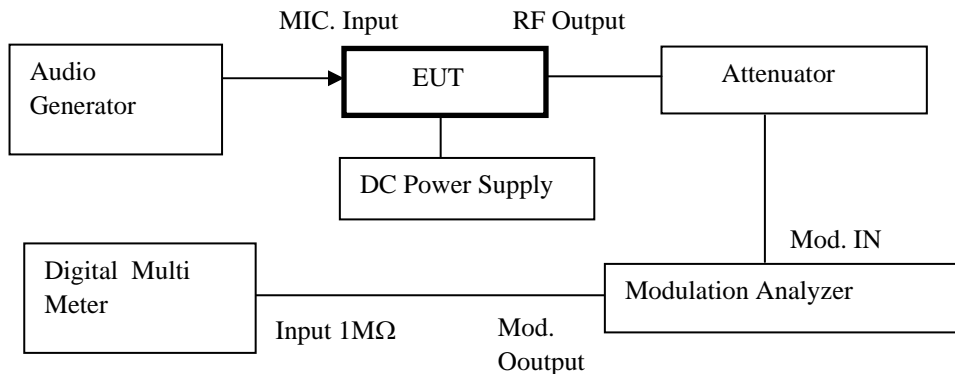
TEST PROCEDURE

- 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	ANRITSU	MG443B	1004468	Jul-05
2	Attenuator (20dB)	Weinschel	40-20-34	AA5701	Jul-05
3	Attenuator (20dB)	Radiall	R414720161	03-24	Jul-05
4	Attenuator (10dB)	TME	CFA-05NPJ-10	262843	Jun-05
5	Modulation Analyzer	HP	8901B	4TG-3008	Sep-04
6	Digital Multi Meter	HP	34401A	US36043517	Jul-05
7	DC Power Supply	KIKUSUI	PAD35-301	None	None

