



TEST REPORT

REGULATION : FCC Part 2, 22, 90

Applicant	Testing Laboratory
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Equipment type	VHF FM TRANSCEIVER
Trademark	KENWOOD
Model(s)	TK-690H-1
Serial No.	None
FCC ID	K44229200
Test Result	Complied
Report Number	JK09070021(R1)
Report issue date	September 18, 2009

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The test report JK09070021 was superseded by this test report.

Approved by K. Gokita

Kazuo Gokita
[Site Manager]

Tested by K. Wagatsuma

Koichi Wagatsuma

In Accordance with FCC Rules and Regulations, Part 2

Sub-part 2.1033

(c)(1) Applicant and Manufacture Information	
APPLICANT	
Company	: Kenwood Corporation
Address	: 1-16-2, Hakusan, Midori-ku, Yokohama-shi, Kanagawa, 226-8525 Japan
Contact Person	: Tamaki Shimamura Manager, Communications Equipment Division
MANUFACTURER	
Company	: Kenwood Corporation
Address	: 1-16-2, Hakusan, Midori-ku, Yokohama-shi, Kanagawa, 226-8525 Japan
(c)(2) FCC ID	
FCC ID	: K44229200
Model number	: TK-690H-1
Serial number	: None
(c)(3) Instruction Manual(S)	
Instruction manual(s)	: Please refer to attached Exhibits F
(c)(4) Type of Emission	
Emission Designation	: 16K0F3E(Wide)
(c)(5) Frequency range	
Frequency Range	: 29.7 to 37 MHz
(c)(6) Power Rating	
Output Power	: 45 to 110 W
Type	: Continuously Variable
(c)(7) Maximum Power Rating	
Output Power	: 110 W
(c)(8): Voltages & currents in all elements in final RF stage, including final transistor or solid-state device	
Collector Current, A	: 25.0 A (Maximum)
Collector Voltage, Vdc	: 13.4 Vdc
Supply Voltage, Vdc	: 13.4 Vdc
Other Information	
Number of Channel	: 160
Maximum Deviation	: 5 kHz
Frequency Stability	: 5 ppm
Antenna Impedance	: 50 Ω Norminal
Note	

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SECTION 1. GENERAL INFORMATION

TEST PERFORMED

Location	Kashima No.1 Test Site and Tochigi No.2 Test Site		
EUT Received	July 23, 2009		
Date of Test	July 24, 2009	to	August 27, 2009
Standard Applied	FCC Part 2, 22, 90		
Measurement Method	ANSI/TIA-603-C-2004		
Deviation from Standard(s)	Not applicable		

QUALIFICATIONS OF TESTING LABORATORY (Kashima Lab.)

ACCREDITATION	SCOPE	LAB. CODE	Remarks
NVLAP	EMC Testing	100290-0	
VLAC	EMC Testing	VLAC-008-1	JAPAN
BSMI	EMC Testing	SL2-IN-E-6008	TAIWAN
FILING			
VCCI	EMC Testing	R-788, C-278, C-279, T-351, T-352 R-274, C-280, C-281, T-353, T-359 R-272, C-276, C-277, T-360, T-361 R-576, C-590, T-362	JAPAN
FCC	EMC Testing	Designation Number:JP0008	USA
IC	EMC Testing	IC-2042K-1, IC-2042K-3	CANADA
SAUDI ARABIA	EMC Testing	N/A	

QUALIFICATIONS OF TESTING LABORATORY (Tochigi Lab.)

ACCREDITATION	SCOPE	LAB. CODE	Remarks
VLAC	EMC Testing	VLAC-008-5	JAPAN
FILING			
VCCI	EMC Testing	R-257, C-260, C-284, T-374, T-375 R-258, C-261, C-285, T-376, T-377 R-259, C-262, T-378	JAPAN
FCC	EMC Testing	Designation Number:JP0011	USA
IC	EMC Testing	IC-2042P-1, IC-2042P-2	CANADA
SAUDI ARABIA	EMC Testing	N/A	

ABBREVIATIONS

EUT	Equipment Under Test	DoC	Declaration of Conformity
AMN	Artificial Mains Network	ISN	Impedance Stabilization Network
LISN	Line Impedance Stabilization Network	Q-P	Quasi-peak
AMP	Amplifier	AVG	Average
ATT	Attenuator	PK	Peak
ANT	Antenna	Cal	Calibration
BBA	Broadband Antenna	N/A	Not applicable or Not available
DIP	Dipole Antenna	LCD	Liquid-Crystal Display
AE	Associated Equipment	4LEVEL FSK	4LEVEL Frequency Shift Key
GMSK	Gaussian Maximum Shift Key	CW ID	Continuously Repeating bit stream
FM	Frequency Modulation	C4FM	Constant envelope 4 Level FM
PTT	Push to Talk		

SECTION 2. SUMMARY OF TEST RESULT

FCC Part2	Part22	Part90	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)	22.359, 357 (a)	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)	22.355	90.213 (a)	Frequency Stability (Temperature Variation)	PASS
2.1055 (d) (1)	22.355	90.213 (a)	Frequency Stability (Voltage Variation)	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.

Note:

As for the FCC Part 15 Subpart B-Unintentional Radiators, the EUT has been measured and declared as Verification by Kenwood Corporation.

SECTION 3. 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	Experimental Radio Auxiliary , Special Broadcast and Other Program Distributional Services	N.A.
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	N.A.
RSS-Gen	General Requirements and Information for the Certification of Radiocommunication Equipment	N.A.

SECTION 4. INFORMATION ABOUT EUT AND SUPPORT EQUIPMENT(S)

4.1 List of System Configuration

Symbol	Item	Model No.	Serial No.	Manufacture	Remarks
A	VHF FM TRANSCEIVER	TK-690H-1	None	Kenwood	EUT
Power Ratings of EUT :		DC 13.4 V +/- 15 %	25.0 A Maximum		
Power Supply :		DC 13.4 V +/- 15 %			
Condition of Equipment		Proto type			
Type		Mobile type			
Suppression Devices		No Modifications by the laboratory were made to the device			

4.2 Port(s)/Connector(s)

Port Name	Connector Type	Connector Pin	Remarks
ACC	D-sub	25 pin	
Speaker	Jack	9 pin	
Antenna	M	2 pin	
Microphone	Kenwood original	12 pin	

4.3 Highest Frequency Oscillator(s)/Crystal(s)

Base Clock	Operating Frequenc	Board Name	Remarks
47.7 MHz	47.7 MHz	TXRX Unit	

SECTION 5. SUPPORT EQUIPMENT

The EUT was supported by the following equipment during the test.

Symbol	Item	Model No.	Serial No.	Manufacture	FCC ID
B	DC Power Supply	GZV4000	90290932	Daiichi denpa kogyo	N/A
C	External Speaker	KES-5	None	Kenwood	N/A
D	Keypad Microphone	KMC-28	None	Kenwood	N/A
E	Dummy Load	CT-150NP	1138693	TME	N/A
Supplied Power:					
B	AC	100V,60Hz			

SECTION 6. USED CABLE(S)

The following cable(s) was used for the test.

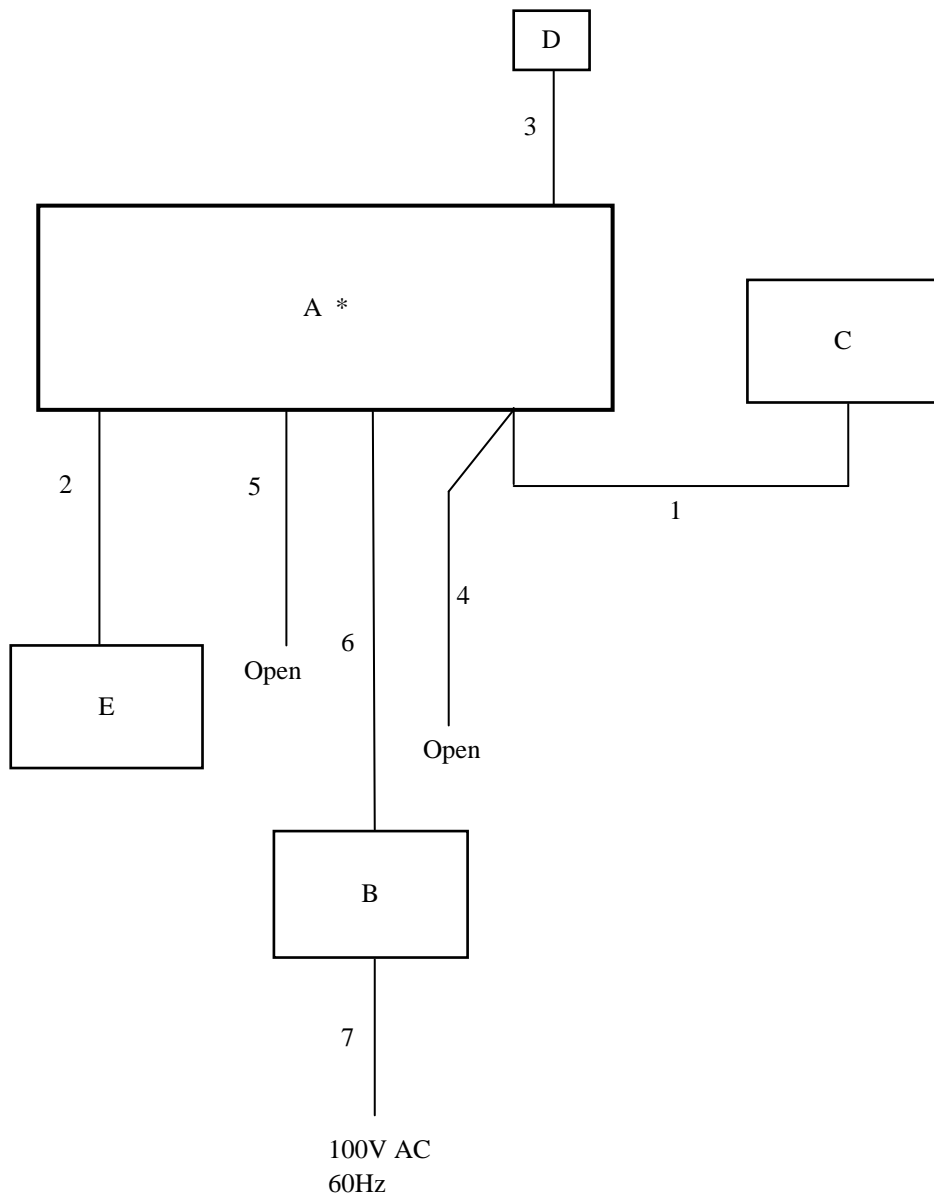
No.	Name	Length (m)	Shield	Connector
1	Speaker cable	2.80	No	Plastic
2	Antenna cable	0.90	Yes	Metal
3	Mic. cable	0.60	No	Plastic
4	Ignition sense cable	3.00	No	Plastic
5	ACC cable	2.40	Yes	Metal
6	DC cable for EUT	3.00	No	Plastic
7	Power cable for DC Power Supply	1.85	No	-

SECTION 7. TEST CONFIGURATION

Details of Configuration and Connection

Example: Case of Section 10.3 Test

* : EUT
□ : Joint Connector



SECTION 8. OPERATING CONDITION

The EUT was operated under the following condition during the test.

