EMC EMISSION - TEST REPORT

JQA APPLICATION No. : KL80000004

Name of Product : 1.9GHz Wireless Base Station Unit (WBSU)

Model/Type No. : FS-469G-E

FCC ID : OXN1900MTDMABASE3

Applicant : MITSUBISHI ELECTRIC CORPORATION
COMMUNICATION SYSTEMS BUSINESS DIVISION

Address : 8-1-1, TSUKAGUCHI-HONMACHI, AMAGASAKI CITY,
HYOGO 661-8661, JAPAN

Manufacturer : MITSUBISHI ELECTRIC CORPORATION
COMMUNICATION SYSTEMS BUSINESS DIVISION

Address : 8-1-1, TSUKAGUCHI-HONMACHI, AMAGASAKI CITY,
HYOGO 661-8661, JAPAN

Receive date of TUT : March 22, 2000

Final Judgement : **Passed**

TEST RESULTS IN THIS REPORT are obtained in use of equipment that is traceable to Electro-technical Lab. of MITI Japan and Communications Research Lab. of PTT Japan.

THE TEST RESULTS only responds to the test sample. This test report shall not be reproduced except in full.

DIRECTORY

TEST REGULATION

FCC Rules and Regulations Part 24 (October 1, 1998)

○ - Narrowband PCS
● - Broadband PCS

Test procedure:

The tests were performed according to FCC Rules Regulations Part 2 (October 1, 1999), and ANSI C63.4 (1992).

GENERAL INFORMATION

Test facility:

1) Test Facility located at Kita-Kansai : 1st and 2nd Open Sites (3 m Site)
Test Facility located at Kameoka Open Site (3, 10 and 30 m, on common plane)
FCC filing No. : 31040/SIT 1300F2

2) KITA-KANSAI TESTING CENTER is recognized under the National Voluntary Laboratory Accreditation Program for satisfactory compliance established in Title 15, Part 285 Code of Federal Regulations.
NVLAP Lab Code: 200191-0

Definitions for symbols used in this test report:

● - Black box indicates that the listed condition, standard or equipment is applicable for this Report.
○ - Blank box indicates that the listed condition, standard or equipment is not applicable for this Report.

Description of the Transmitter Under Test (TUT):

1)	Name	: 1.9GHz Wireless Base Station unit (WBSU)
2)	Model/Type No.	: FS-469G-E
3)	Product Type	: Prototype(Serial No. : 30500001)
4)	Category	: Broadband PCS
5)	TUT Authorization	: ○ - Verification ● - Certification ○ - D.o.C.
6)	Transmitting Frequency	: 1930.080 MHz (2 ch) - 1989.960 MHz (1998 ch)
7)	Receiving Frequency	: 1850.040 MHz (2 ch) - 1909.92 MHz (1998 ch)
8)	Emission Designations	: 32K3D7W
9)	Nominal ERP	: 0.1 W
10)	Power Rating	: -24Vdc ~ -48Vdc

General Description of the TUT :

The TDMA system is the medium for the linking calls between PBX and non-public systems users and mobile users. The system also enables a mobile user to communicate with other mobiles.

This Wireless Base Station Unit(WBSU) is the distributed radio component of a 1.9 GHz PCS System that is being developed for the operation in the licensed PCS holder. The WBSU is being developed as a subsystem component.

The WBSU provides the IS-136A air interface to handheld mobiles operating as a private in-building or campus system. The WBSU is connected to the centralized system controller through a dedicated line interface. This interface utilizes a RJ45 physical connector(modular). This cable connection from the controller to the WBSU provides the following signals.

(1) -48Vdc power to supply a WBSU.
(2) The clock source of 128kHz for the WBSU to control the frequency accuracy.
(3) ISDN BRI(Basic Rate Interface) signal to control the communications.

The voltage of -48Vdc generated at the controller gets lower as it comes to the WBSU by its consumption current through the line cable. It can operate at the input line voltage of -48Vdc to -24Vdc. An internal power supply circuit in the WBSU converts the DC input voltage into the internal working voltage of 5V and 3.6V.

The WBSU is approximately 12" × 12" × 3". The unit weighs approximately 4kg. A security screw is provided which requires a special tool for removal. The antennas (TX1 and TX2) are integrated to the WBSU and are contained within the assembly.

The operating frequency range of the WBSU is the standard licensed bands within the PCS spectrum. The output level of the transceiver is from -10dBW to -38 dBW and is software controlled.

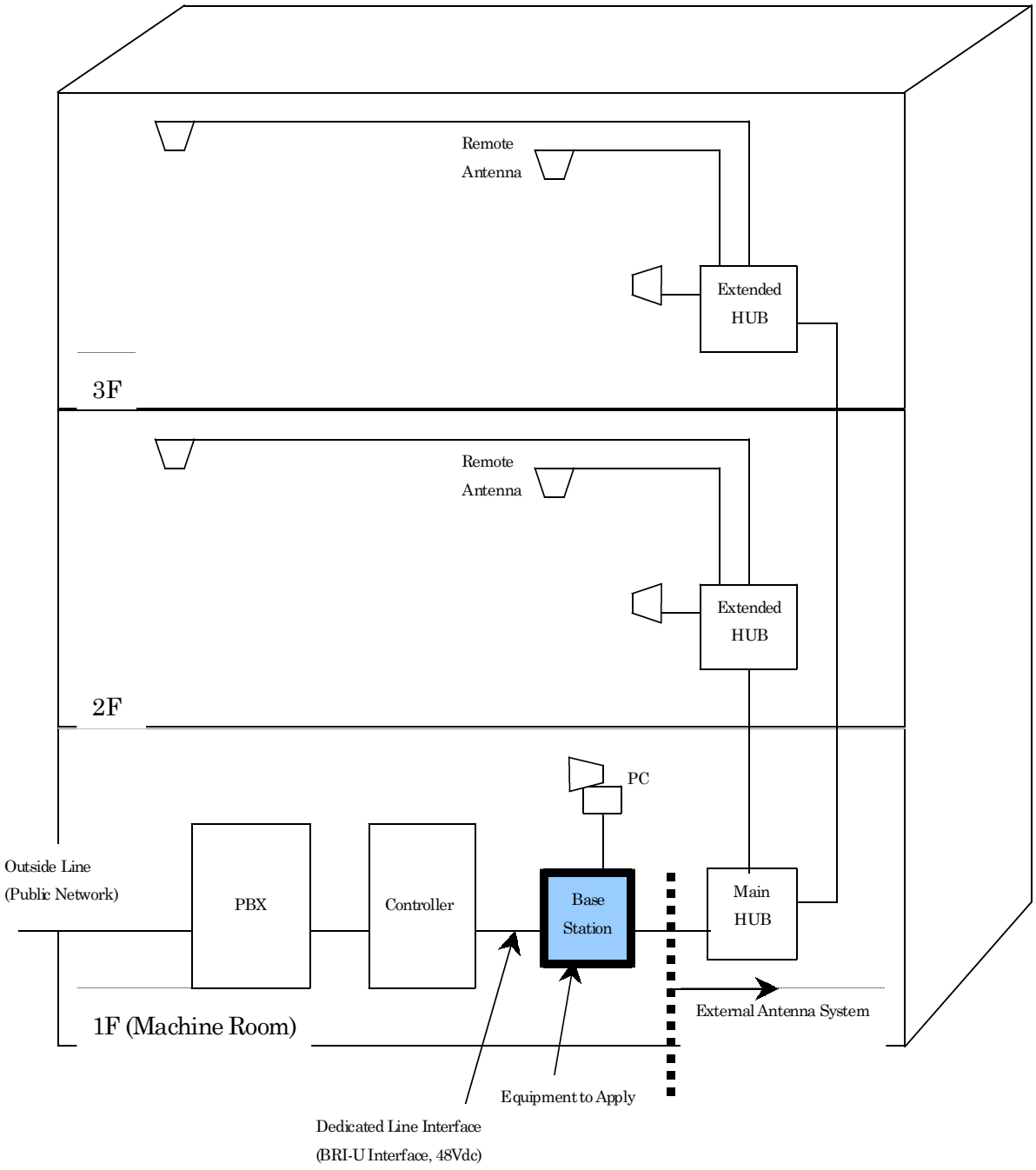
The network connections to provide voice or data communications through to the PSTN(Public Switched Telephone Network) or PBX are provided by the central controller and are not part of the WBSU.

The TDMA system is the medium for linking calls between PBX and non-public system users and mobile users. The system also enables a mobile user to communicate with other mobiles.

In a typical installation, the WBSU (called External Antenna Type) is supposed to have an external antenna system attached, as indicated in the drawing, to distribute the transmitted power into the offices of a building. This antenna system is a standard product made in the U.S.

There is another similar type of base station (called Internal Antenna Type) which has antennas connected inside the housing. The Internal-antenna-type base station has been applied to FCC for a certification, too, as a separate application.

The basic office environment(including a machine room) is air conditioned, normally 25°C(77°F). The humidity is usually low. The WBSU is designed to operate at least in 0°C(32°F) to 40°C(104°F).

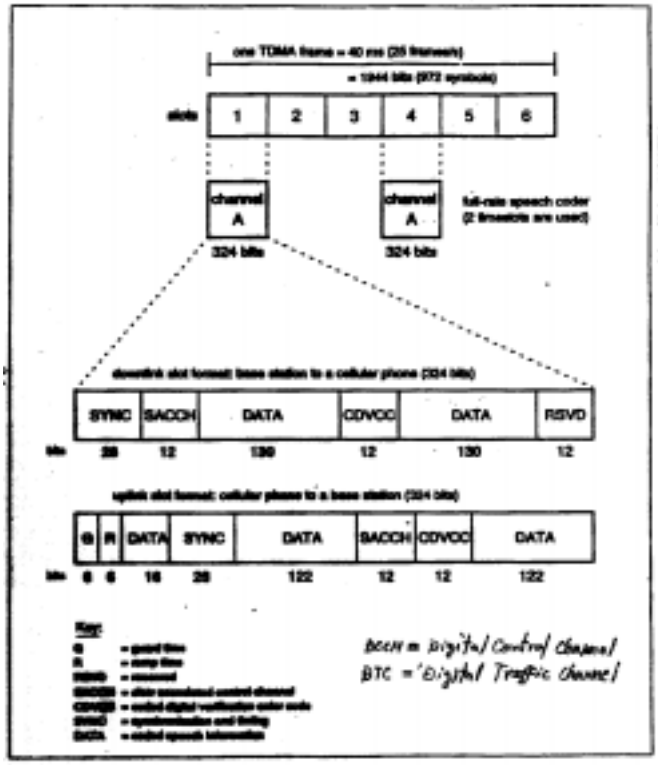


General Configuration of a Typical In-Building System (Private System)