MEASUREMENT EQUIPMENT CONFIGURATION



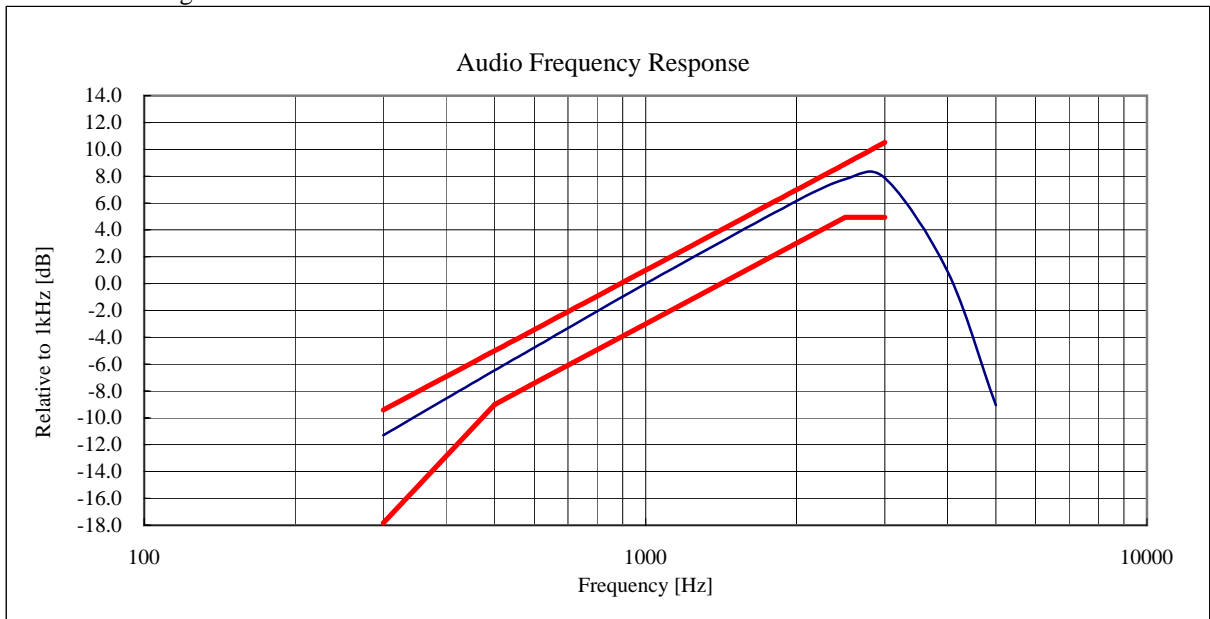
UNCERTAINTY

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

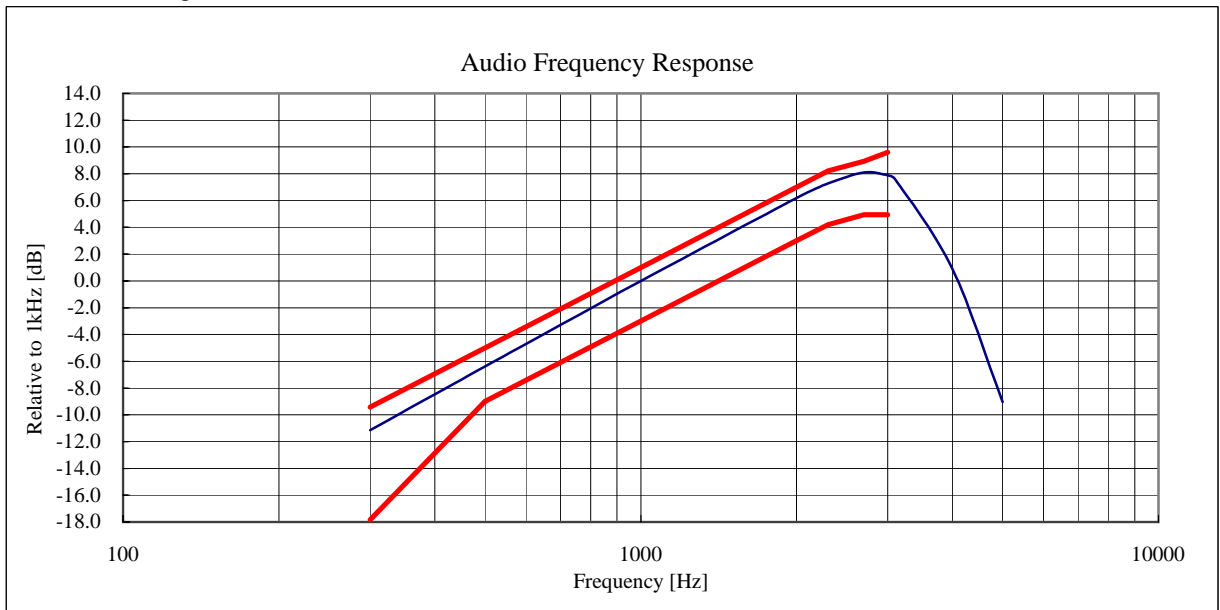
TEST RESULTS

Measured for the worst case

State : 469.95MHz High Power / Wide Band Modulation



State : 469.95MHz 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

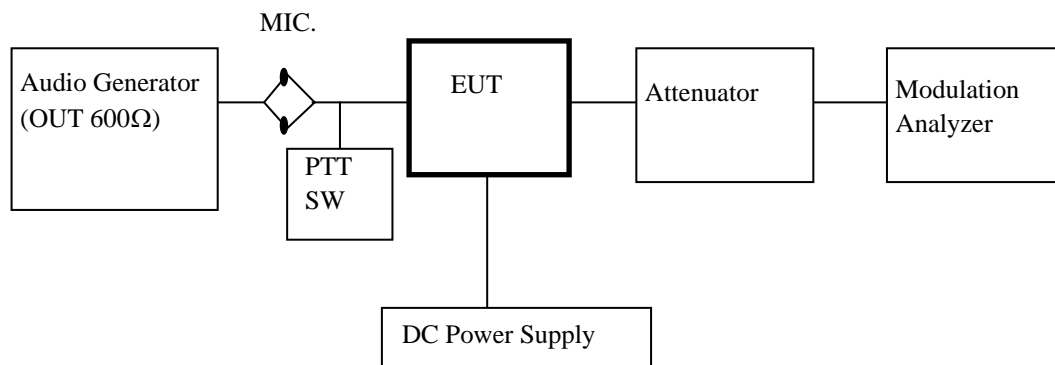
TEST PROCEDURE

- 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	ANRITSU	MG443B	1004468	Jul-05
2	Attenuator (20dB)	Weinschel	40-20-34	AA5701	Jul-05
3	Attenuator (20dB)	Radiall	R414720161	03-24	Jul-05
4	Attenuator (10dB)	TME	CFA-05NPJ-10	262843	Jun-05
5	Modulation Analyzer	HP	8901B	4TG-3008	Sep-04
6	DC Power Supply	KIKUSUI	PAD35-301	None	None