8.1 Operating Condition

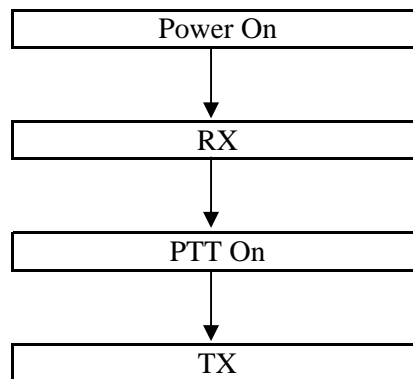
The test was carried out under Transmit mode.

(29.75 MHz, 33.35 MHz, 36.95 MHz)

EUT was examined in the operating conditions that had maximum emissions.

8.2 Operating Flow [Transmit mode]

Following operations were performed continuously.



SECTION 9. MEASUREMENT UNCERTAINTY

Carrier Output Power (Conducted)	U_{lab}	$U_{tia-603-c}$
	+/- 0.29dB ($k = 2$)	+/- 0.59 dB
Unwanted Emissions (Transmitter Conducted)		
	+/- 2.19 dB ($k = 2$)	+/- 1.1 dB
Field Strength of Spurious Radiation		
	+/- 3.9dB ($k = 2$)	+/- 3.3 dB
Emission Masks (Occupied Bandwidth)		
	+/- 0.5dB ($k = 2$)	+/- 2.1 dB
Transient Frequency Behavior		
	+/- 1.10% ($k = 2$)	+/- 21.6 %
Audio Low Pass Filter (Voice Input)		
	+/- 0.1dB ($k = 2$)	+/- 1.2 dB
Audio Frequency Response		
	+/- 0.1dB ($k = 2$)	+/- 1.2 dB
Modulation Limiting		
	+/- 1% ($k = 2$)	+/- 1 %
Frequency Stability (Temperature Variation)		
	+/- 14.9Hz ($k=2$)	+/-34.2 Hz
Frequency Stability (Voltage Variation)		
	+/- 14.9Hz ($k=2$)	+/-34.2 Hz
Receiver Spurious Emissions	U_{lab}	U_{cispr}
30-1000MHz	+/- 3.7dB ($k = 2$)	+/- 5.2 dB
1-40GHz	+/- 4.3dB ($k = 2$)	

SECTION 10. TEST DATA

10.1 Carrier Output Power (Conducted)

REGULATIONS	: 47 CFR 2.1046 (a)
TEST METHOD/GUIDE	: ANSI/TIA-603-C 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.
 $RF\ Power\ (dBm) = Power\ Meter\ reading\ (dBm) + Attenuator\ Loss\ (dB) + Cable\ Loss\ (dB)$
 $RF\ Power\ (W) = 10^{(RF\ Power\ (dBm)/10)}/1000$

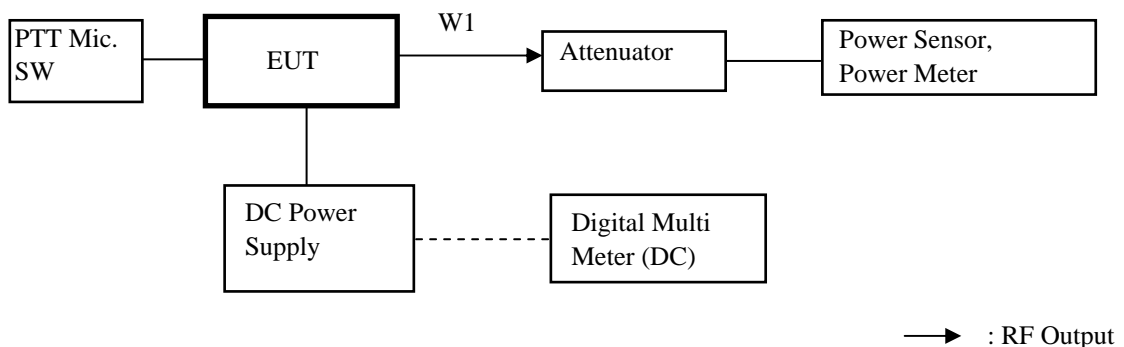
Measuring Equipments

No.	Equipment	Manufacture	Model No.	Serial No.	Cal Date	Cal Exp.
1	Power Meter	Hewlett Packard	E4418B	GB38410265	May 26, 09	May. 31, 10
2	Power Sensor	Hewlett Packard	8482A	US37292237	May 26, 09	May. 31, 10
3	Attenuator (20dB)	Aeroflex/Wenshel	66-20-34	BY4537	Mar. 30, 09	Mar. 31, 10
4	Attenuator (30dB)	Weinschel	WA-29-30-34	8924	May. 15, 09	May. 31, 10
5	Digital Multi Meter	Agilent	34401A	3146A08906	Dec. 17, 08	Dec. 31, 09
6	DC Power Supply	Daiichi denpa kogyo	GZV4000	90290932	None	None

Measuring Cables

No.	Cable	Manufacturer	Model No.	Serial No.	Cal Date	Cal Exp.
W1	Coaxial Cable	Suhner	SUCOFLEX104	KSR00091	May. 15, 09	May. 31, 10

Measuring Equipment Configuration



Test Results

Test date	Jul 24, 2009
Location	Kashima No.1 Test Site
temperature	25.2 to 25.7 [degree C]
Humidity Variation	49 to 53 [%]
Atmospheric Pressure	100.7 to 100.8 [kPa]
Test Engineer	Koichi Wagatsuma

Test was carried out for all the Authorized Bandwidth.
 State the worst case (below).

No.	Frequency (MHz)	Band	Setting	RF Power (W)
1	29.75	Low	High Power	110
2	33.35	Middle	High Power	110
3	36.95	High	High Power	110
4	29.75	Low	Low Power	45
5	33.35	Middle	Low Power	45
6	36.95	High	Low Power	45

RF Power:Peak reading

10.2 Unwanted Emissions (Transmitter Conducted)

REGULATIONS	: 47 CFR 2.1051, 90.210
TEST METHOD/GUIDE	: ANSI/TIA-603-C 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) RBW : 10 kHz (< 1 GHz), 1 MHz (> 1 GHz).
 - b) VBW : 30 kHz (< 1 GHz), 3 MHz (> 1 GHz).
 - c) Sweep Speed : 50 msec.
 - d) Detector mode : Average power (FM Modulation) , Positive peak with peak hold (C4FM Modulation)
- 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.

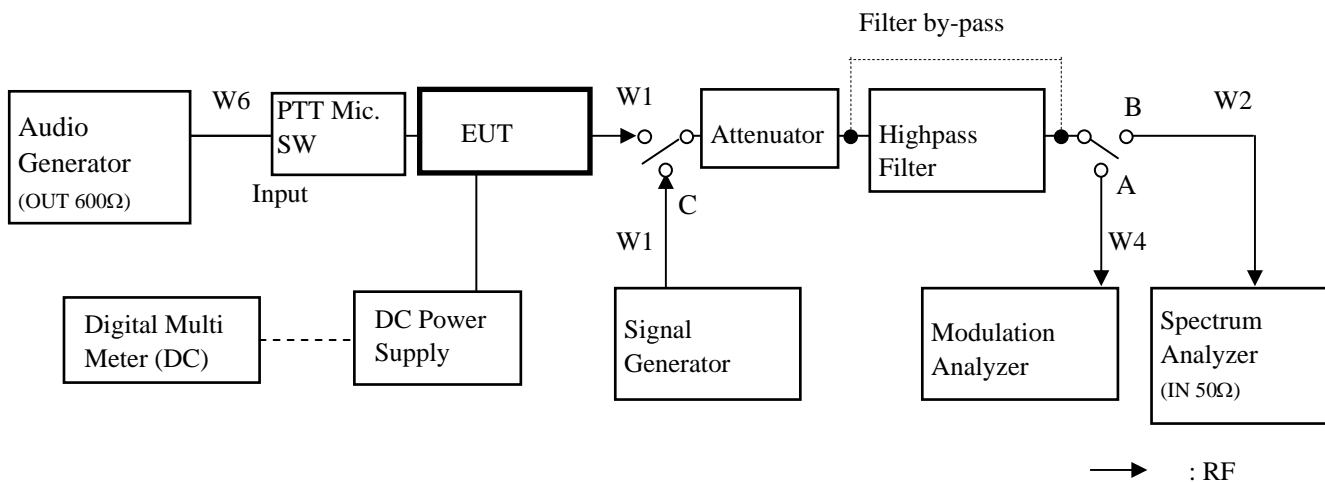
Measuring Equipments

No.	Equipment	Manufacture	Model No.	Serial No.	Cal Date	Cal Exp.
1	Audio Generator	Anritsu	MG443B	M70150	Apr. 01, 09	Apr. 30, 10
2	Attenuator (20dB)	Aeroflex/Wenshel	66-20-34	BY4537	Mar. 30, 09	Mar. 31, 10
3	Attenuator (30dB)	Weinschel	WA-29-30-34	8924	May. 15, 09	May. 31, 10
4	Highpass Filter	Anritsu	MP526G	M39892	Apr. 24, 09	Apr. 30, 10
5	Modulation Analyzer	Hewlett Packard	8901B	2806A01669	Feb. 23, 09	Feb. 28, 10
6	Signal Generator	Rohde&Schwarz	SMT06	100684	Dec 12, 08	Dec. 31, 09
7	Spectrum Analyzer	Agilent	E4407B	MY45102460	Feb. 09, 09	Feb. 28, 10
8	Digital Multi Meter	Agilent	34401A	3146A08906	Dec. 17, 08	Dec. 31, 09
9	DC Power Supply	Daiichi denpa kogyo	GZV4000	90290932	None	None