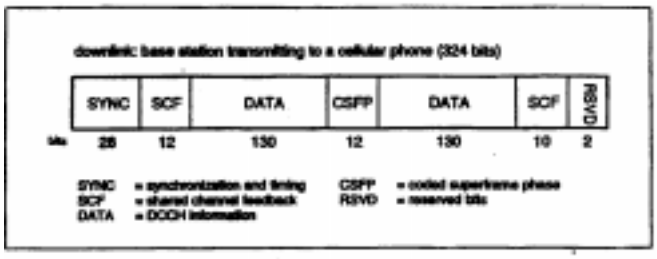
Transmitter Technical Characteristics(§2.1033) :

A.	TX RF Power Output	: 100 mW (TX1, TX2)
B.	Number of Simultaneous Traffic Channels	: 5(Refer to page 8)
C.	Tunable Channels(not user tunable)	: 1997(Refer to page 13)
D.	Transmitting Frequency Range	: 1930.08 to 1989.96 MHz
E.	Emission Designations	: 32K3D7W
F.	Power Supply	: -24Vdc ~ -48Vdc
G.	Frequency Stability	: ± 0.1ppm (0°C ~ 40°C)

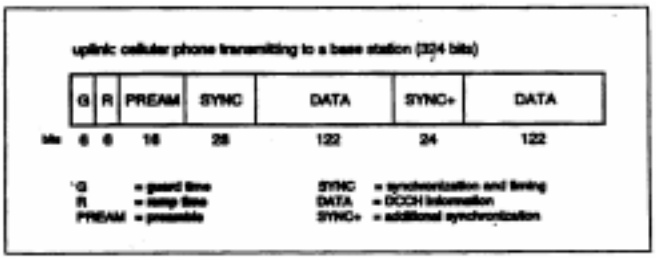
TMDA Information :



(a) DTC-Burst Format



(b) DCCH-Downlink Burst Format



(C) DCCH-Normal Uplink Burst Format

Fig. 1 IS-136 TDMA Burst Foemat

Circuit Description :

(1) Means for Frequency Stabilization

This base station is provided a clock of 128KHz from the controller(Network side). The stability of this clock is within +/-0.1ppm at room temperature. The transmitter uses 19.2MHz primary signal which is generated by a VCXO. The frequency of VCXO is divided by 150 and the phase is compared with that of 128KHz clock. The result of comparison determines the control voltage of VCXO.

(2) Means for Suppression of Spurious Radiation

Major spurious are occurred as follows. A mixing circuit employed occurs the image of a carrier and the leakage of a local oscillator. A power amplifier occurs harmonics due to the non-linearity. Three band pass filters(BPF #1 through #3) are introduced to reduce these spurious frequencies. The frequency response for the filters are shown in page 10. Furthermore each circuit block on TRX board is shielded from each other against spread of spurious.

(3) Means for Limiting power

An automatic power controller (APC) circuit employed regulates transmitter power in a range of +2 to -4dB of its nominal power. An APC circuit compares detected power with nominal power and adjust the loss of attenuator. These procedure are done by MPU with digital data processing. Even though an excessive adjustment occurs by a certain disturbance, it is neglected according to a given threshold. So the transmitter power does not exceed the nominal power too much.

(4) Means for Modulation System

The transmitter is capable of generating pi/4-DQPSK signals. The baseband wave (I&Q signals) generator has a square root raised cosine Nyqist filter with roll off factor of 0.35 for the pulse shaping. The symbol rate is 24.3K symbols per second.

I&Q baseband signals modulate an intermediate carrier frequency of 218.19MHz and generates Pi/4-Shifted QPSK signals. The intermediate carrier frequency is then raised to the final transmission frequency by a mixer.(W3013 Modulator/Mixer IC)

(5) Tune-up Procedure

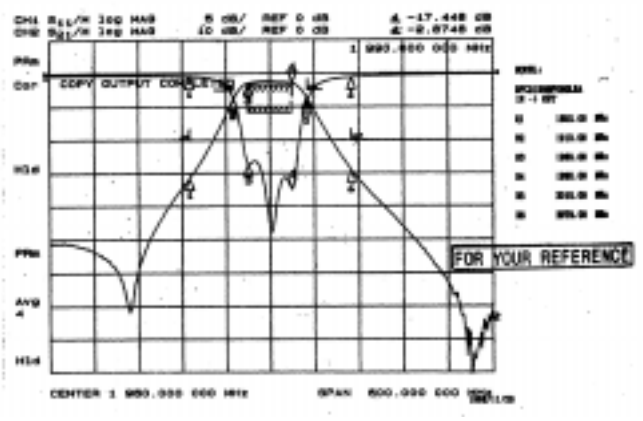
For Transmission Frequency, the WBSU comes tuned from factory, these are no user adjustments. For transmission power, it is also factory-tuned and no user adjustments.

(6) Transmitting for TX1 and TX2

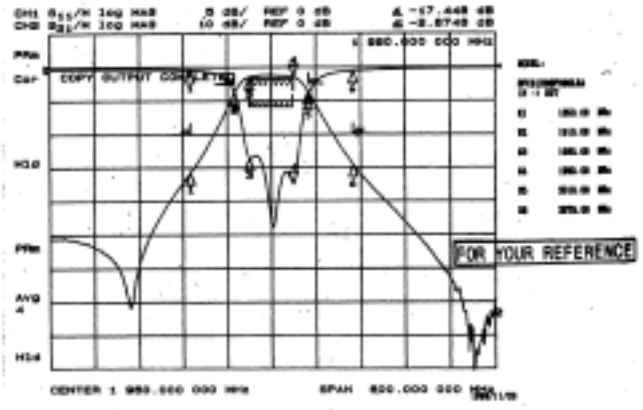
This WBSU contains two radio transceivers and they operate independently of each other. The transmitting frequencies used in the transceivers are allocated by the controller from a system point of view.

One transceiver is set several channels apart from the other transceiver. The respective channels (TX1 and TX2) are controlled to be not induced the interference by the same channel, adjacent channels or next adjacent channels.

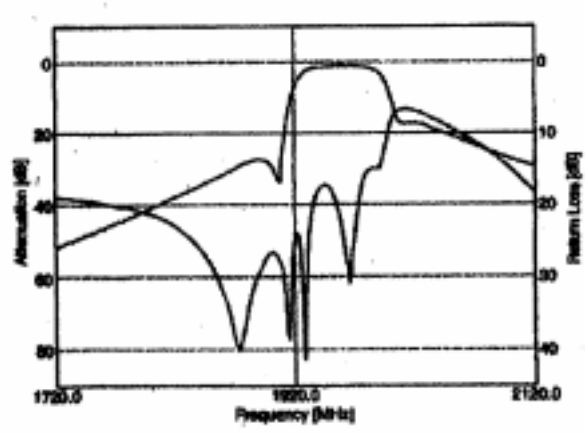
Band Pass Filter Characteristics :



(1) Typical Frequency Response of Bass Filter #1 (FL2001)



(2) Typical Frequency Response of Bass Filter #2 (FL2002)



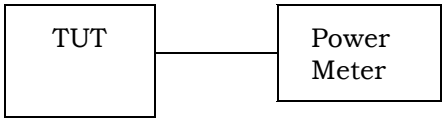
(3) Typical Frequency Response of Bass Filter #3 (Z2003:Duplexer)

TEST CONDITIONS

Transmitter Power(TP) Measurement (§2.1046(a),§24.232)

Test Procedure :

The Transmitter Power was measured with a power meter, a short, low loss cable.



Test location :

KITA-KANSAI Testing Center
7-7, Ishimaru, 1-Chome, Mino-Shi, Osaka, 562-0027, Japan
● - Shielded room
KAMEOKA EMC Branch
9-1, Ozaki, Inukanno, Nishibetsuin-Cho, Kameoka-Shi, Kyoto, 621-0126, Japan
○ - Shielded room

Used test instruments and sites :

Model No.	Device ID	Last Cal. Date	Cal. Interval
● - 432B/8478B	B - 24 / B - 43	March, 1999	1 Year
○ - 6-20	D - 27		
○ - 4T-10	D - 73		
○ - 4T-10	D - 74		
○ - 8566B	A - 13		
○ - 8593A	A - 15		

Environmental conditions :

Temperature: 24 °C Humidity: 30 %

Antenna Conducted Spurious Emission Measurement (§2.1051)

Test Procedure :

The Antenna Conducted Emission was measured with a spectrum analyzer, one high pass filter and a short, low loss cable.

Test location :

KITA-KANSAI Testing Center
7-7, Ishimaru, 1-Chome, Mino-Shi, Osaka, 562-0027, Japan
● - Shielded room
KAMEOKA EMC Branch
9-1, Ozaki, Inukanno, Nishibetsuin-Cho, Kameoka-Shi, Kyoto, 621-0126, Japan
○ - Shielded room

Used test instruments and sites :

Model No.	Device ID	Last Cal. Date	Cal. Interval
○ - 432B/8478B	B - 24 / B - 43		
○ - 6-20	D - 27		
○ - 4T-10	D - 73		
○ - 4T-10	D - 74		
● - UHP-127	D - 42	April, 2000	1 year
● - 8566B	A - 13	November, 1999	1 Year
○ - 8593A	A - 15		
○ - 8673D	B - 2		

Environmental conditions :

Temperature: 24 °C Humidity: 30 %

Occupied Bandwidth Measurement(§2.1049(c)(1), §24.238)

Test Procedure :

The measurement was made under the modulated condition shown in page 25. The bandwidth for the TUT is 32.3 kHz. This measurement was taken with connection through two 10dB attenuators from the antenna output to the spectrum analyzer. The wave shape was captured in trace A using a Resolution Bandwidth (RES BW) of 1kHz, a Video Bandwidth (VIDEO BW) of 3 kHz. The reference was adjusted to be equal trace A. Then for trace B the Resolution Bandwidth was adjusted to 1kHz which is approximately 1% of the specified occupied bandwidth. The occupied bandwidth of the Emission in trace B was measured at the point 26 dB below Reference level.

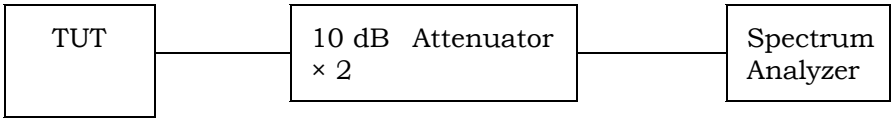
Band-edge Emission Measurement(§2.1049(c)(1), §24.235,§24.238)

The measurement was made under the modulated condition shown in page 25.
The Band-edge emission measurement was performed under the modulated condition of the worst result of the occupied bandwidth measurement. The wave shape was captured in trace using a Resolution Bandwidth (RES BW) of 1kHz , a Video Bandwidth (VIDEO BW) of 3 MHz, a frequency span(SPAN) of 1.2 MHz and a center frequency of the band-edge frequency against the each channel. The peak level at unmodulation emission was adjusted to be equal to the reference level.