MEASUREMENT EQUIPMENT CONFIGURATION



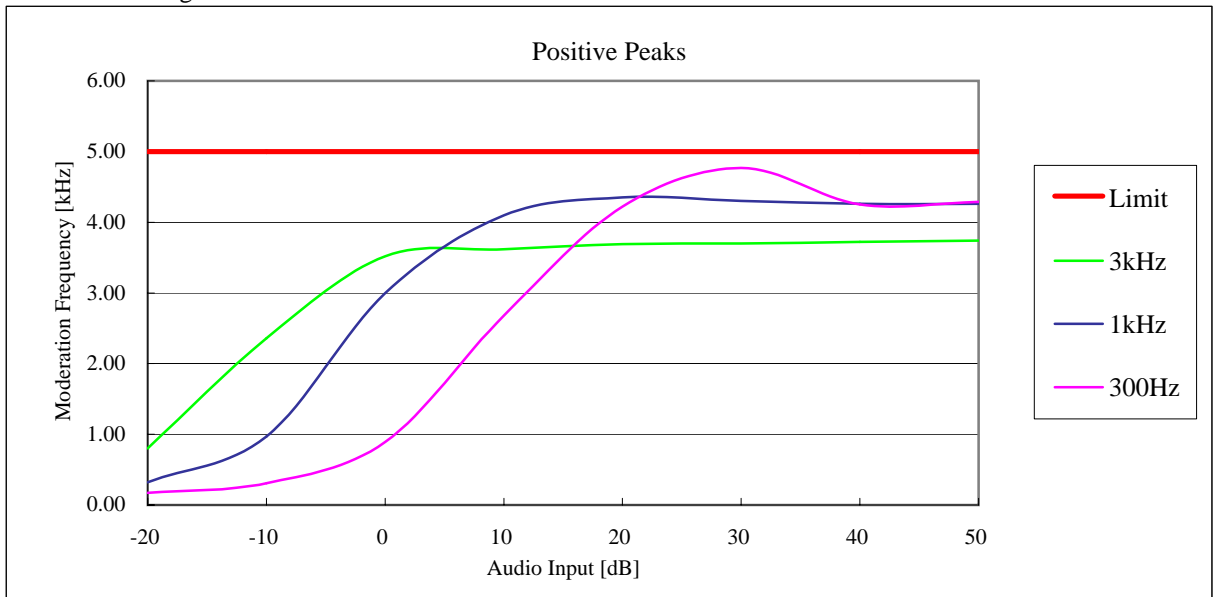
UNCERTAINTY

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