Measuring Cables

No.	Cable	Manufacturer	Model No.	Serial No.	Cal Date	Cal Exp.
W1	Coaxial Cable	Suhner	SUCOFLEX104	KSR00091	May. 15, 09	May. 31, 10
W2	Coaxial Cable	Suhner	SUCOFLEX104	KSR00042	Mar. 12, 09	Mar. 31, 10
W4	Coaxial Cable	Pacific custom	RG-58 C/U	AM90C03	Jan. 14, 09	Jan. 31, 10
W6	Balance Cable	Nicoon	3D-2V	KSR00092	Oct. 09, 08	Oct. 31, 09

Measuring Equipment Configuration



Test Results

Test date	Aug 3, 2009	
Location	Kashima No.1 Test Site	
temperature	24.2 to 26.7	[degree C]
Humidity Variation	60 to 65	[%]
Atmospheric Pressure	100.6 to 100.7	[kPa]
Test Engineer	Koichi Wagatsuma	

Test was carried out for all the frequency band of section 10.1
 State the worst case (below).

State : High Power / Authorized Bandwidth 20 kHz

No.	Band	Frequency (MHz)	Correct Level (dBm)	Emission Level (dBc)	Limit (dBc)	Margin (dB)
1	Low	59.50	-38.80	-89.21	-63.4	25.8
2	Middle	66.70	-31.30	-81.71	-63.4	18.3
3	High	73.90	-34.20	-84.61	-63.4	21.2

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

State : Low Power / Authorized Bandwidth 20 kHz

No.	Band	Frequency (MHz)	Correct Level (dBm)	Emission Level (dBc)	Limit (dBc)	Margin (dB)
1	Low	59.50	-44.60	-91.13	-59.5	31.6
2	Middle	66.70	-35.30	-81.83	-59.5	22.3
3	High	73.90	-39.90	-86.43	-59.5	26.9

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

Mask B Limit(dBc)=- $(43+10\text{Log}(P))$
 Correct Level (dBm) = Substitute SG Level (dBm)
 Emission Level (dBc) = Correct Level (dBm) - $10\text{Log}(P*1000)$
 P = Carrier Level (W)
 " - " = Measurement Limit

10.3 Field Strength of Spurious Radiation

REGULATIONS	: 47 CFR 2.1053 (a), 90.210
TEST METHOD/GUIDE	: ANSI/TIA-603-C 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) RBW : 10 kHz (< 1 GHz), 1 MHz (> 1 GHz).
 - b) VBW : 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

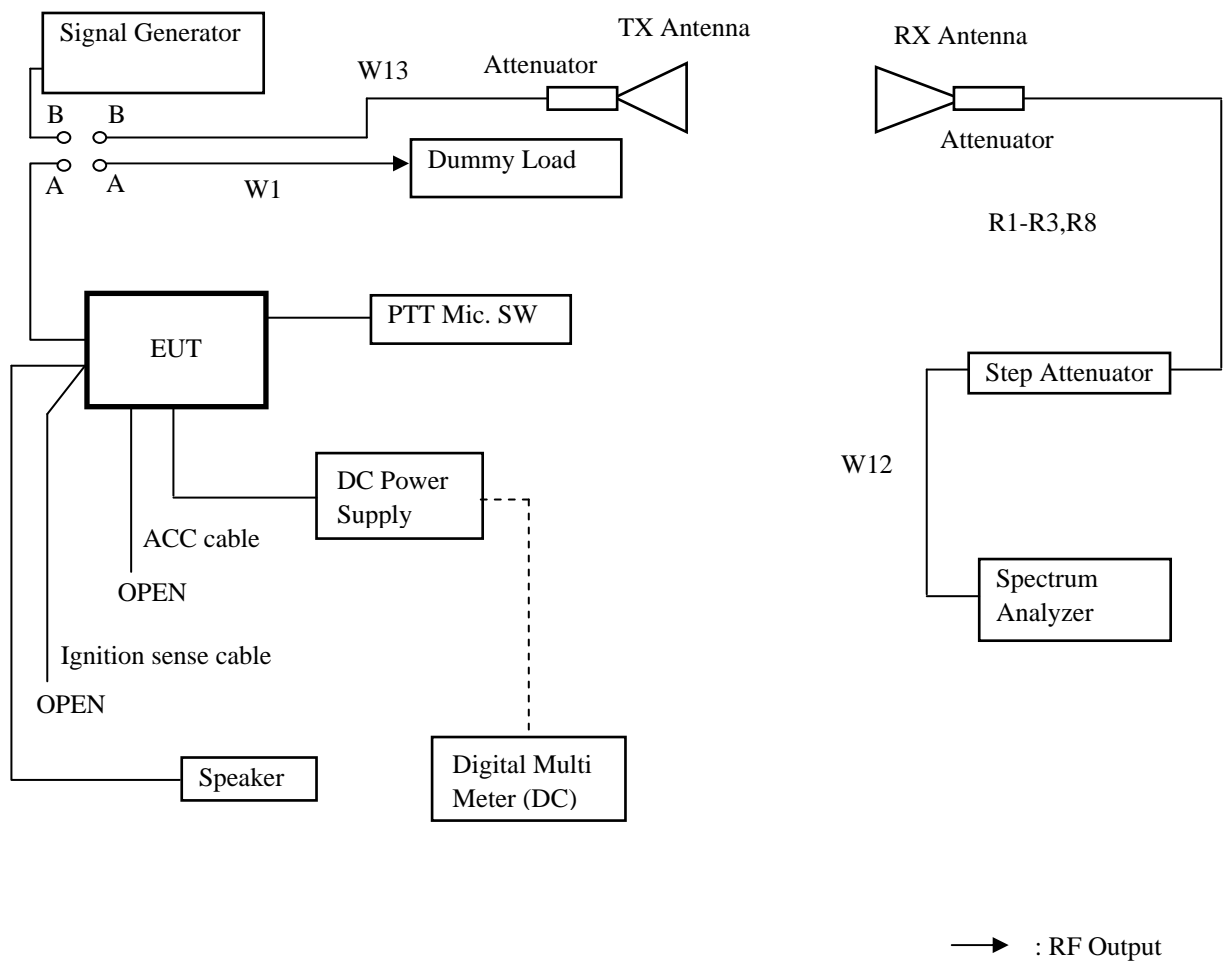
Measuring Equipments

No.	Equipment	Manufacture	Model No.	Serial No.	Cal Date	Cal Exp.
1	Dipole Antenna(TX)	Schwarzbeck	VHA9103	C01082007	May 18, 09	May. 31, 10
2	Biconical Antenna (TX)	Schwarzbeck	BBA9106	C01082007	May 18, 09	May. 31, 10
3	Dipole Antenna(TX)	Schwarzbeck	UHA9105	AM0082002	May 18, 09	May. 31, 10
4	Tri-log Antenna(RX)	Schwarzbeck	VULB9168WP	218	Mar. 05, 09	Mar. 31, 10
5	Attenuator(6dB)	TAMAGAWA	CFA-01(NPJ-6)	None	May. 20, 09	May. 31, 10
6	Attenuator(10dB)	TAMAGAWA	CFA-01(NPJ-10)	None	Aug. 10, 09	Aug. 31, 10
7	Step Attenuator	8494B	2805A14563	Hewlett Packard	May. 20, 09	May. 31, 10
8	Spectrum Analyzer	Agilent	E7402A	MY44212198	Dec. 12, 08	Dec. 31, 09
9	Signal Generator	Rohde&Schwarz	SMT06	100684	Dec. 12, 08	Dec. 31, 09
10	Dummy Load	TME	CT-150NP	1138693	Sep. 09, 08	Sep. 30, 09
11	Digital Multi Meter	Agilent	34401A	3146A08906	Dec. 17, 08	Dec. 31, 09
12	DC Power Supply	Daiichi denpa kogyo	GZV4000	90290932	None	None

Measuring Cables

No.	Cable	Manufacturer	Model No.	Serial No.	Cal Date	Cal Exp.
W1	Coaxial Cable	Suhner	SUCOFLEX104	KSR00091	May. 15, 09	May. 31, 10
R1	Coaxial Cable	Intertek Japan	5D-2W	2R1001a	May. 20, 09	May. 31, 10
R2	Coaxial Cable	Intertek Japan	RG-177/U	2R1002	May. 20, 09	May. 31, 10
R3	Coaxial Cable	Intertek Japan	RG-5A/U	2R1003	May. 20, 09	May. 31, 10
R8	Coaxial Cable	Intertek Japan	5D-2W	2R1008a	May. 20, 09	May. 31, 10
W12	Coaxial Cable	Intertek Japan	5D-2W	KSR00099	Jan. 14, 09	Jan. 31, 10
W13	Coaxial Cable	Suhner	SUCOFLEX104	KSR00207	Jun. 12, 09	Jun. 30, 10

Measuring Equipment Configuration



Test Results

Test date	Aug 11, 2009	
Location	Tochigi No.2 Test Site	
temperature	20.1 to 22.3	[degree C]
Humidity Variation	50 to 51	[%]
Atmospheric Pressure	98.3 to 98.5	[kPa]
Test Engineer	Koichi Wagatsuma	

Test was carried out for all the frequency band of section 10.1
 State the worst case (below).