Channel Numbers and Frequencies for 1900MHz Operation

Band	Bandwidth (MHz)	Number of Channels	Boundary Channel Numbers	Transmitter Center Frequency (MHz)
Not Used		1	1	1930.050
A	15	497	2 ~ 498	1930.080 ~ 1944.960
A, D(Note)		3	499 ~ 501	1944.990 ~ 1945.050
D	5	164	502 ~ 665	1945.080 ~ 1949.970
D, B(Note)		2	666 ~ 667	1950.000 ~ 1950.030
B	15	498	668 ~ 1165	1950.060 ~ 1964.970
B, E(Note)		2	1166 ~ 1167	1965.000 ~ 1965.030
E	5	165	1168 ~ 1332	1965.060 ~ 1969.980
E, F(Note)		2	1333 ~ 1334	1970.010 ~ 1970.040
F	5	164	1335 ~ 1498	1970.070 ~ 1974.960
F, C(Note)		3	1499 ~ 1501	1974.990 ~ 1975.050
C	15	497	1502 ~ 1998	1975.080 ~ 1989.960
Not Used		1	1999	1989.990

Note : This channel does not entirely fall into a single band (A, B, C, D, E or F). A mobile station capable of operating in any of these bands or combination thereof shall also be able to operate on the associated border channel (s).



Test location :

KITA-KANSAI Testing Center
7-7, Ishimaru, 1-Chome, Mino-Shi, Osaka, 562-0027, Japan
● - Shielded room
KAMEOKA EMC Branch
9-1, Ozaki, Inukanno, Nishibetsuin-Cho, Kameoka-Shi, Kyoto, 621-0126, Japan
○ - Shielded room

Used test instruments and sites :

Model No.	Device ID	Last Cal. Date	Cal. Interval
○ - 4396B	B - 47		
● - 8566B	A - 13	November, 1999	1 Year
● - 4T-10	D - 73	May, 1999	1 year
● - 4T-10	D - 74	May, 1999	1 year
○ - 8593A	A - 15		
○ - 2-10	D - 40		
○ - 6-20			
○ - VP-7212A	B - 41		

Environmental conditions :

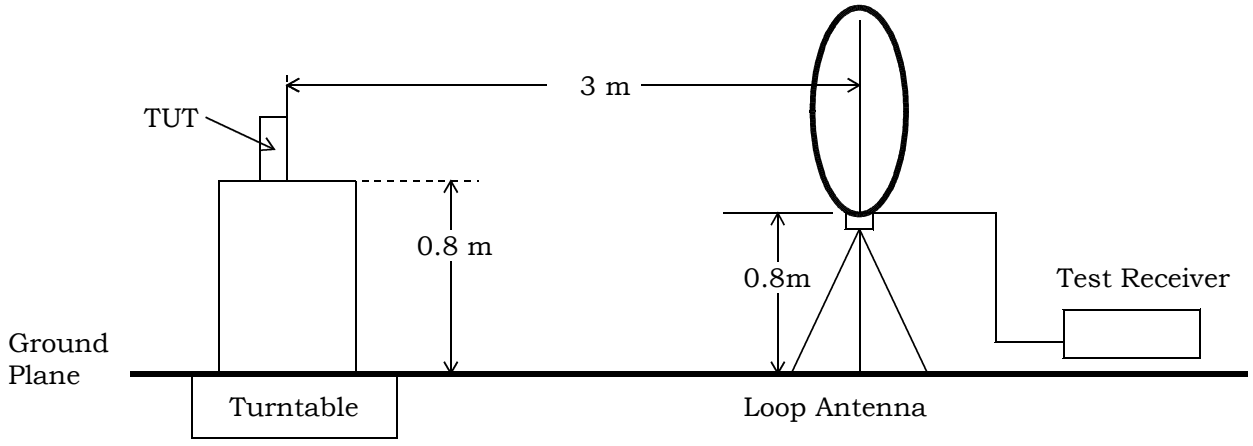
Temperature: 24 °C Humidity: 30 %

Unwanted Radiation Measurement (§2.1053,§24.238)

The ERP of the transmitter spurious radiation were measured at the distance 3 m away from the TUT which was placed on a wooden table 0.8m in height and was varying at three orthogonal axes. The receiving antenna was oriented for vertical polarization and varied from 1 m to 4 m until the maximum emission level was detected on the measuring instrument. The TUT was rotated 360 degrees until the maximum emission was received. The measurement was repeated with the receiving antenna in the horizontal polarization.
The TUT was removed and replaced by a horn antenna. The center of the half-wave dipole antenna (30 MHz - 1GHz) or the horn antenna(above 1GHz) was placed at the same location of the TUT.(In the case of the lower frequencies, where the half-wave dipole antenna is polarized vertically. In such a case the lower end of the antenna was adjusted to one foot above the ground). The RF power was fed to the transmitting antenna from a signal generator, and the RF output level of the signal generator was adjusted to obtain the previously recorded maximum reading at the particular spurious emissions frequency and recorded. This procedure was repeated with the receiving antenna and the transmitting antenna in the orthogonal polarization.
The ERP was calculated by these readings. The level of the spurious emission (ERP in dBm) was compared with the fundamental frequency transmitter power(TP) by specified attenuation limits, $43+10\log_{10}$(TP in watt).

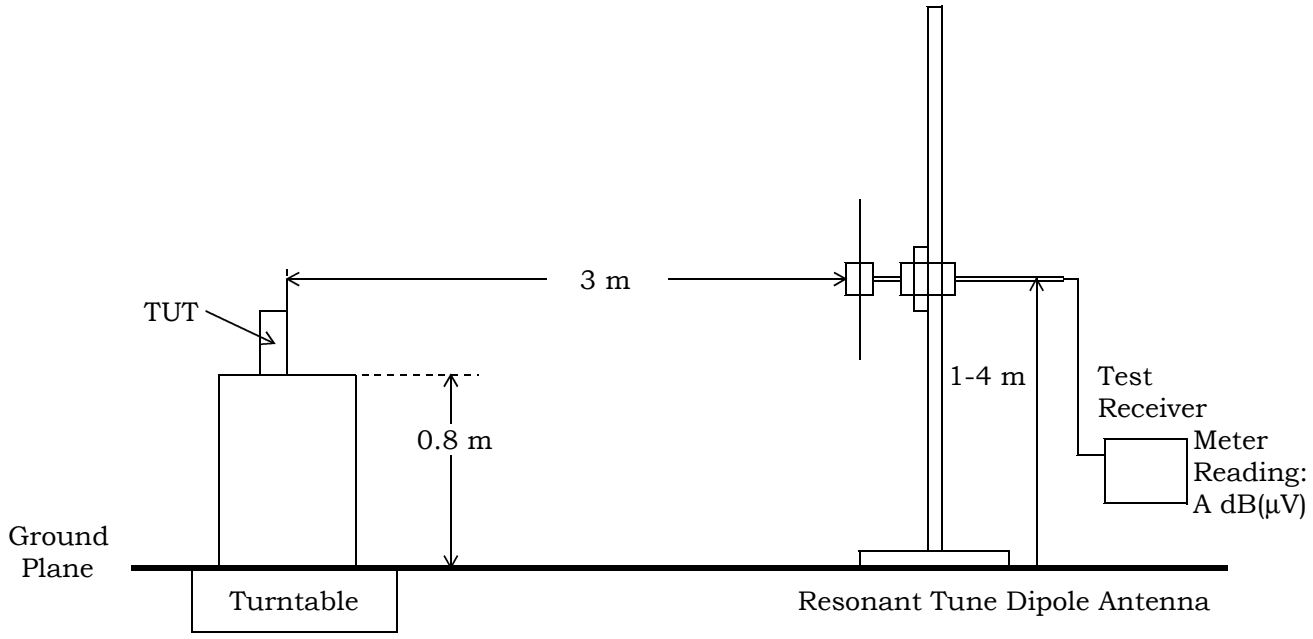
Transmitter Test Condition :

The test was made under such transmitting operation under the antenna terminal with the equivalent terminator.