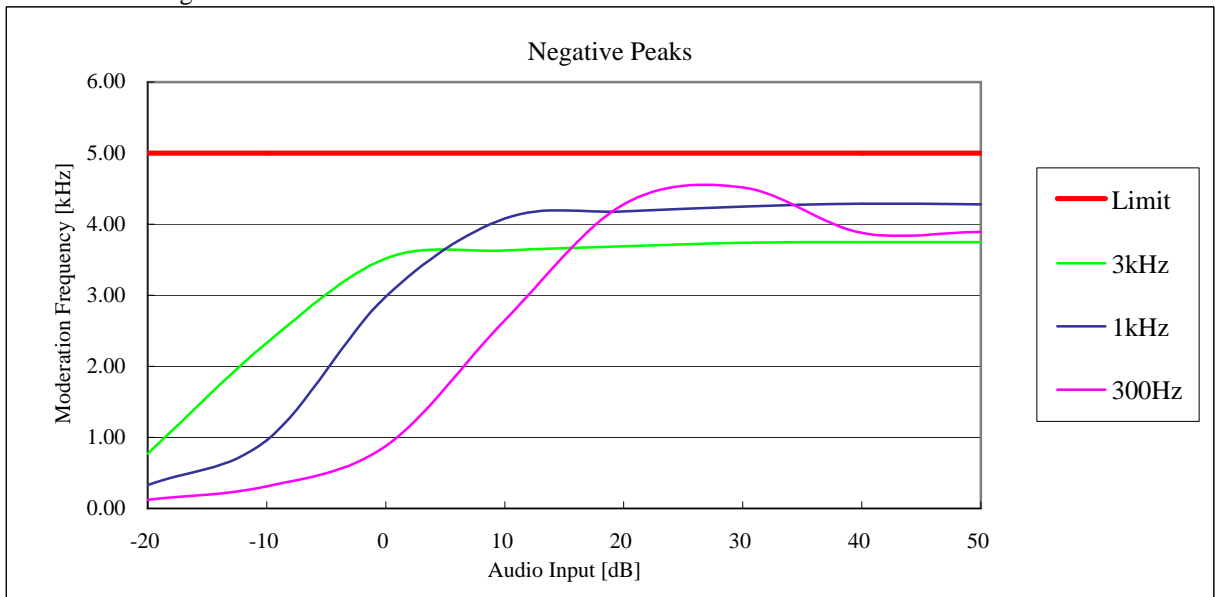
TEST RESULTS

Measured for the worst case

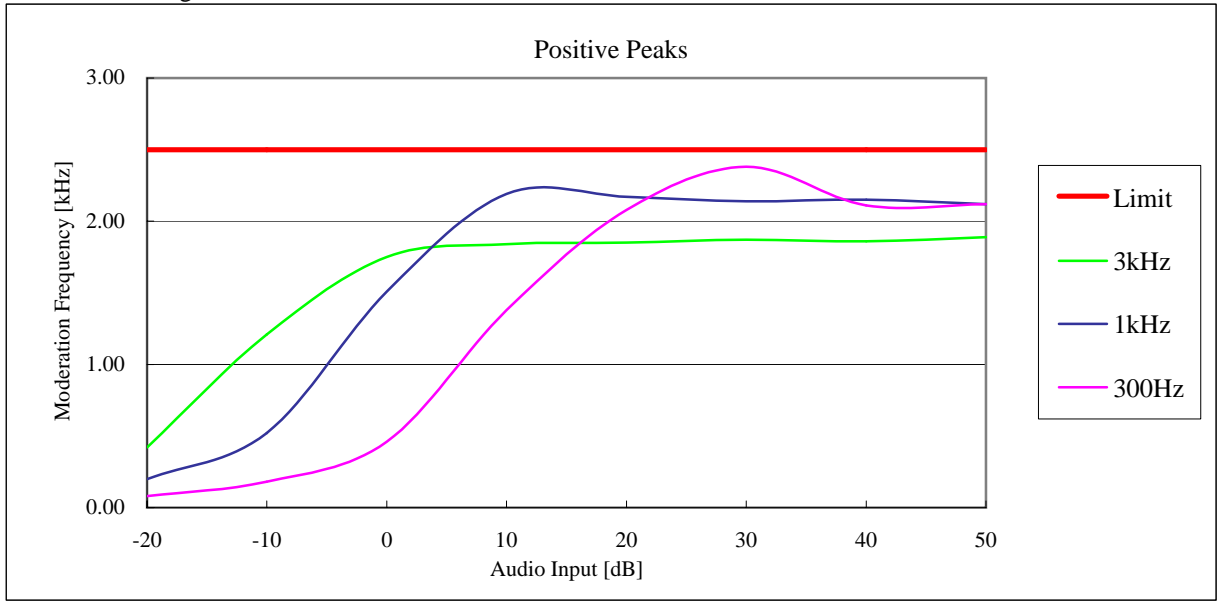
State : 469.95MHz High Power / Wide Band Modulation