State : High Power / Authorized Bandwidth 20 kHz / 36.95 MHz

No	Frequency (MHz)	Pol	Reading	SG Out	Loss (dB)	Antenna	Correct	Emission	Limit	Margin (dB)
			Level (dBm)	Level (dBm)		Gain (dBi)	Level (dBm)	Level (dBc)	Level (dBc)	
1	73.90	Hor.	-68.33	-27.00	10.56	1.12	-36.4	-86.9	-63.4	23.4
		Ver.	-57.79	-18.40	10.56	1.12	-27.8	-78.3	-63.4	14.8
2	110.85	Hor.	-75.77	-33.00	10.77	-0.57	-44.3	-94.7	-63.4	31.3
		Ver.	-69.47	-28.60	10.77	-0.57	-39.9	-90.3	-63.4	26.9
3	147.80	Hor.	-81.71	-35.70	10.84	-0.89	-47.4	-97.8	-63.4	34.4
		Ver.	-77.01	-32.00	10.84	-0.89	-43.7	-94.1	-63.4	30.7
4	184.75	Hor.	-80.46	-40.60	10.95	2.15	-49.4	-99.8	-63.4	36.4
		Ver.	-70.21	-28.80	10.95	2.15	-37.6	-88.0	-63.4	24.6
5	221.70	Hor.	-62.65	-24.70	11.03	2.15	-33.6	-84.0	-63.4	20.6
		Ver.	-57.94	-15.10	11.03	2.15	-24.0	-74.4	-63.4	11.0
6	258.65	Hor.	-79.26	-38.80	11.12	2.15	-47.8	-98.2	-63.4	34.8
		Ver.	-76.56	-32.10	11.12	2.15	-41.1	-91.5	-63.4	28.1
7	295.60	Hor.	-76.62	-33.40	11.21	2.15	-42.5	-92.9	-63.4	29.5
		Ver.	-81.36	-32.90	11.21	2.15	-42.0	-92.4	-63.4	29.0
8	332.55	Hor.	-70.87	-26.60	11.30	2.15	-35.7	-86.2	-63.4	22.7
		Ver.	-72.70	-23.90	11.30	2.15	-33.0	-83.5	-63.4	20.0
9	369.50	Hor.	-88.85	-43.20	11.39	2.15	-52.4	-102.9	-63.4	39.4
		Ver.	-87.37	-39.20	11.39	2.15	-48.4	-98.9	-63.4	35.4

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

Mask B Limit (dBc) = -(43+10Log(P))

Correct Level (dBm) = Substitute SG Level (dBm) + ANT Gain (dB) - Loss (Cable, Attenuator) (dB)

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

P = Carrier Level (W)

" - " = Measurement Limit

State : Low Power / Authorized Bandwidth 20 kHz / 36.95 MHz

No	Frequency (MHz)	Pol	Reading Level (dBm)	SG Out Level (dBm)	Loss (dB)	Antenna Gain (dBi)	Correct Level (dBm)	Emission Level (dBc)	Limit Level (dBc)	Margin (dB)
1	73.90	Hor.	-75.14	-33.90	10.56	1.12	-43.3	-89.9	-59.5	30.3
		Ver.	-62.55	-21.90	10.56	1.12	-31.3	-77.9	-59.5	18.3
2	110.85	Hor.	-81.94	-39.00	10.77	-0.57	-50.3	-96.9	-59.5	37.3
		Ver.	-72.89	-32.10	10.77	-0.57	-43.4	-90.0	-59.5	30.4
3	147.80	Hor.	-76.41	-30.70	10.84	-0.89	-42.4	-89.0	-59.5	29.4
		Ver.	-72.06	-27.10	10.84	-0.89	-38.8	-85.4	-59.5	25.8
4	184.75	Hor.	-89.11	-49.20	10.95	2.15	-58.0	-104.5	-59.5	45.0
		Ver.	-84.02	-42.70	10.95	2.15	-51.5	-98.0	-59.5	38.5
5	221.70	Hor.	-67.12	-29.20	11.03	2.15	-38.1	-84.6	-59.5	25.1
		Ver.	-62.39	-19.40	11.03	2.15	-28.3	-74.8	-59.5	15.3
6	258.65	Hor.	-84.05	-43.80	11.12	2.15	-52.8	-99.3	-59.5	39.8
		Ver.	-83.03	-38.70	11.12	2.15	-47.7	-94.2	-59.5	34.7
7	295.60	Hor.	-78.76	-35.70	11.21	2.15	-44.8	-91.3	-59.5	31.8
		Ver.	-81.97	-33.50	11.21	2.15	-42.6	-89.1	-59.5	29.6
8	332.55	Hor.	-77.31	-33.00	11.30	2.15	-42.1	-88.7	-59.5	29.1
		Ver.	-80.85	-31.80	11.30	2.15	-40.9	-87.5	-59.5	27.9
9	369.50	Hor.	-86.73	-41.20	11.39	2.15	-50.4	-97.0	-59.5	37.4
		Ver.	-85.88	-37.80	11.39	2.15	-47.0	-93.6	-59.5	34.0

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

Mask B Limit (dBc) = -(43+10Log(P))

Correct Level (dBm) = Substitute SG Level (dBm) + ANT Gain (dB) - Loss (Cable, Attenuator) (dB)

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

P = Carrier Level (W)

" - " = Measurement Limit

10.4 Emission Masks (Occupied Bandwidth)

REGULATIONS	: 47 CFR 2.1049 (c) (1), 22.359, 357 (a) (1) , 90.210
TEST METHOD/GUIDE	: ANSI/TIA-603-C 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 deviation (or 50 % modulation).
- 3 With level constant, the signal level was increased 16 dB.
- 4 Adjust the spectrum analyzer for the following setting:
 - a) RBW : 100Hz (Non modulation and Authorized Band 11.25 kHz),
300Hz (Non modulation and Authorized Band 20 kHz).
 - b) VBW : 10times the RBW (Non modulation , Authorized Band 11.25 kHz and Authorized Band 20 kHz).
 - 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.

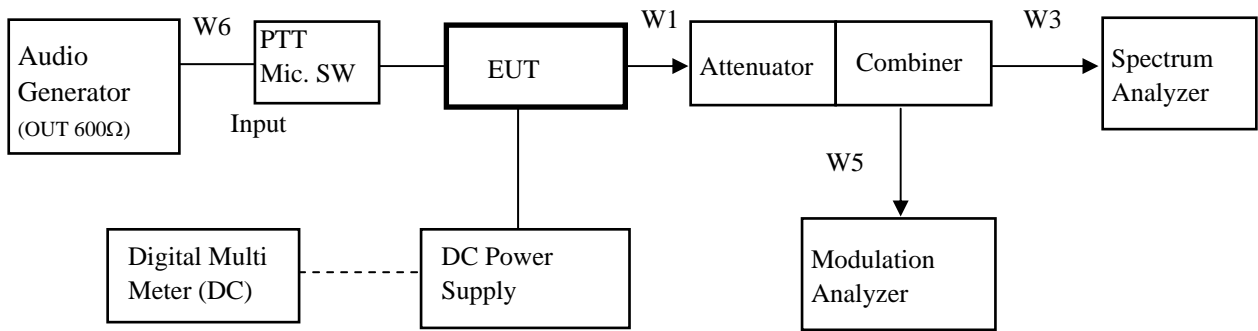
Measuring Equipments

No.	Equipment	Manufacture	Model No.	Serial No.	Cal Date	Cal Exp.
1	Audio Generator	Anritsu	MG443B	M70150	Apr. 01, 09	Apr. 30, 10
2	Attenuator (20dB)	Aeroflex/Wenshel	66-20-34	BY4537	Mar. 30, 09	Mar. 31, 10
3	Attenuator (30dB)	Weinschel	WA-29-30-34	8924	May. 15, 09	May. 31, 10
4	Combiner	Anritsu	Z-164A	M89549	Oct. 09, 08	Oct. 31, 09
5	Modulation Analyzer	Hewlett Packard	8901B	2806A01669	Feb. 23, 09	Feb. 28, 10
6	Spectrum Analyzer	Agilent	E4407B	MY45102460	Feb. 09, 09	Feb. 28, 10
7	Digital Multi Meter	Agilent	34401A	3146A08906	Dec. 17, 08	Dec. 31, 09
8	DC Power Supply	Daiichi denpa kogyo	GZV4000	90290932	None	None

Measuring Cables

No.	Cable	Manufacture	Model No.	Serial No.	Cal Date	Cal Exp.
W1	Coaxial Cable	Suhner	SUCOFLEX104	KSR00091	May. 15, 09	May. 31, 10
W3	Coaxial Cable	Suhner	SUCOFLEX104	KSR00042	Mar. 12, 09	Mar. 31, 10
W5	Coaxial Cable	Pacific custom	RG-58 C/U	AM90C03	Jan. 14, 09	Jan. 31, 10
W6	Balance Cable	Nicoon	3D-2V	KSR00092	Oct. 09, 08	Oct. 31, 09