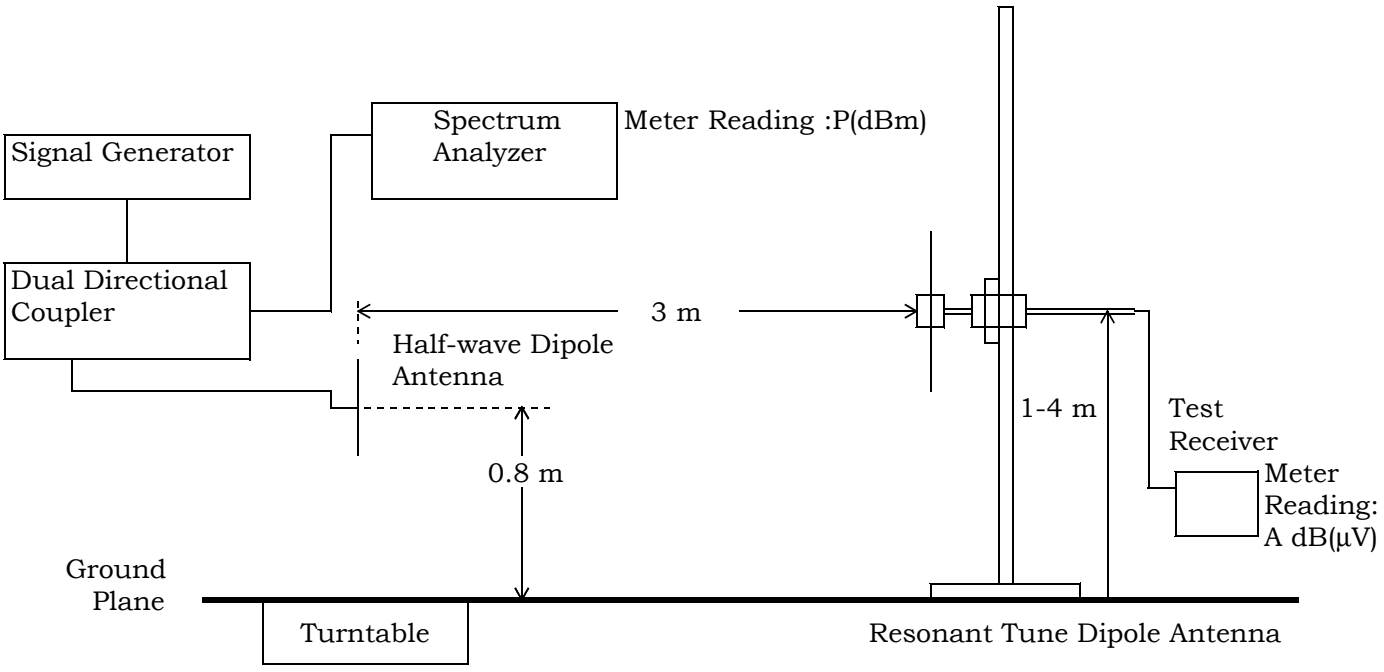


(a) Measurement set up for up to 30 MHz

Fig.2 Unwanted Radiation Measurement



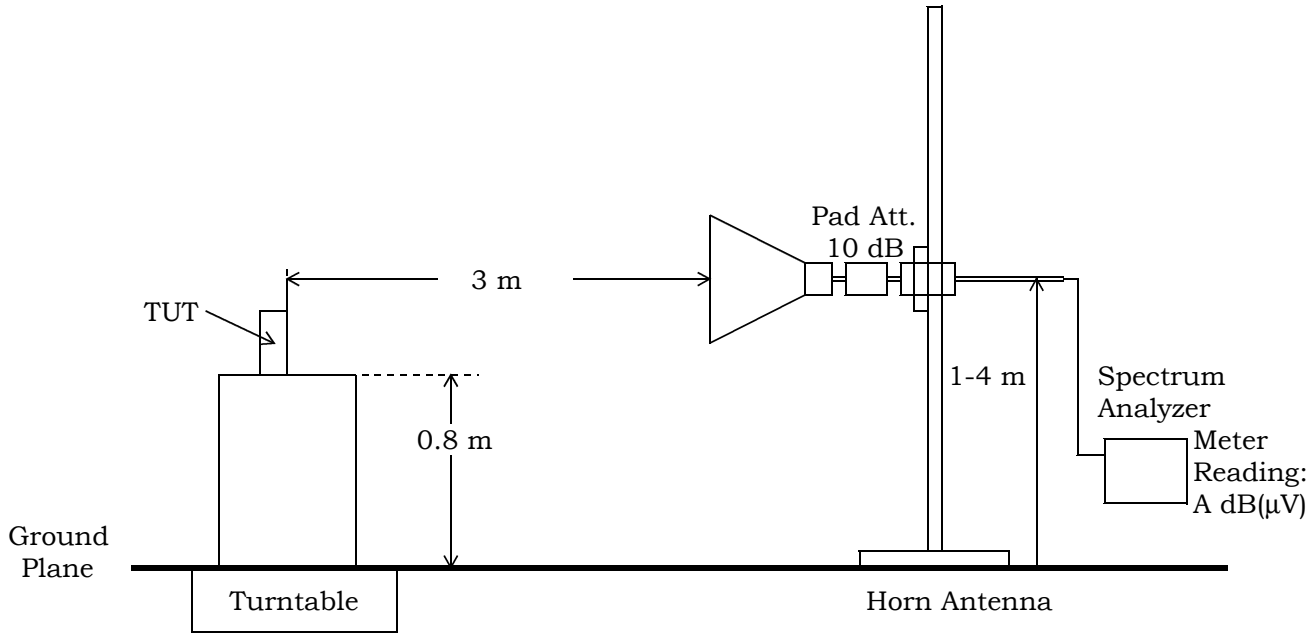
(b-1) TUT



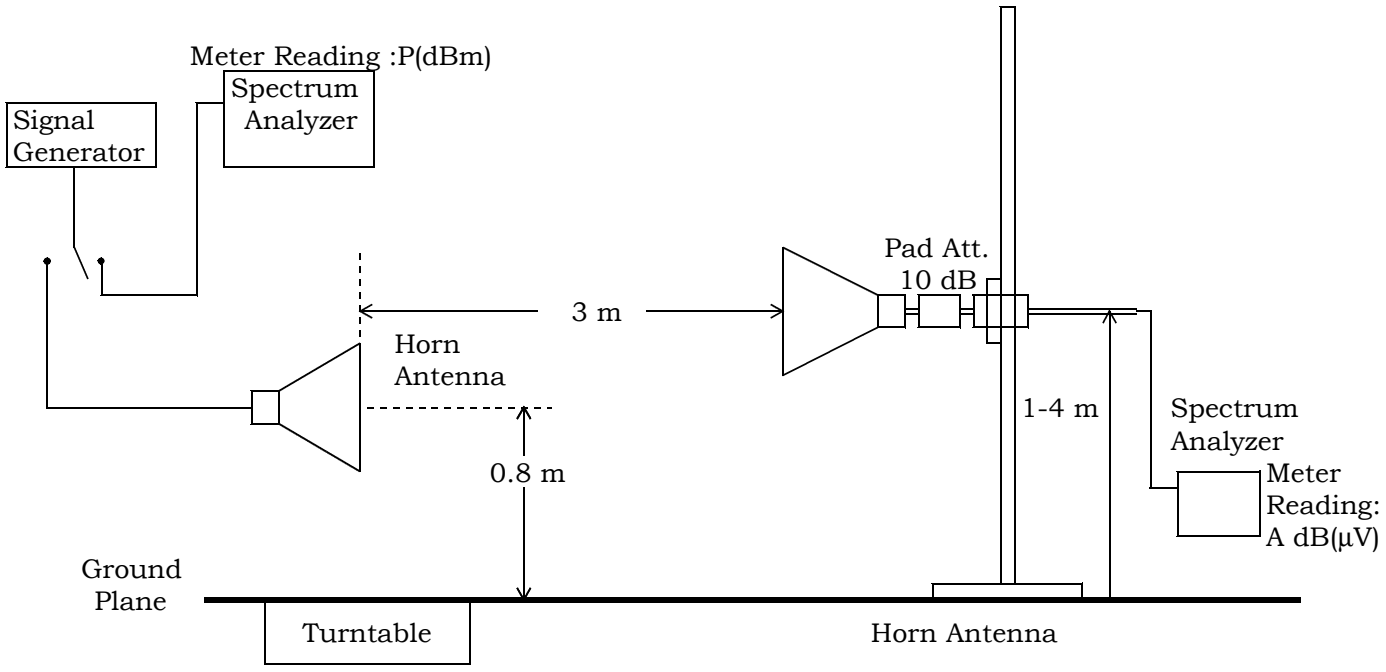
(b-2)Substitution Half-wave Dipole Antenna

(b) Measurement set up for up to 1 GHz

Fig.2 Unwanted Radiation Measurement



(c-1) TUT



(c-2) Substitution Horn Antenna

(c) Measurement set up for above 1 GHz

Fig.2 Unwanted Radiation Measurement

Test location :

KITA-KANSAI Testing Center
7-7, Ishimaru, 1-Chome, Mino-Shi, Osaka, 562-0027, Japan
● - 1st site (3 meters)
○ - 2nd site (3 meters)
KAMEOKA EMC Branch
9-1, Ozaki, Inukanno, Nishibetsuin-Cho, Kameoka-Shi, Kyoto, 621-0126, Japan
○ - 1st open site ○ - 3 m ○ - 10 m ○ - 30 m
○ - 2nd open site ○ - 3 m ○ - 10 m

Validation of Site Attenuation :

1) Last Confirmed Date : October 28, 1999
2) Interval : 1 Year

Used test instruments :

Model No.	Device ID	Last Cal. Date	Cal. Interval
○ - ESH 3	A - 1		
● - ESH 2	A - 2	May, 1999	1 Year
○ - ESH 2	A - 3		
● - HFH2-Z2	C - 2	February, 2000	1 Year
○ - HFH2-Z2	C - 3		
● - ESV/ESV-Z3	A - 7 / A - 17	December, 1999	1 Year
○ - ESV/ESV-Z3	A - 6 / A - 18		
● - KBA-511A	C - 12	November, 1999	1 Year
● - KBA-611	C - 22	November, 1999	1 Year
○ - KBA-511A	C - 13		
○ - KBA-611	C - 19		
○ - KBA-511A	C - 11		
○ - KBA-611	C - 21		
○ - Cable	H - 1		
○ - Cable	H - 2		
● - Cable	H - 5	November, 1999	1 Year
○ - Cable	H - 6		
○ - 4396B	B - 47		
● - 8566B	A - 13	November, 1999	1 Year
○ - 8593A	A - 15		
● - 8673D	B - 2	April, 1999	1 Year
● - KBA-511A	C - 12	November, 1999	1 Year
● - KBA-611	C - 22	November, 1999	1 Year
○ - Cable	H - 1		
○ - Cable	H - 2		
○ - Cable	H - 5		
○ - Cable	H - 6		
○ - DC6180	E - 51		

- continue -

Used test instruments :

Model No.	Device ID	Last Cal. Date	Cal. Interval
● - 4T-10	D - 73	May, 1999	1 Year
○ - 4T-10	D - 74		
○ - WJ-6611-513	A - 23		
● - WJ-6882-824	A - 21	May, 1999	1 Year
● - DBL-0618N515	A - 33	October, 1999	1 Year
● - 91888-2	C - 40 - 1	May, 1999	1 Year
● - 91888-2	C - 41 - 1	May, 1999	1 Year
● - 91889-2	C - 41 - 2	May, 1999	1 Year
● - 94613-1	C - 41 - 3	May, 1999	1 Year
● - 91891-2	C - 41 - 4	May, 1999	1 Year
● - 94614-1	C - 41 - 5	May, 1999	1 Year
● - 3160-04	C - 55	June, 1999	1 Year
● - 3160-05	C - 56	June, 1999	1 Year
● - 3160-06	C - 57	June, 1999	1 Year
● - 3160-07	C - 58	June, 1999	1 Year
● - 3160-08	C - 59	June, 1999	1 Year
● - 3160-09	C - 48	October, 1999	1 Year
○ - 3160-10	C - 49		
○ - TRA-603D	D - 24		
○ - 8494H/8595H	D - 76		
● - MZ5010C	D - 81	October, 1999	1 Year
● - Cable	C - 40 - 11	May, 1999	1 Year
● - Cable	C - 40 - 12	May, 1999	1 Year

Environmental conditions :