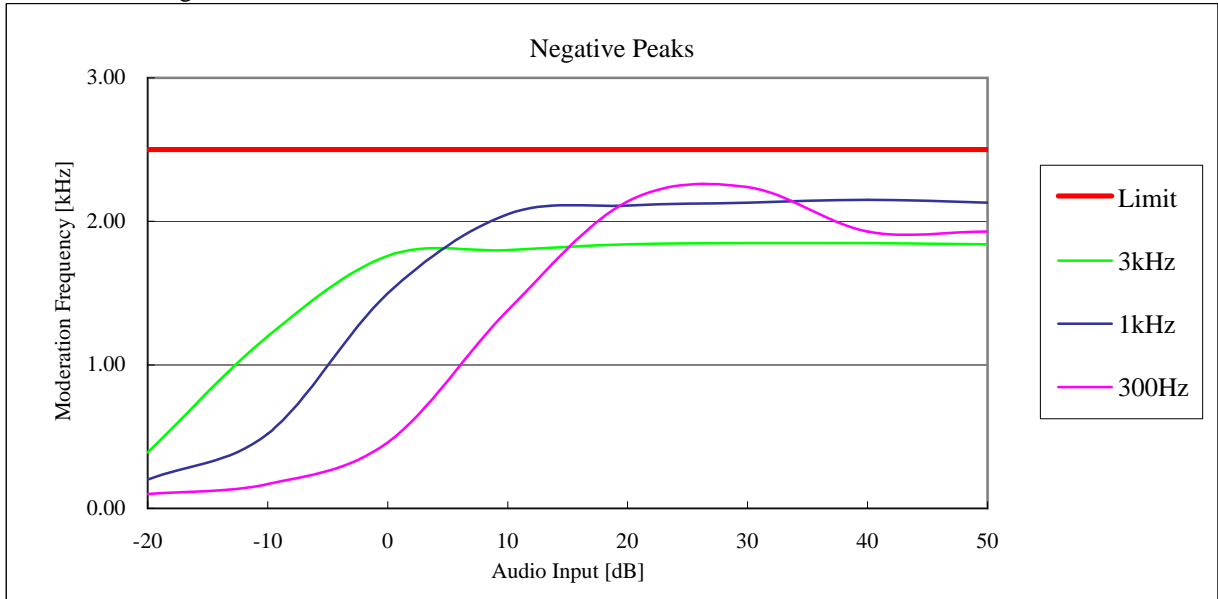
State : 469.95MHz High Power / Wide Band Modulation



State : 400.05MHz High Power / Narrow Band Modulation



State : 400.05MHz 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

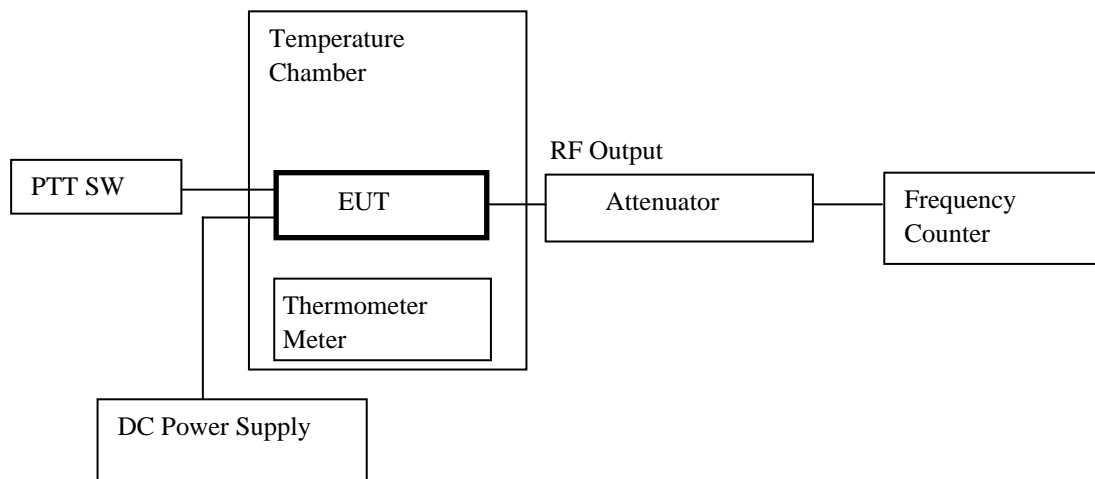
TEST PROCEDURE

- 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	Frequency Counter	ANRITSU	MF76A	MT27358	Sep-04
2	Attenuator (20dB)	Weinschel	40-20-34	AA5701	Jul-05
3	Attenuator (20dB)	Radiall	R414720161	03-24	Jul-05
4	Attenuator (10dB)	TME	CFA-05NPJ-10	262843	Jun-05
5	DC Power Supply	DAIWA	PS-3020	None	None
6	Temperature Chamber	TABAI	PL-3F	5103661	None
7	Temperature Meter	KIKUSUI	PAD35-301	None	Jan-05