Measuring Equipment Configuration

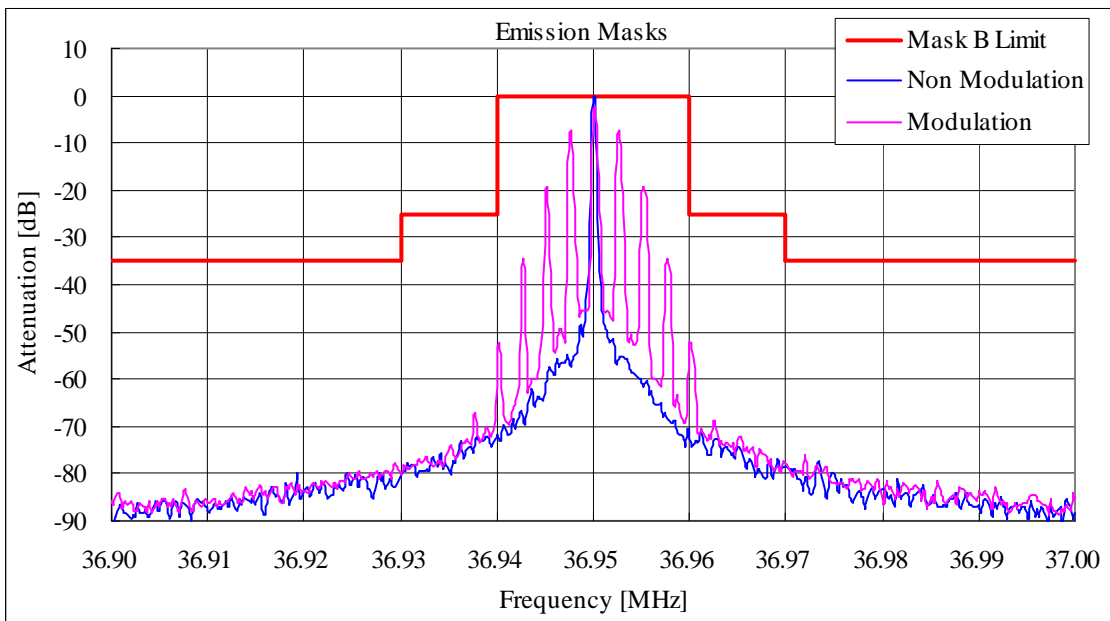


Test Results

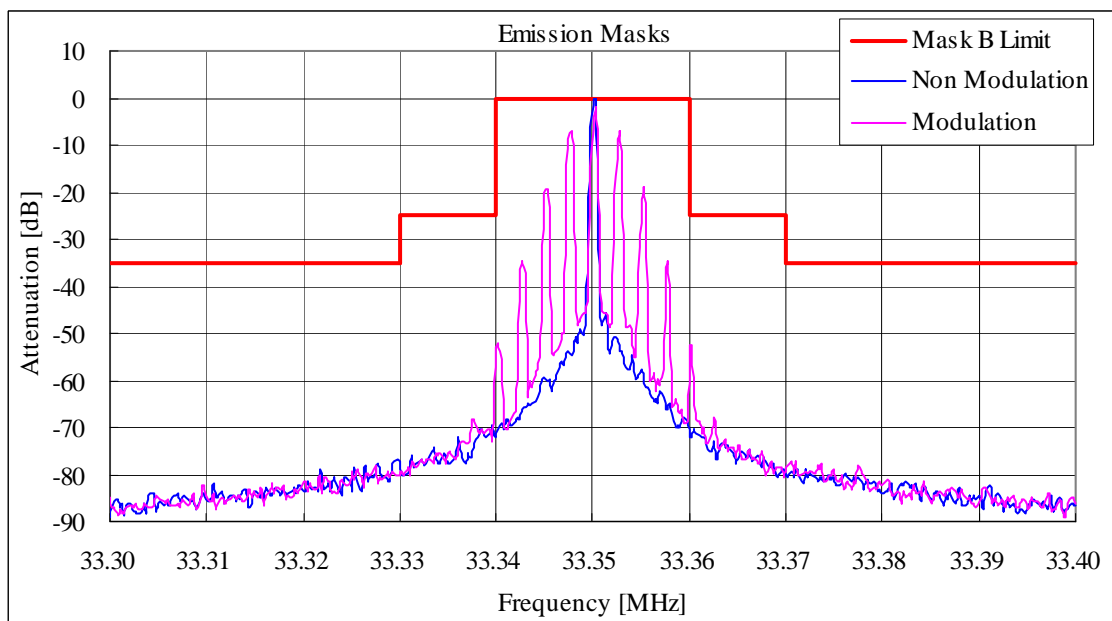
Test date	Jul 30, 2009	
Location	Kashima No.1 Test Site	
temperature	24.9 to 26.5	[degree C]
Humidity Variation	48 to 50	[%]
Atmospheric Pressure	100.4 to 100.5	[kPa]
Test Engineer	Koichi Wagatsuma	

Test was carried out for all the frequency band of section 10.1
 State the worst case (below).

State : High Power / Authorized Bandwidth 20 kHz:FM / 36.95 MHz



State : Low Power / Authorized Bandwidth 20 kHz:FM / 33.35 MHz



10.5 Transient Frequency Behavior

REGULATIONS	: 47 CFR 90.214
TEST METHOD/GUIDE	: ANSI/TIA-603-C Section 2.2.19.3

Test Procedure

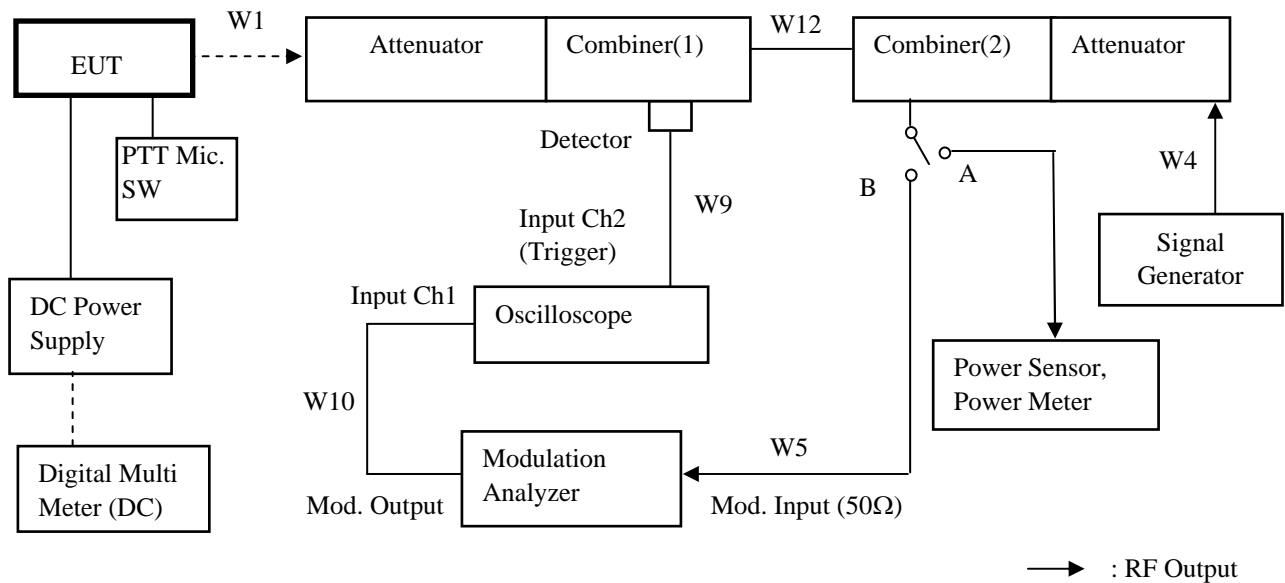
- 1 The EUT and test equipment were set up as shown on the following page.
- 2 The transmitter was turned on.
- 3 The transmitter carrier level was measured at the output of the combiner .
- 4 The transmitter was turned off.
- 5 An RF signal generator (1) modulated with a 1 kHz tone at either 25 kHz or 12.5 kHz or 6.25 kHz deviation, and set to the same frequency as the assigned transmitter frequency, (2) was adjusted to a level -30 dB below the level recorded in Procedure 3, 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-603C steps 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-603-C steps m, n, and o was captured and plotted.
- 9 The carrier off-time as referenced in TIA-603-C steps p, q, r, and s was captured and plotted.

No.	Equipment	Manufacture	Model No.	Serial No.	Cal Date	Cal Exp.
1	Signal Generator	Rohde&Schwarz	SMT06	100684	Dec. 12, 08	Dec. 31, 09
2	Oscilloscope	Tektronix	TDS 680B	B010292	Oct. 14, 08	Oct. 31, 09
3	Power Meter	Hewlett Packard	E4418B	GB38410265	May 26, 09	May. 31, 10
4	Power Sensor	Hewlett Packard	8482A	US37292237	May 26, 09	May. 31, 10
5	Attenuator (10dB)	Aeroflex/Wenshel	66-10-34	BY2887	Mar. 30, 09	Mar. 31, 10
6	Attenuator (20dB)	Aeroflex/Wenshel	66-20-34	BY4537	Mar. 30, 09	Mar. 31, 10
7	Modulation Analyzer	Hewlett Packard	8901B	2806A01669	Feb. 23, 09	Feb. 28, 10
8	Combiner(1)	Anritsu	Z-164A	M89549	Oct. 09, 08	Oct. 31, 09
9	Combiner(2)	Anritsu	Z-164A	M89249	Oct. 09, 08	Oct. 31, 09
10	Attenuator (3dB)	TME	CFA-20NPJ-3	679701	May. 15, 09	May. 31, 10
11	Digital Multi Meter	Agilent	34401A	3146A08906	Dec. 17, 08	Dec. 31, 09
12	DC Power Supply	Daïichi denpa kogyo	GZV4000	90290932	None	None

Measuring Cables

No.	Cable	Manufacture	Model No.	Serial No.	Cal Date	Cal Exp.
W1	Coaxial Cable	Suhner	SUCOFLEX104	KSR00091	May. 15, 09	May. 31, 10
W4	Coaxial Cable	Pacific custom	RG-58 C/U	AM90C02	Jan. 14, 09	Jan. 31, 10
W5	Coaxial Cable	Pacific custom	RG-58 C/U	AM90C03	Jan. 14, 09	Jan. 31, 10
W9	Coaxial Cable	Pacific custom	RG-58 C/U	KSR00094	Oct. 09, 08	Oct. 31, 09
W10	Coaxial Cable	Pacific custom	RG-58 C/U	KSR00095	Oct. 09, 08	Oct. 31, 09
W12	Coaxial Cable	Pacific custom	RG-58 C/U	AM90C04	Jan. 14, 09	Jan. 31, 10