Temperature: 24 °C Humidity: 28 %

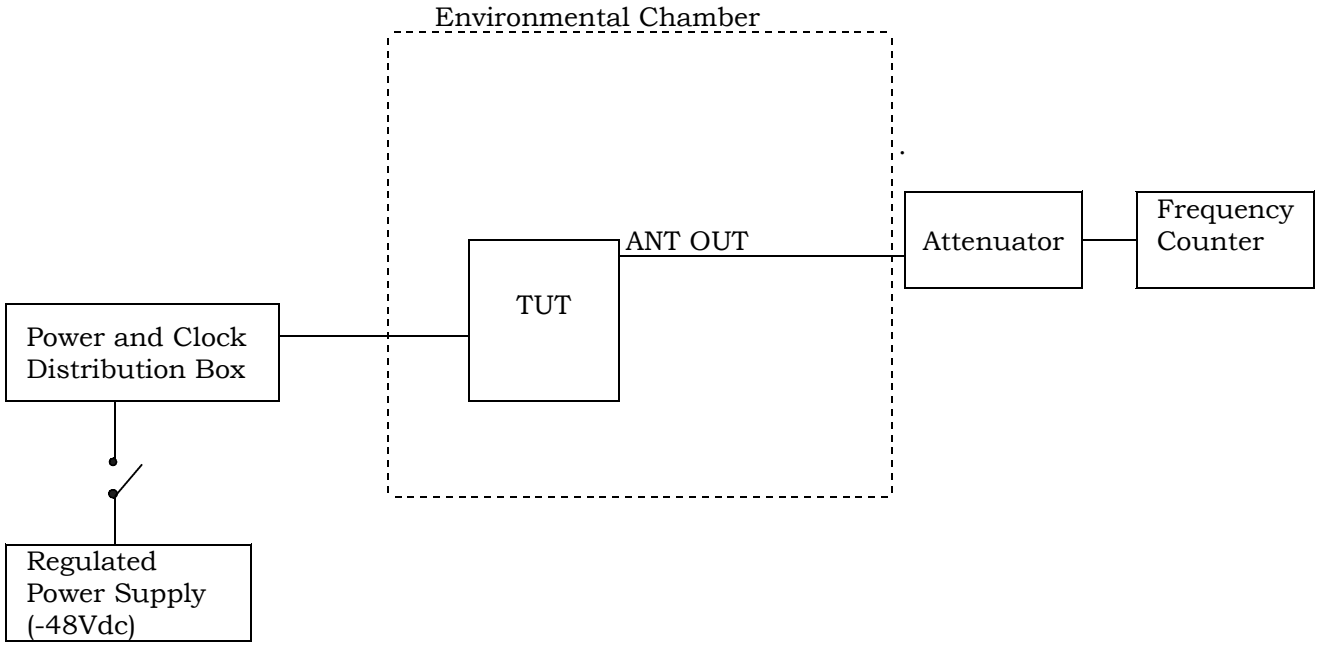
Frequency Stability Measurement(§2.1055, §24.235)

a) Frequency Stability Measurement versus Temperature

The TUT was placed in an environmental chamber and was tested in the -30, +20, +50 degrees Celsius. The TUT was stabilized at each temperature. The power(-48.0Vdc) supplied to the Power and Clock Distribution Box was applied to the transmitter and allowed to stabilize for 10 minutes. The transmitting frequency was measured at startup and 2 minutes, 5 minutes and 10 minutes after startup. This procedure was repeated in the -30, +20, +50 °C.

b) Frequency Stability Measurement versus Power Supply Voltage

The TUT was placed in an environmental chamber and was tested at the temperature of +20 degrees Celsius. The TUT was stabilized at the temperature. The power(-48.0Vdc) supplied to the Power and Clock Distribution Box which is set to 85% and at 115% to stabilize for 10 minutes. The transmitting frequency was measured at startup and 2 minutes, 5 minutes and 10 minutes after startup.



Test location:

KITA-KANSAI Testing Center
7-7, Ishimaru, 1-Chome, Mino-Shi, Osaka, 562-0027, Japan
○ - Shielded room
● - Environment Testing Room
KAMEOKA EMC Branch
9-1, Ozaki, Inukanno, Nishibetsuin-Cho, Kameoka-Shi, Kyoto, 621-0126, Japan
○ - Shielded room

Used test instruments and sites :

Model No.	Device ID	Last Cal. Date	Cal. Interval
● - PL-3G	02304009	December, 1999	1 Year
● - EL100-06-T4	14201089	December, 1999	1 Year
● - 2011-39	B - 33	April, 1999	1 Year
● - 6032A	F - 5	April, 1999	1 Year
● - 538B	13006007-B	November, 1999	1 Year

CONFIGURATION OF TUT

The Transmitter Under Test (TUT) consists of :

Description	Applicant (Manufacturer)	Model No. (Serial No.)	FCC ID
1.9GHz Wireless Base Station Unit (WBSU)	MITSUBISHI ELECTRIC CORPORATION (MITSUBISHI ELECTRIC CORPORATION)	FS-469G-E (30500001)	OXN1900MTDM BASE3

The measurement was carried out with the following equipment connected :

Description	Grantee/Distributor	Model No. (Serial No.)	FCC ID
Power and Clock Distribution Box	MITSUBISHI ELECTRIC CORPORATION	-- (--)	N/A
Personal Computer	COMPAQ COMPUTER CORPORATION	3511V5 (7535HTP40265)	CNT75MDB6V5
CRT Display	DELL Corporation	D825HT (2534691)	L5ACPD100SE
Mouse	COMPAQ COMPUTER Corporation	M-S34-6MD (ID75BC WF3AA3)	DZL210472
DC Power Supply	TAKASAGO, LTD.	GP0110-1 (13883217)	N/A

Type of Interference Cable(s) and the AC Power Cord used with the TUT :

	Description	Port	Shielded Cable	Shell Material	Ferrite Core	Cable Length
1	TUT Power and Clock Distribution Box	BRI BS#1	NO	Nonmetal Nonmetal	NO	2.0 m
2	TUT Personal Computer	TEST Serial	NO	Nonmetal Metal	NO	2.5 m
3	Personal Computer Mouse	PS-2 --	YES	Metal --	YES	1.8 m
4	Personal Computer Keyboard	PS-2 --	YES	Metal --	NO	1.9 m
5	Personal Computer CRT Display	CRT --	YES	Metal --	YES	1.8 m
6	Power and Clock Distribution Box DC Power Supply	PWR --	NO	--	NO	2.5 m
7	AC Power Cord (DC Power Supply) 1ϕ-3Pin Plug	--	NO	--	NO	1.5 m
8	AC Power Cord(Personal Computer) 1ϕ-3Pin Plug	--	NO	--	NO	2.0 m
9	AC Power Cord(CRT Display) 1ϕ-3Pin Plug	--	NO	--	NO	2.0 m

Test Configuration:

Operation - mode of the TUT:

The preliminary test was made under the modulation and the unmodulation at the maximum power level. As result, the modulation type shown as follows was respectively determined at each measurement item.

1) Occupied Bandwidth Measurement
The carrier wave is modulated by PN9 random pattern data, which causes the maximum spread on the spectrum specified in TIA/EIA IS-138-A.

2) Other Measurement items
Transmitting under unmodulation

Test system:

The TUT has 6 Antenna terminals(TX1, TX2, RX1, RX2, MX1, MX2) shown as follows:

1) Transmitting antenna terminals : TX1, TX2
2) Receiving antenna terminals : RX1, RX2
3) Monitor Receiving antenna terminals : MX1, MX2

Except the above 6 antenna terminals, the TUT has 2 ports, as one BRI port and one TEST port shown as follows:

1) BRI port : ISDN, -48Vdc and 128kHz reference clock
2) TEST port : Control Signal

Special accessories:

None

Detailed Transmitter portion :

Transmitting frequency : 1930.080 MHz(2ch) - 1989.960 MHz(1998ch)

Detailed Receiver portion :

Receiving frequency : 1850.040 MHz(2ch) - 1909.920 MHz(1998ch)

1) RX portion
1st Local frequency : 1711.890 MHz(2ch) - 1771.770 MHz(1998ch)
2nd Local frequency : 137.70 MHz
1st Intermediate frequency : 138.15 MHz
2nd Intermediate frequency : 450 kHz

2) MX portion
MX IF Local frequency : 2015.460 MHz(2ch) - 2075.340 MHz(1998ch)
Intermediate frequency : 85.38 MHz
MX Local frequency : 303.57 MHz

3) Modulator & Mixer IC
Mixer Local frequency : 1711.890 MHz(2ch) - 1771.770 MHz(1998ch)
MOD Local frequency : 218.19 MHz

Other Clock Frequency:

VCXO : 19.2 MHz (128kHz Reference clock(+/-0.1ppm) fed from the CONTROLLER
LO for RF loopback Test : 80.04 MHz
Logic Unit : 19.2 MHz, 20.48 MHz, 28.8 MHz, 31.104 MHz

TUT Modification

● - No modifications were conducted by JQA to achieve compliance to applied levels.

○ - To achieve compliance to applied levels, the following change(s) were made by JQA during the compliance test.

The modification(s) will be implemented in all production models of this equipment.

Applicant : N/A Date : N/A

Typed Name : N/A Position : N/A

Responsible Party

Responsible Party of Test Item(Product)

Responsible party :

Contact Person :

Signatory

Deviation from standard

● - No deviations from the standard described in page 3.

○ - The following deviations were employed from the standard described in page 3.

TEST RESULTS

Transmitter Power(TP)

The requirements are ● - Passed ○ - Not Passed

The transmitter power is	94.6	mW	at	1960.020	MHz
Min. limit margin	30.2	dB	at	1960.020	MHz
Max. limit exceeding		dB	at		MHz
Uncertainty of measurement results	+ 0.6	dB(2σ)		- 0.6	dB(2σ)

Remarks:

Antenna Conducted Spurious Emission

The requirements are ● - Passed ○ - Not Passed

Min. limit margin	11.1	dB	at	5790.240	MHz
Max. limit exceeding		dB	at		MHz
Uncertainty of measurement results	+ 1.3	dB(2σ)		- 1.3	dB(2σ)

Remarks:

Occupied Bandwidth

The requirements are ● - Passed ○ - Not Passed

The results(Occupied Bandwidth) Refer to page 39
The results(Band-edge Emission) Refer to pages 40 - 41

Uncertainty of measurement results at Frequency ± 0.05 ppm(2σ)
Uncertainty of measurement results at Amplitude ± 0.6 dB(2σ)

Remarks:

Unwanted Radiation (9 kHz - 20 GHz)

The requirements are ● - Passed ○ - Not Passed

Min. limit margin 2.3 dB at 9949.8 MHz

Max. limit exceeding _____ dB at _____ MHz

Uncertainty of measurement results 9 kHz - 30 MHz	+ 2.5 dB(2σ)	- 2.5 dB(2σ)
30 MHz - 1 GHz	+ 4.1 dB(2σ)	- 4.2 dB(2σ)
1 GHz - 20 GHz	+ 3.1 dB(2σ)	- 3.2 dB(2σ)

Remarks:

Frequency Stability

Frequency Stability : Less than 0.10 ppm at 1930.08 MHz

Uncertainty of measurement results ± 0.05 ppm

Remarks:

SUMMARY

GENERAL REMARKS :

The TUT was tested according to the requirements of FCC Rules and Regulations Part 24 (October 1, 1998) under the test configuration, as shown in page 31.