MEASUREMENT EQUIPMENT CONFIGURATION



UNCERTAINTY

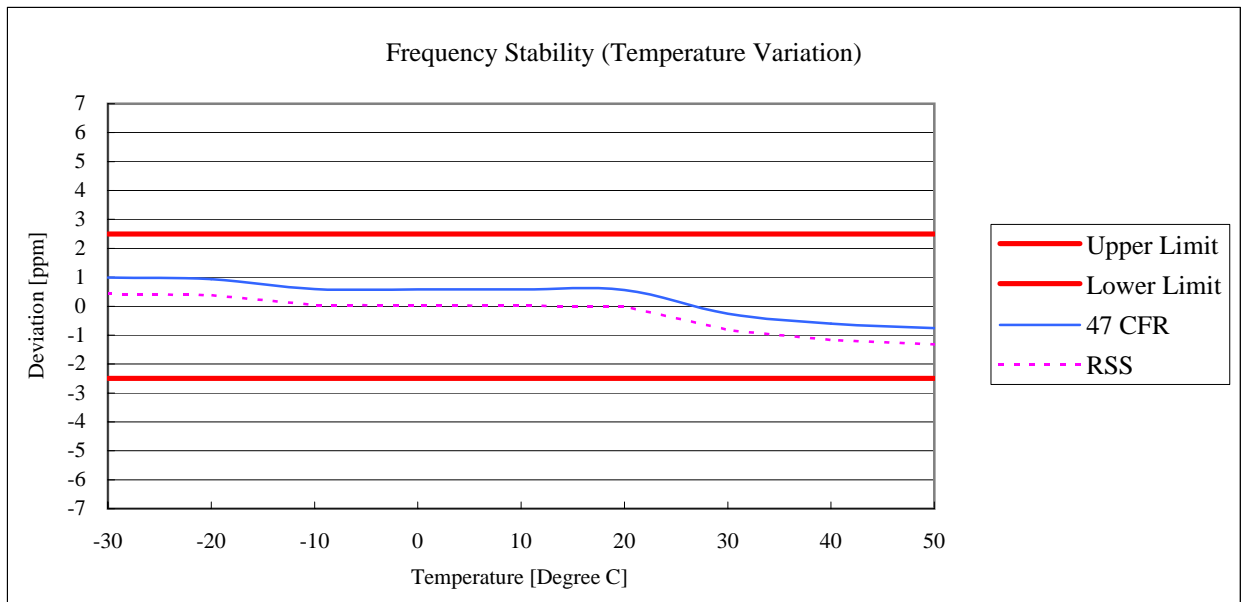
Measurement uncertainty is +/- 3.6%

TEST RESULTS

Measured for the worst case

State : 469.95MHz High Power / Narrow Band Modulation

No.	Temperature (Degree C)	Frequency (MHz)	47 CFR Deviation (ppm)	RSS Deviation (ppm)	Limit (ppm)
1	-30	469.950465	0.989467	0.429833	2.5
2	-20	469.950441	0.938398	0.378763	2.5
3	-10	469.950280	0.595808	0.036174	2.5
4	0	469.950275	0.585169	0.025535	2.5
5	10	469.950273	0.580913	0.021279	2.5
6	20	469.950263	0.559634	0.000000	2.5
7	30	469.949877	-0.261730	-0.821364	2.5
8	40	469.949715	-0.606447	-1.166081	2.5
9	50	469.949643	-0.759655	-1.319289	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

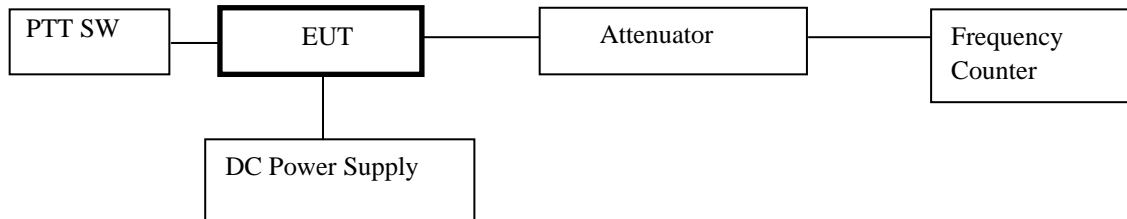
TEST PROCEDURE

- 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	Frequency Counter	ANRITSU	MF76A	MT27358	Sep-04
2	Attenuator (20dB)	Weinschel	40-20-34	AA5701	Jul-05
3	Attenuator (20dB)	Radiall	R414720161	03-24	Jul-05
4	Attenuator (10dB)	TME	CFA-05NPJ-10	262843	Jun-05
5	DC Power Supply	DAIWA	PS-3020	None	None