Measuring Equipment Configuration

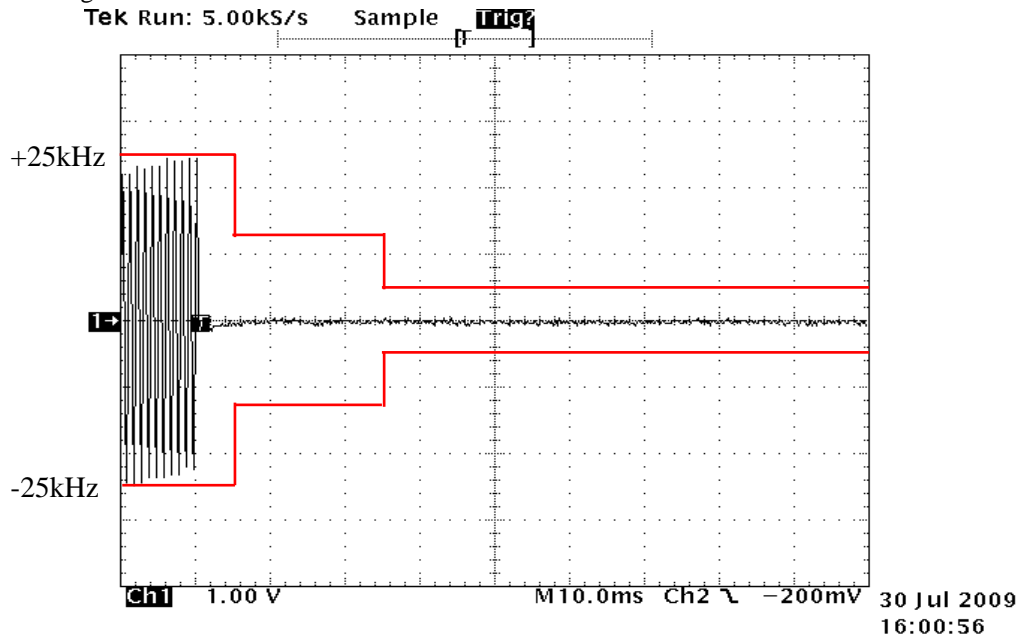


Test Results

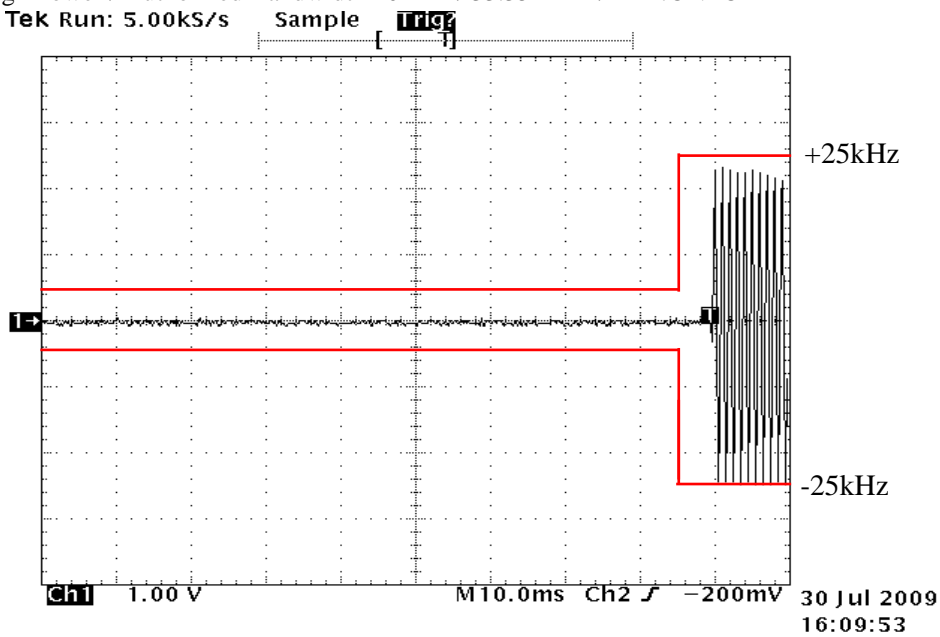
Test date	Jul 30, 2009	
Location	Kashima No.1 Test Site	
temperature	25 to 25.5	[degree C]
Humidity Variation	50 to 58	[%]
Atmospheric Pressure	100.4 to 100.5	[kPa]
Test Engineer	Koichi Wagatsuma	

Test was carried out for all the frequency band of section 10.1
 State the worst case (below).

State : High Power / Authorized Bandwidth 20 kHz / 33.35 MHz / PTT:OFF -ON



State : High Power / Authorized Bandwidth 20 kHz / 33.35 MHz / PTT:ON -OFF



10.6 Audio Frequency Response / Audio Low Pass Filter (Voice Input)

REGULATIONS	: 47 CFR 2.1047 (a)
TEST METHOD/GUIDE	: ANSI/TIA-603-C 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.

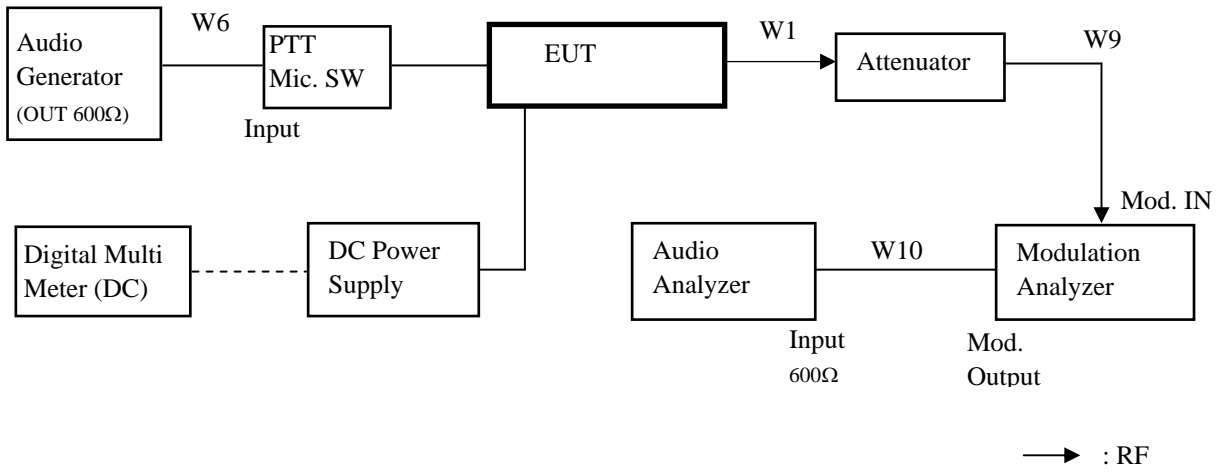
Measuring Equipments

No.	Equipment	Manufacture	Model No.	Serial No.	Cal Date	Cal Exp.
1	Audio Generator	Anritsu	MG443B	M70150	Apr. 01, 09	Apr. 30, 10
2	Audio Analyzer	Hewlett Packard	8903B	2818A04372	Apr. 10, 09	Apr. 30, 10
3	Attenuator (20dB)	Aeroflex/Wenshel	66-20-34	BY4537	Mar. 30, 09	Mar. 31, 10
4	Attenuator (30dB)	Weinschel	WA-29-30-34	8924	May. 15, 09	May. 31, 10
5	Modulation Analyzer	Hewlett Packard	8901B	2806A01669	Feb. 23, 09	Feb. 28, 10
6	Digital Multi Meter	Agilent	34401A	3146A08906	Dec. 17, 08	Dec. 31, 09
7	DC Power Supply	Daiichi denpa kogyo	GZV4000	90290932	None	None

Measuring Cables

No.	Cable	Manufacture	Model No.	Serial No.	Cal Date	Cal Exp.
W1	Coaxial Cable	Suhner	SUCOFLEX104	KSR00091	May. 15, 09	May. 31, 10
W6	Balance Cable	Nicoon	3D-2V	KSR00092	Oct. 09, 08	Oct. 31, 09
W9	Coaxial Cable	Pacific custom	RG-58 C/U	KSR00094	Oct. 09, 08	Oct. 31, 09
W10	Coaxial Cable	Pacific custom	RG-58 C/U	KSR00095	Oct. 09, 08	Oct. 31, 09

Measuring Equipment Configuration

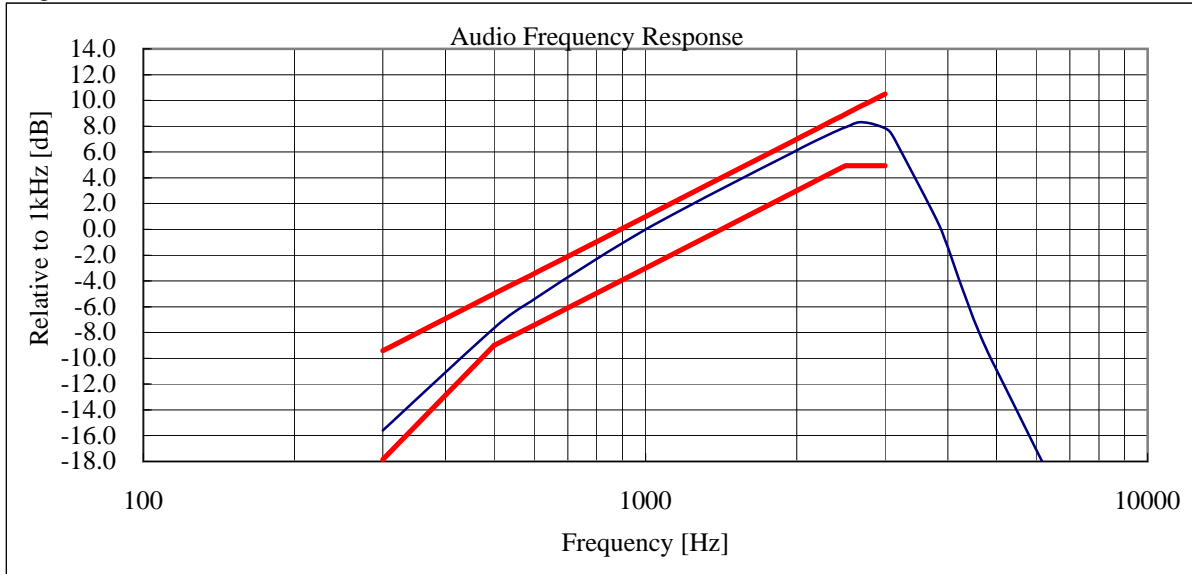


Test Results

Test date	Jul 29, 2009	
Location	Kashima No.1 Test Site	
temperature	24.9 to 25.9	[degree C]
Humidity Variation	49 to 59	[%]
Atmospheric Pressure	101.4 to 101.6	[kPa]
Test Engineer	Koichi Wagatsuma	

Test was carried out for all the frequency band of section 10.1
 State the worst case (below).

State : High Power / Authorized Bandwidth 20 kHz / 33.35 MHz



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.

10.7 Modulation Limiting

REGULATIONS	: 47 CFR 2.1047 (b)
TEST METHOD/GUIDE	: ANSI/TIA-603-C 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 modulation 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.