The conclusion for the test items of which are required by the applied regulation is indicated under the final judgement.

FINAL JUDGEMENT :

The "as received" sample;

● - fulfill the test requirements of the regulation mentioned on page 3.

○ - fulfill the test requirements of the regulation mentioned on page 3, but with certain qualifications.

○ - doesn't fulfill the test regulation mentioned on page 3.

Begin of testing : April 1, 2000

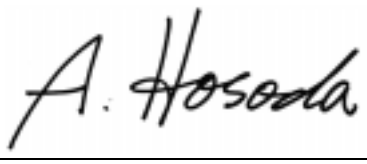
End of testing : April 6, 2000

- JAPAN QUALITY ASSURANCE ORGANIZATION -

Approved by :

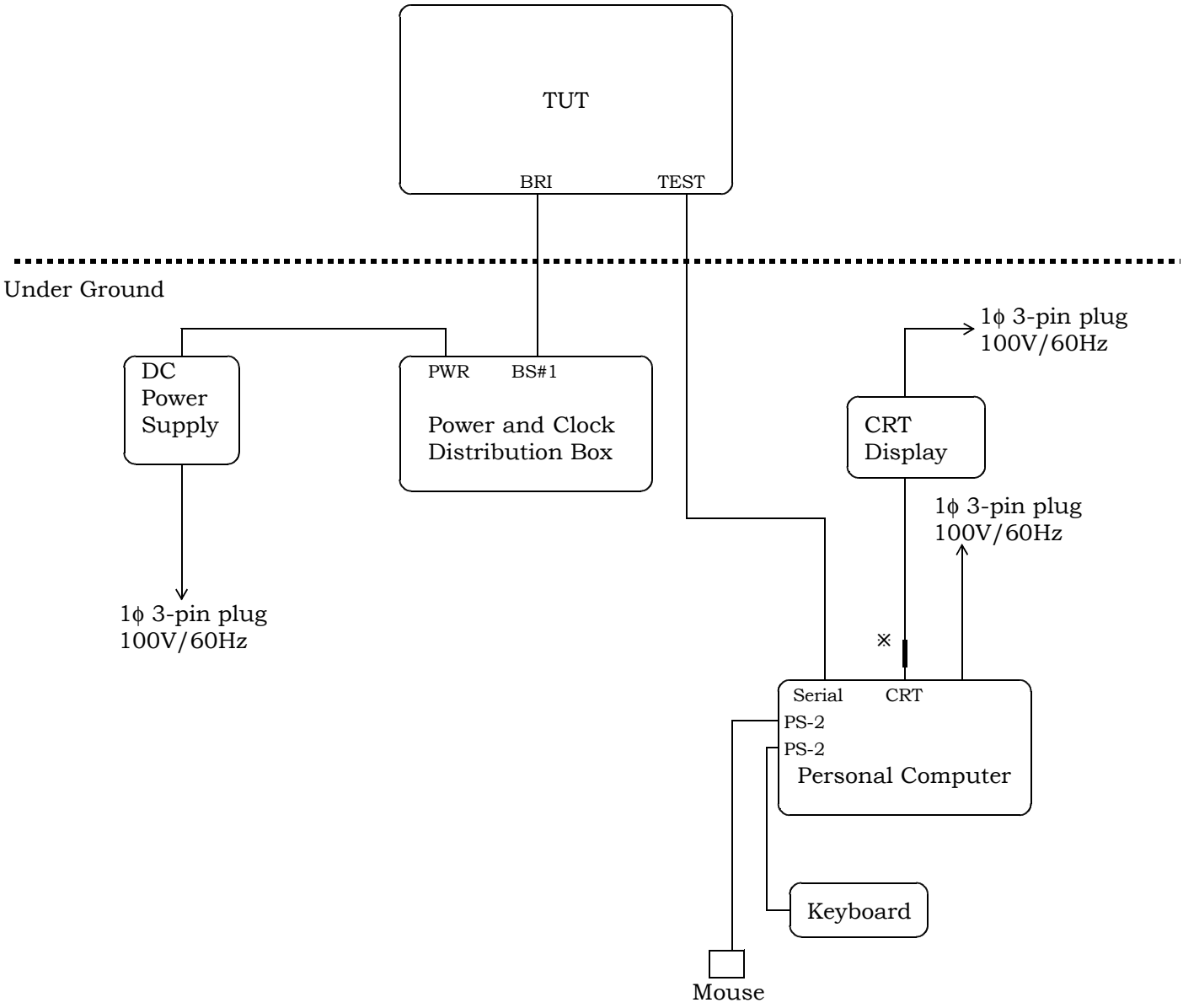
Takashi Yamanaka
Manager
EMC Div.
JQA KITA-KANSAI Testing Center

Issued by :



Akio Hosoda
Project Manager
EMC Div.
JQA KITA-KANSAI Testing Center

Test System-Arrangement (Drawings)



Note) ※ - Applied Ferrite Core

Test-Setup (Photographs) at worst case

Transmitter Power(TP) Measurement

Test Date: April 5, 2000
Temp.: 24 °C ; Humi.: 30 %

Measurement Results:

1) Transmitting Antenna : TX1

Frequency (MHz)	Meter Reading (mW)	Result (mW)	Limits (W)	Margin (dB)
1930.080	77.1	77.1	100.0	+31.1
1960.020	94.6	94.6	100.0	+30.2
1989.960	70.3	70.3	100.0	+31.5

2) Transmitting Antenna Terminal : TX2

Frequency (MHz)	Meter Reading (mW)	Result (mW)	Limits (W)	Margin (dB)
1930.080	69.3	69.3	100.0	+31.6
1960.020	90.8	90.8	100.0	+30.4
1989.960	69.6	69.6	100.0	+31.6

Sample of calculated result at 1960.020 MHz, as the Minimum Margin point:
Minimum Margin : 10Log(100/94.6E-3) = 30.2(dB)
The point shown on "___ " is the Minimum Margin Point.

Tester Signature : A. Hosoda

Type Name : Akio Hosoda

Antenna Conducted Spurious Emission Measurement

Test Date: April 5, 2000
Temp.: 24 °C ; Humi.: 30 %

Measurement Results:

1-a) Transmitting Frequency : 1930.08 MHz
Transmitting Antenna Terminal : TX1

Frequency (MHz)	Corr. Factor (dB)	Meter Reading (dBm)	Result (dBm)	Limits (dBm)	Margin (dB)	Remarks (Note2)
3860.160	1.7	-60.4	-58.7	-13.0	+45.7	A
5790.240	2.2	-26.3	-24.1	-13.0	+11.1	A
7720.320	2.3	-51.3	-49.0	-13.0	+36.0	A
9650.400	2.3	-47.1	-44.8	-13.0	+31.8	A
11580.480	2.7	-64.6	-61.9	-13.0	+48.9	A
13510.560	2.9	-75.7	-72.8	-13.0	+59.8	A
15440.640	3.0	-73.6	-70.6	-13.0	+57.6	A
17370.720	4.8	<-77.0	<-72.2	-13.0	>+59.2	A
19300.800	27.7	<-77.0	<-49.3	-13.0	>+36.3	B

1-b) Transmitting Frequency : 1930.08 MHz
Transmitting Antenna Terminal : TX2

Frequency (MHz)	Corr. Factor (dB)	Meter Reading (dBm)	Result (dBm)	Limits (dBm)	Margin (dB)	Remarks (Note2)
3860.160	1.7	-75.2	-73.5	-13.0	+60.5	A
5790.240	2.2	-34.1	-31.9	-13.0	+18.9	A
7720.320	2.3	-53.9	-51.6	-13.0	+38.6	A
9650.400	2.3	-49.6	-47.3	-13.0	+34.3	A
11580.480	2.7	-71.0	-68.3	-13.0	+55.3	A
13510.560	2.9	<-77.0	<-74.1	-13.0	>+61.1	A
15440.640	3.0	<-77.0	<-74.0	-13.0	>+61.0	A
17370.720	4.8	<-77.0	<-72.2	-13.0	>+59.2	A
19300.800	27.7	<-77.0	<-49.3	-13.0	>+36.3	B

2-a) Transmitting Frequency : 1960.02 MHz
Transmitting Antenna Terminal : TX1

Frequency (MHz)	Corr. Factor (dB)	Meter Reading (dBm)	Result (dBm)	Limits (dBm)	Margin (dB)	Remarks (Note2)
3920.040	1.7	-57.6	-55.9	-13.0	+42.9	A
5880.060	2.2	-34.1	-31.9	-13.0	+18.9	A
7840.080	2.3	-53.2	-50.9	-13.0	+37.9	A
9800.100	2.5	-54.2	-51.7	-13.0	+38.7	A
11760.120	2.7	-58.6	-56.2	-13.0	+43.2	A
13720.140	2.9	-68.0	-65.1	-13.0	+52.1	A
15680.160	3.6	-67.2	-63.6	-13.0	+50.6	A
17640.180	5.0	<-77.0	<-72.0	-13.0	>+59.0	A
19600.200	30.7	<-77.0	<-46.3	-13.0	>+33.3	B

2-b) Transmitting Frequency : 1960.02 MHz
Transmitting Antenna Terminal : TX2

Frequency (MHz)	Corr. Factor (dB)	Meter Reading (dBm)	Result (dBm)	Limits (dBm)	Margin (dB)	Remarks (Note2)
3920.040	1.7	-67.1	-65.4	-13.0	+52.4	A
5880.060	2.2	-34.2	-32.0	-13.0	+19.0	A
7840.080	2.3	-47.3	-45.0	-13.0	+32.0	A
9800.100	2.5	-52.4	-49.9	-13.0	+36.9	A
11760.120	2.7	<-77.0	<-74.3	-13.0	>+61.3	A
13720.140	2.9	<-77.0	<-74.1	-13.0	>+61.1	A
15680.160	3.6	<-77.0	<-73.4	-13.0	>+60.4	A
17640.180	5.0	<-77.0	<-72.0	-13.0	>+59.0	A
19600.200	30.7	<-77.0	<-46.3	-13.0	>+33.3	B