MEASUREMENT EQUIPMENT CONFIGURATION



UNCERTAINTY

Measurement uncertainty is +/- 3.6%

TEST RESULTS

Measured for the worst case

State : 469.95MHz High Power / Narrow Band Modulation

No.	Diviation (%)	Voltage (V)	Frequency (MHz)	Deviation (ppm)	Limit (ppm)
1	85	11.6	469.949300	-1.489520	2.5
2	100	13.6	469.949773	-0.483030	2.5
3	115	15.6	469.949951	-0.104266	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 co
- 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.

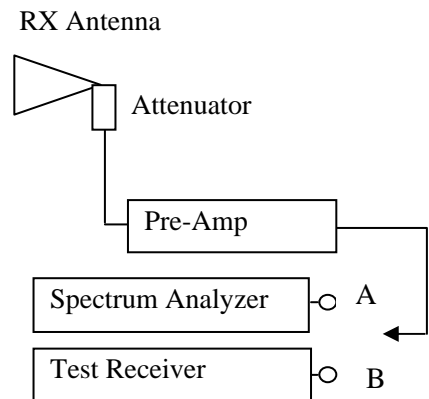
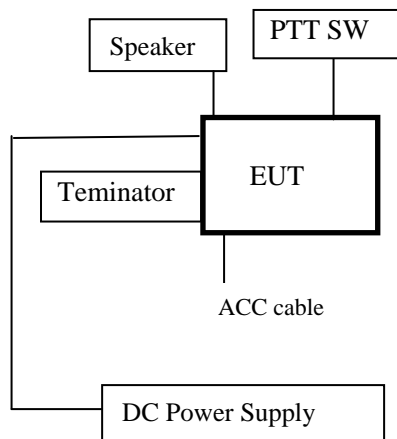
The equipment and cables are arranged or manipulated within the range of the test standard in the above condition.

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	VULB9168	106	Feb-05
2	D.R.G Antenna	EMCO	3115	9612-5044	Jul-05
3	Step Attenuator	HP	8464B	2726A14513	Oct-04
4	Pre-Amplifier	HP	8447D	1937A03130	Oct-05
5	Pre-Amplifier	HP	83051A	3332A00329	Aug-04
6	Attenuator (6dB)	ANRITSU	MP721B	M57593	Oct-04
7	Attenuator (3dB)	Narda	3157846	4538	Aug-04
8	Spectrum Analyzer	HP	8564E	3643A00665	Aug-05
9	Test Receiver	Rohde & Schwarz	ESS	842123/005	Sep-04
10	Terminator	TME	CT-01	A040CON50	Jul-05
11	DC Power Supply	DAIWA	PS-3020	None	None

MEASUREMENT EQUIPMENT CONFIGURATION



UNCERTAINTY

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

TEST RESULTS

Measured for the worst case

State : 469.95MHz Receiver Condition

No.	Frequency (MHz)	Pol	Reading Level (dBuv)	Factor* (dB)	Emission Level (dBuV/m)	Limit Level (dBuV/m)	Margin (dB)
1	365.05	Hor.	31.60	-3.00	28.60	46.0	17.4
		Ver.	-	-	-	-	-
2	376.12	Hor.	34.90	-2.60	32.30	46.0	13.7
		Ver.	-	-	-	-	-
3	387.18	Hor.	37.30	-2.40	34.90	46.0	11.1
		Ver.	35.10	-2.40	32.70	46.0	13.3
4	398.24	Hor.	38.60	-2.00	36.60	46.0	9.4
		Ver.	-	-	-	-	-
5	425.08	Hor.	30.30	-1.30	29.00	46.0	17.0
		Ver.	-	-	-	-	-
6	850.20	Hor.	32.00	8.40	40.40	46.0	5.6
		Ver.	35.70	8.40	44.10	46.0	1.9

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 44.85MHz.
- 4 The EUT which was connected to an ACC cable was measured because the equipment which is connected to an ACC port for the digital forwarding did not exist.

4.11 Necessary Bandwidth and Emission Bandwidth

REGULATIONS	: 47 CFR 2.202 (g) & Federal Register/ Vol.68, No236
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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)	11kHz

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

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

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

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.

Copying of this report without permission is prohibited.

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.