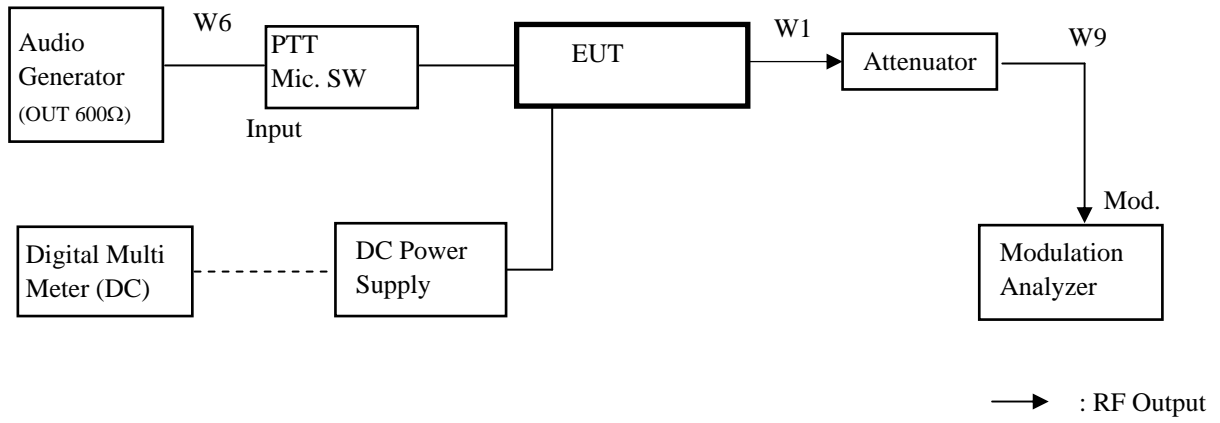
Measuring Equipments

No.	Equipment	Manufacture	Model No.	Serial No.	Cal Date	Cal Exp.
1	Audio Generator	Anritsu	MG443B	M70150	Apr. 01, 09	Apr. 30, 10
2	Attenuator (20dB)	Aeroflex/Wenshel	66-20-34	BY4537	Mar. 30, 09	Mar. 31, 10
3	Attenuator (30dB)	Weinschel	WA-29-30-34	8924	May. 15, 09	May. 31, 10
4	Modulation Analyzer	Hewlett Packard	8901B	2806A01669	Feb. 23, 09	Feb. 28, 10
5	Digital Multi Meter	Agilent	34401A	3146A08906	Dec. 17, 08	Dec. 31, 09
6	DC Power Supply	Daiichi denpa kogyo	GZV4000	90290932	None	None

Measuring Cables

No.	Cable	Manufacture	Model No.	Serial No.	Cal Date	Cal Exp.
W1	Coaxial Cable	Suhner	SUCOFLEX104	KSR00091	May. 15, 09	May. 31, 10
W6	Balance Cable	Nicoon	3D-2V	KSR00092	Oct. 09, 08	Oct. 31, 09
W9	Coaxial Cable	Pacific custom	RG-58 C/U	KSR00094	Oct. 09, 08	Oct. 31, 09

Measuring Equipment Configuration

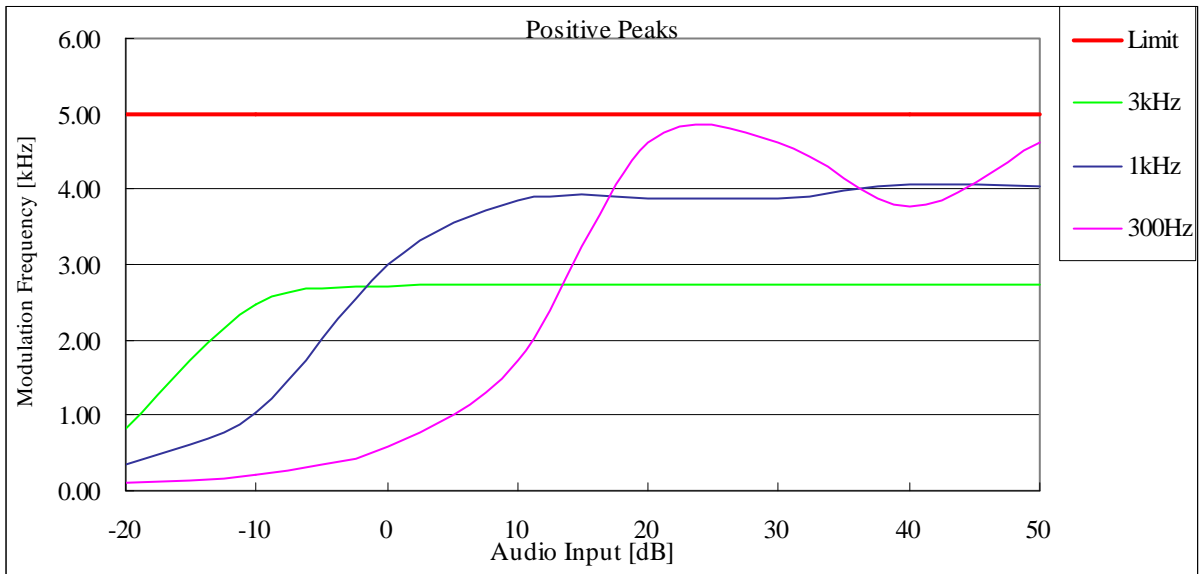


Test Results

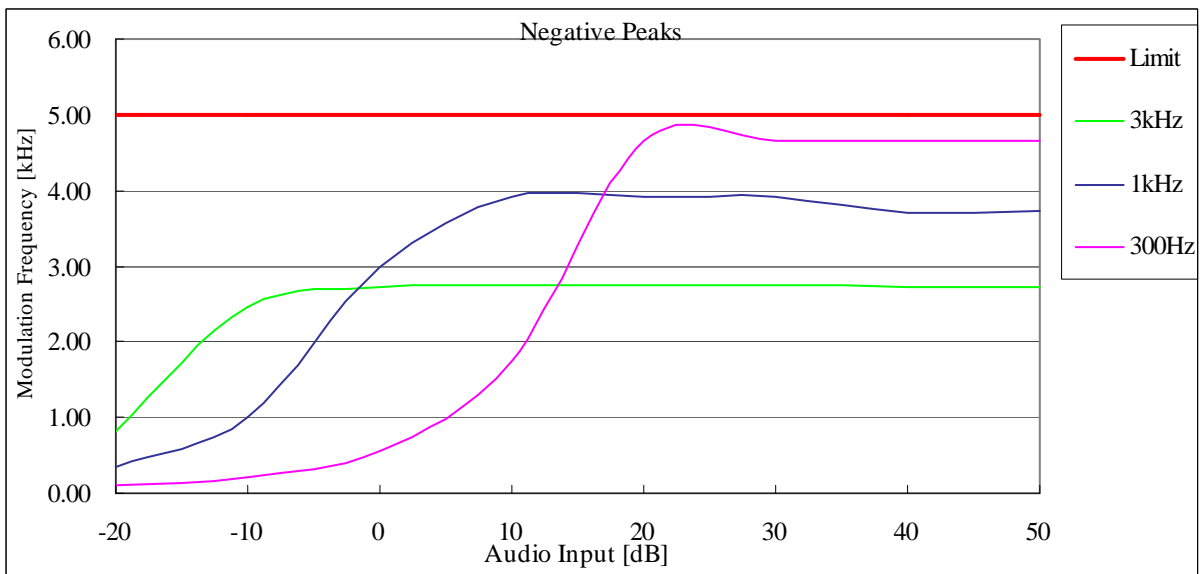
Test date	Jul 28, 2009	
Location	Kashima No.1 Test Site	
temperature	24.5 to 25.2	[degree C]
Humidity Variation	57 to 66	[%]
Atmospheric Pressure	101.6to 101.7	[kPa]
Test Engineer	Koichi Wagatsuma	

Test was carried out for all the frequency band of section 10.1
 State the worst case (below).

State : High Power / Authorized Bandwidth 20 kHz / 29.75 MHz



State : High Power / Authorized Bandwidth 20 kHz / 29.75 MHz



10.8 Frequency Stability (Temperature Variation)

REGULATIONS	: 47 CFR 2.1055 (a) (1), 22.355 , 90.213(a)
TEST METHOD/GUIDE	: ANSI/TIA-603-C 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.
Two minutes 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.

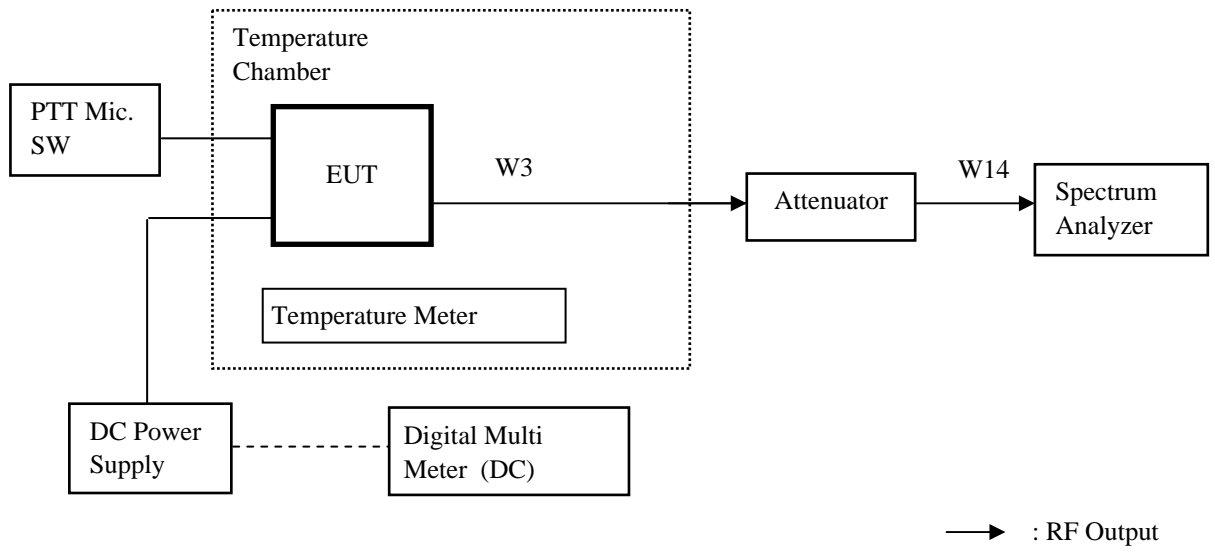
Measuring Equipments

No.	Equipment	Manufacture	Model No.	Serial No.	Cal Date	Cal Exp.
1	Attenuator (30dB)	Weinschel	WA-29-30-34	8923	May. 15, 09	May. 31, 10
2	Attenuator (30dB)	Weinschel	WA-29-30-34	8924	May. 15, 09	May. 31, 10
3	Attenuator (10dB)	Aeroflex/Wenshel	66-10-34	BY2887	Mar. 30, 09	Mar. 31, 10
4	Spectrum Analyzer	Agilent	E4407B	MY45102460	Feb. 09, 09	Feb. 28, 10
5	Digital Multi Meter	FLUKE	8846A	9642018	Jul 06, 09	Jul. 31, 10
6	DC Power Supply	Daiichi denpa kogyo	GZV4000	90290931	None	None
7	Temperature Chamber	Tabai	PL-3F	5103661	None	None
8	Temperature Meter	Sato	PC-5000TRH-II	A11999972	Apr. 10, 09	Apr. 30, 10

Measuring Cables

No.	Cable	Manufacture	Model No.	Serial No.	Cal Date	Cal Exp.
W3	Coaxial Cable	Suhner	SUCOFLEX104	KSR00042	Mar. 12, 09	Mar. 31, 10
W14	Coaxial Cable	Suhner	SUCOFLEX104	KSR00211	Aug. 11, 09	Aug. 31, 10

Measuring Equipment Configuration



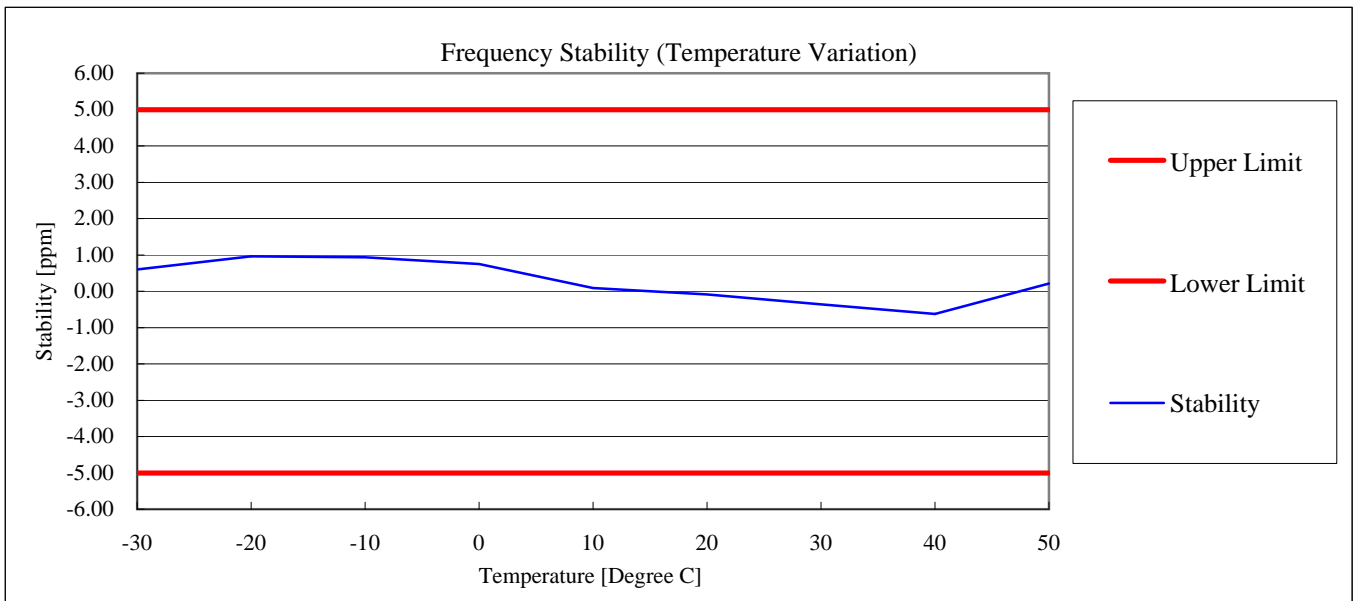
Test Results

Test date	Aug 27, 2009
Location	Kashima No.1 Test Site
Test Engineer	Koichi Wagatsuma

Test was carried out for all the frequency band of section 10.1
 State the worst case (below).

State : High Power / Authorized Bandwidth 20 kHz / 33.35 MHz
 Reference Frequency: 33.350000 MHz

No.	Temperature (Degree C)	Frequency (MHz)	Stability (ppm)	Limit (+/- ppm)	Min. Margin (ppm)
1	-30	33.350020	0.60	5.0	4.40
2	-20	33.350032	0.96	5.0	4.04
3	-10	33.350031	0.93	5.0	4.07
4	0	33.350025	0.75	5.0	4.25
5	10	33.350003	0.09	5.0	4.91
6	20	33.349997	-0.09	5.0	4.91
7	30	33.349988	-0.36	5.0	4.64
8	40	33.349979	-0.63	5.0	4.37
9	50	33.350007	0.21	5.0	4.79



10.9 Frequency Stability (Voltage Variation)

REGULATIONS	: 47 CFR 2.1055 (d) (1), 22.355 , 90.213(a)
TEST METHOD/GUIDE	: ANSI/TIA-603-C 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.

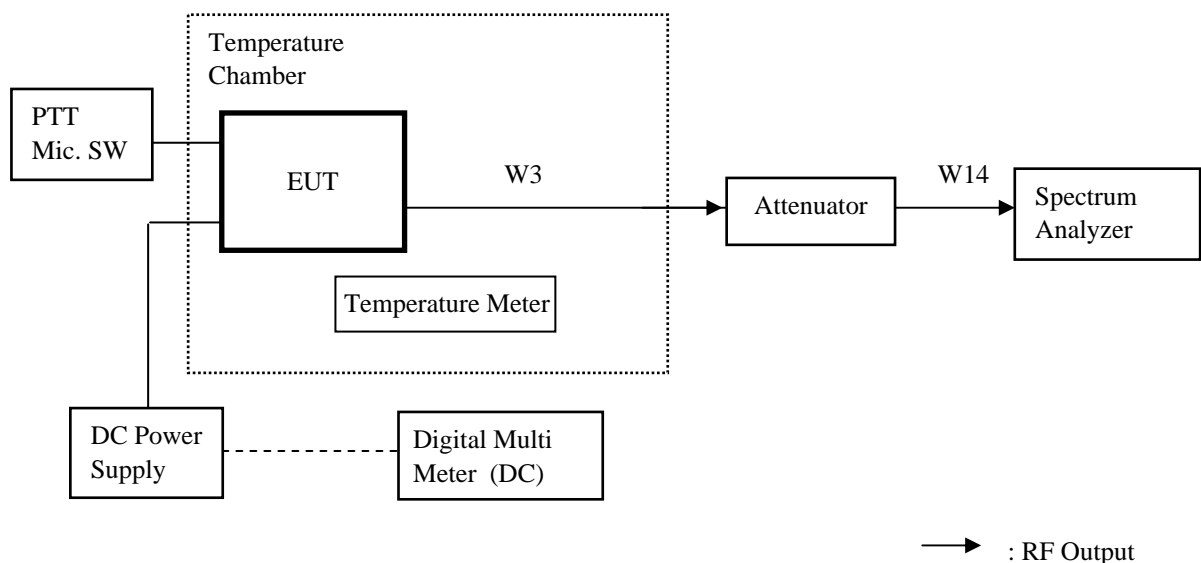
Measuring Equipments

No.	Equipment	Manufacture	Model No.	Serial No.	Cal Date	Cal Exp.
1	Attenuator (30dB)	Weinschel	WA-29-30-34	8923	May. 15, 09	May. 31, 10
2	Attenuator (30dB)	Weinschel	WA-29-30-34	8924	May. 15, 09	May. 31, 10
3	Attenuator (10dB)	Aeroflex/Wenshel	66-10-34	BY2887	Mar. 30, 09	Mar. 31, 10
4	Spectrum Analyzer	Agilent	E4407B	MY45102460	Feb. 09, 09	Feb. 28, 10
5	Digital Multi Meter	FLUKE	8846A	9642018	Jul 06, 09	Jul. 31, 10
6	DC Power Supply	Daiichi denpa kogyo	GZV4000	90290931	None	None
7	Temperature Chamber	Tabai	PL-3F	5103661	None	None
8	Temperature Meter	Sato	PC-5000TRH-II	A11999972	Apr. 10, 09	Apr. 30, 10

Measuring Cables

No.	Cable	Manufacture	Model No.	Serial No.	Cal Date	Cal Exp.
W3	Coaxial Cable	Suhner	SUCOFLEX104	KSR00042	Mar. 12, 09	Mar. 31, 10
W14	Coaxial Cable	Suhner	SUCOFLEX104	KSR00211	Aug. 11, 09	Aug. 31, 10

Measuring Equipment Configuration



Test Results

Test date	Aug 19, 2009
Location	Kashima No.1 Test Site
Test Engineer	Koichi Wagatsuma

Test was carried out for all the frequency band of section 10.1
 State the worst case (below).

State : High Power / Authorized Bandwidth 20 kHz / 29.75 MHz

No.	Temperature (Degree C)	Diviation (%)	Voltage (V)	Frequency (MHz)	Stability (ppm)	Limit +/- (ppm)	Margin (ppm)
1	20 +/- 5	85	11.39	29.749994	-0.20	5.0	4.80
2	20 +/- 5	100	13.40	29.749996	-0.13	5.0	4.87
3	20 +/- 5	115	15.41	29.749984	-0.54	5.0	4.46

10.10 Necessary Bandwidth and Emission Bandwidth

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

State : 16K0F3E (Authorized Bandwidth 20 kHz)

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

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