3-a) Transmitting Frequency : 1989.96 MHz
Transmitting Antenna Terminal : TX1

Frequency (MHz)	Corr. Factor (dB)	Meter Reading (dBm)	Result (dBm)	Limits (dBm)	Margin (dB)	Remarks (Note2)
3979.920	1.8	-59.8	-58.0	-13.0	+45.0	A
5969.880	2.2	-36.9	-34.7	-13.0	+21.7	A
7959.840	2.3	-45.0	-42.7	-13.0	+29.7	A
9949.800	2.6	-51.8	-49.2	-13.0	+36.2	A
11939.760	2.7	-77.0	-74.3	-13.0	+61.3	A
13929.720	2.9	-69.2	-66.3	-13.0	+53.3	A
15919.680	4.1	-72.6	-68.5	-13.0	+55.5	A
17909.640	8.7	<-77.0	<-68.3	-13.0	>+55.3	A
19899.600	28.9	<-77.0	<-48.1	-13.0	>+35.1	B

3-b) Transmitting Frequency : 1989.96 MHz
Transmitting Antenna Terminal : TX2

Frequency (MHz)	Corr. Factor (dB)	Meter Reading (dBm)	Result (dBm)	Limits (dBm)	Margin (dB)	Remarks (Note2)
3979.920	1.8	-66.3	-64.5	-13.0	+51.5	A
5969.880	2.2	-36.4	-34.2	-13.0	+21.2	A
7959.840	2.3	-46.0	-43.7	-13.0	+30.7	A
9949.800	2.6	-56.4	-53.8	-13.0	+40.8	A
11939.760	2.7	<-77.0	<-74.3	-13.0	>+61.3	A
13929.720	2.9	<-77.0	<-74.1	-13.0	>+61.1	A
15919.680	4.1	-72.1	-68.0	-13.0	+55.0	A
17909.640	8.7	<-77.0	<-68.3	-13.0	>+55.3	A
19899.600	28.9	<-77.0	<-48.1	-13.0	>+35.1	B

Sample of calculated result at 5790.240 MHz, as the Minimum Margin point:

	Correction Factor	=	2.2 dB
+)	Meter Reading	=	-26.3 dBm
	Result	=	-24.1 dBm

Minimum Margin : -13.0 - (-24.1) = 11.1(dB)
The point shown on "___ " is the Minimum Margin Point.

Applied limits = 10log[TP(mW)] - [43 + 10log[tp(W)]] = 10log[TP(mW)] - [43 + (10log[TP(mW)] - 30)]
= -13 [dBm]
Where tp(W) = TP(mW) / 1000 : Transmitter Power at antenna terminal
10log(tp) = 10log(TP) - 30

Note : 1. The spectrum was checked from 9 kHz up to the tenth harmonic frequency.
2. All emissions not listed were found to be more than 20dB below the limit.

Remarks:

Note 3	Detector Function	RES. B.W	V.B.W	Sweep T	Span	Corr. Factor *
A	Peak (SP)	1 MHz	1 MHz	20 msec	0 Hz	CL+HPF
B	Peak (SP)	1 MHz	1 MHz	20 msec	0 Hz	CL+HPF+Mix.
C	Peak (ESV)	120 kHz	--	--	--	CL+P20

*) ANT: Antenna Factor/CL: Cable Loss/ P20: 20dB Att. / P10: 10dB Att. / Amp.: Amplifier Gain/
Mix.: Mixer Conversion Loss/HPF: High Pass Filter

Tester Signature : A. Hosoda

Type Name : Akio Hosoda

Occupied Bandwidth Measurement

Test Date: April 5, 2000
Temp.: 24 °C ; Humi.: 30 %

1) Occupied Bandwidth measurement

Measurement Results:

Attached Graph : Refer to page 39.

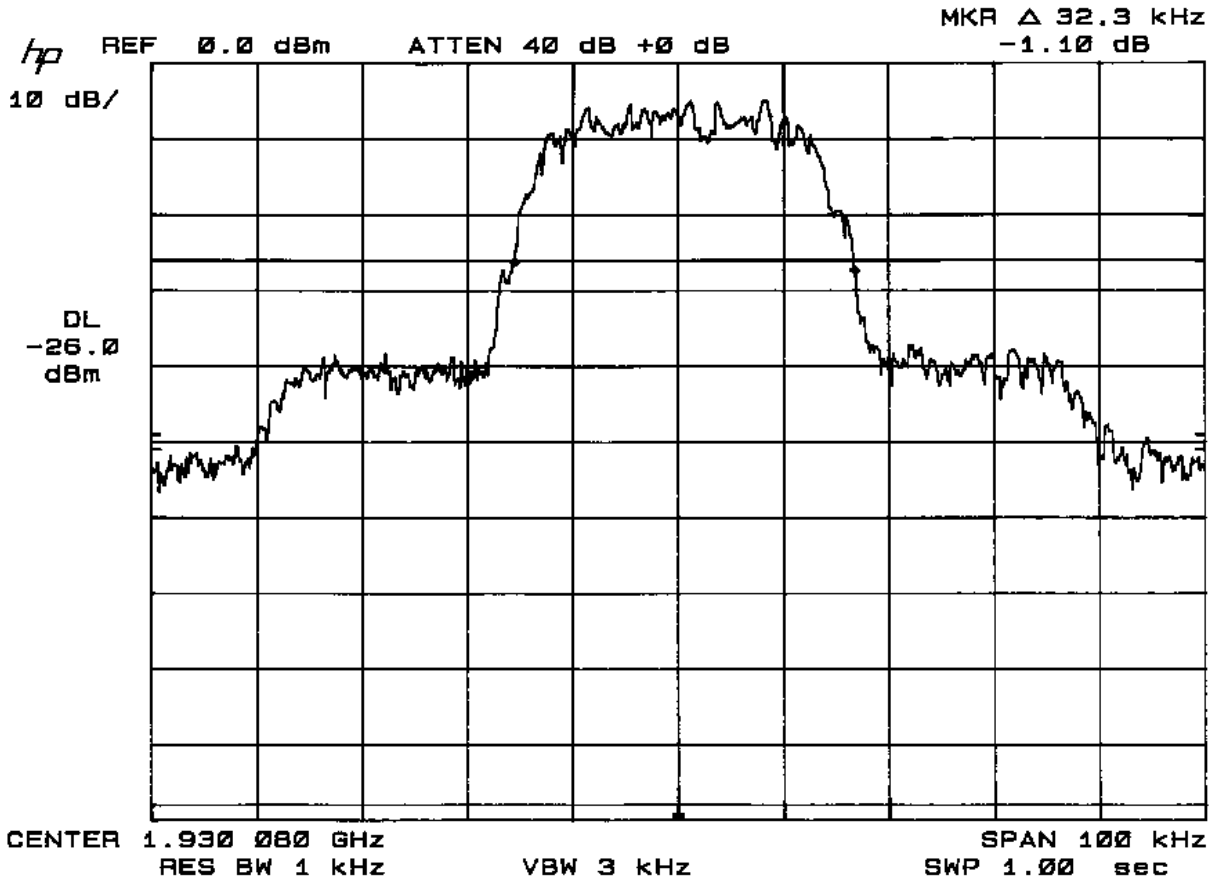
2) Band-edge Emission measurement

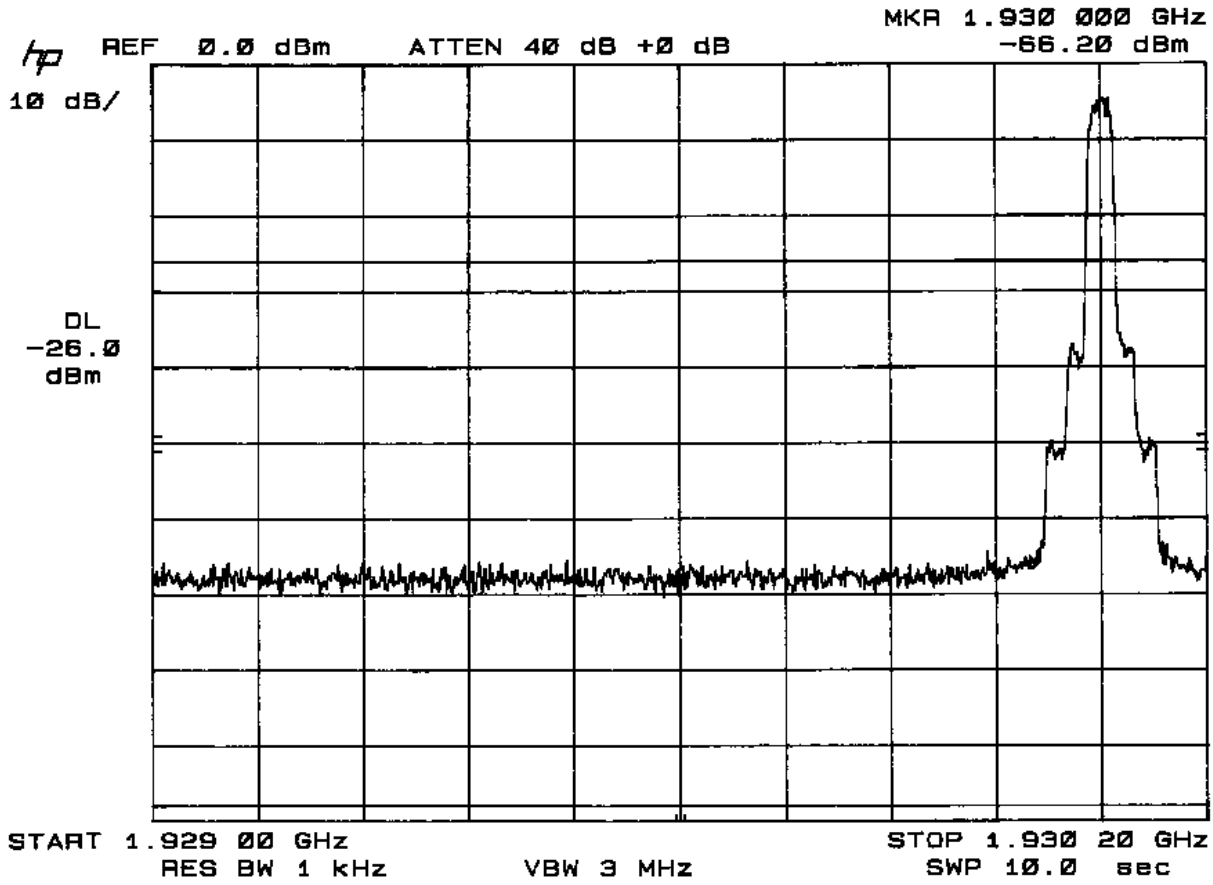
Measurement Results:

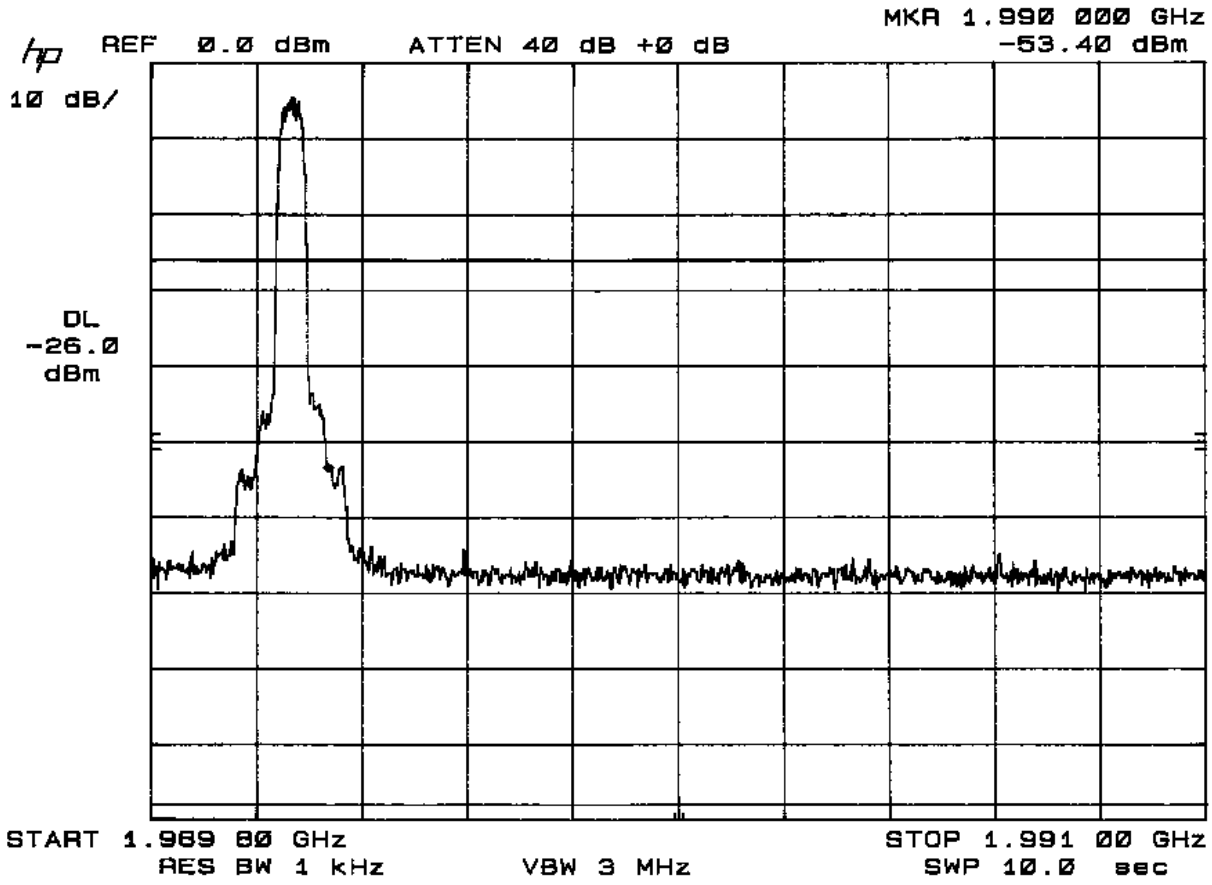
Attached Graph : Refer to pages 40 - 41.
Note : Specified limits(§24.238)

Tester Signature : A. Hosoda

Type Name : Akio Hosoda


MKR Δ 32.3 kHz
REF 0.0 dBm
ATTEN 40 dB +0 dB
−1.10 dB
10 dB/
DL
−26.0
dBm
CENTER 1.930 080 GHz
SPAN 100 kHz
RES BW 1 kHz
VBW 3 kHz
SWP 1.00 sec


MKR 1.930 000 GHz
−66.20 dBm
REF 0.0 dBm
ATTEN 40 dB +0 dB
10 dB/
DL
−26.0
dBm
START 1.929 00 GHz
RES BW 1 kHz
VBW 3 MHz
STOP 1.930 20 GHz
SWP 10.0 sec


MKR 1.990 000 GHz
REF 0.0 dBm
ATTEN 40 dB +0 dB
-53.40 dBm
10 dB/
DL
-26.0
dBm
START 1.989 80 GHz
RES BW 1 kHz
VBW 3 MHz
STOP 1.991 00 GHz
SWP 10.0 sec

Unwanted Radiation Measurement

Test Date: April 1, 2000
Temp.: 24 °C ; Humi.: 28 %

Measurement Results:

1-a) Transmitting Frequency : 1930.08 MHz
Transmitting Antenna : TX1

Frequency (MHz)	ERP [dBm]		Limits [dBm]	Margin (dB)	Remarks (Note 3)
	Hori.	Vert.			
3860.16	-41.6	-47.6	-13.0	+28.6	C
5790.24	-35.8	-43.8	-13.0	+22.8	C
7720.32	-34.4	-41.4	-13.0	+21.4	B
9650.40	-20.5	-27.5	-13.0	+7.5	B
11580.48	-39.8	<-45.8	-13.0	+26.8	B
13510.56	<-41.7	<-41.7	-13.0	>+28.7	B
15440.64	<-41.9	<-41.9	-13.0	>+28.9	B
17370.72	<-41.9	<-41.9	-13.0	>+28.9	B
19300.80	<-31.7	<-31.7	-13.0	>+18.7	D

1-b) Transmitting Frequency : 1930.08 MHz
Transmitting Antenna : TX2

Frequency (MHz)	ERP [dBm]		Limits [dBm]	Margin (dB)	Remarks (Note 3)
	Hori.	Vert.			
3860.16	-62.8	-60.8	-13.0	+47.8	A
5790.24	-27.2	-21.2	-13.0	+8.2	A
7720.32	-42.4	-48.4	-13.0	+29.4	B
9650.40	-27.5	-27.5	-13.0	+14.5	B
11580.48	<-45.8	<-45.8	-13.0	>+32.8	B
13510.56	<-41.7	<-41.7	-13.0	>+28.7	B
15440.64	<-41.9	<-41.9	-13.0	>+28.9	B
17370.72	<-41.9	<-41.9	-13.0	>+28.9	B
19300.80	<-31.7	<-31.7	-13.0	>+18.7	D

2-a) Transmitting Frequency : 1960.02 MHz
Transmitting Antenna : TX1

Frequency (MHz)	ERP [dBm]		Limits [dBm]	Margin (dB)	Remarks (Note 3)
	Hori.	Vert.			
3920.04	-41.8	-39.8	-13.0	+26.8	A
5880.06	-50.2	-49.2	-13.0	+36.2	B
7840.08	-26.4	-33.4	-13.0	+13.4	B
9800.10	-24.4	-24.4	-13.0	+11.4	B
11760.12	-43.7	-42.7	-13.0	+29.7	B
13720.14	<-41.7	<-41.7	-13.0	>+28.7	B
15680.16	<-41.9	<-41.9	-13.0	>+28.9	B
17640.18	<-41.7	<-41.7	-13.0	>+28.7	B
19600.20	<-31.2	<-31.2	-13.0	>+18.2	D

2-b) Transmitting Frequency : 1960.02 MHz
Transmitting Antenna : TX2

Frequency (MHz)	ERP [dBm]		Limits [dBm]	Margin (dB)	Remarks (Note 3)
	Hori.	Vert.			
3920.04	-60.8	-60.8	-13.0	+47.8	A
5880.06	-49.2	-42.2	-13.0	+29.2	B
7840.08	-30.4	-35.4	-13.0	+17.4	B
9800.10	-34.4	-32.4	-13.0	+19.4	B
11760.12	-45.7	-45.7	-13.0	+32.7	B
13720.14	<-41.7	<-41.7	-13.0	>+28.7	B
15680.16	<-41.9	<-41.9	-13.0	>+28.9	B
17640.18	<-41.7	<-41.7	-13.0	>+28.7	B
19600.20	<-31.2	<-31.2	-13.0	>+18.2	D

3-a) Transmitting Frequency : 1989.96 MHz
Transmitting Antenna : TX1

Frequency (MHz)	ERP [dBm]		Limits [dBm]	Margin (dB)	Remarks (Note 3)
	Hori.	Vert.			
3979.92	-42.4	-38.4	-13.0	+25.4	A
5969.88	-42.0	-44.0	-13.0	+29.0	B
7959.84	-41.4	-42.4	-13.0	+28.4	B
9949.80	-15.3	-23.3	-13.0	+2.3	B
11939.76	-39.7	-44.7	-13.0	+26.7	B
13929.72	<-41.7	<-41.7	-13.0	>+28.7	B
15916.68	<-42.0	<-42.0	-13.0	>+29.0	B
17909.64	<-41.5	<-41.5	-13.0	>+28.5	B
19899.60	<-31.2	<-31.2	-13.0	>+18.2	D

3-b) Transmitting Frequency : 1989.96 MHz
Transmitting Antenna : TX2

Frequency (MHz)	ERP [dBm]		Limits [dBm]	Margin (dB)	Remarks (Note 3)
	Hori.	Vert.			
3979.92	-52.4	-50.4	-13.0	+37.4	A
5969.88	-52.0	-50.0	-13.0	+37.0	B
7959.84	-31.4	-38.4	-13.0	+18.4	B
9949.80	-26.3	-27.3	-13.0	+13.3	B
11939.76	-39.7	-35.7	-13.0	+22.7	B
13929.72	<-41.7	<-41.7	-13.0	>+28.7	B
15916.68	<-42.0	<-42.0	-13.0	>+29.0	B
17909.64	<-41.5	<-41.5	-13.0	>+28.5	B
19899.60	<-31.2	<-31.2	-13.0	>+18.2	D

Sample of calculated result at 9949.80 MHz, as the Minimum Margin point:
Minimum Margin : -15.3 - (-13.0) = 2.3(dB)
The point shown on "___ " is the Minimum Margin Point.

Applied limits = 10log[TP(mW)] - [43 + 10log[tp(W)]] = 10log[TP(mW)] - [43 + (10log[TP(mW)] - 30)]
= -13 [dBm]
Where tp(W) = TP(mW) / 1000 : Transmitter Power at antenna terminal
10log(tp) = 10log(TP) - 30

Note : 1. The spectrum was checked from 9 kHz up to the tenth harmonic frequency.
2. All emissions not listed were found to be more than 20dB below the limit.

Remarks:

Note 3	Detector Function	RES. B.W	V.B.W	Sweep T	Span	Corr. Factor *
A	Peak (SP)	1 MHz	1 MHz	20 msec	0 Hz	ANT+CL
B	Peak (SP)	1 MHz	1 MHz	20 msec	0 Hz	ANT+CL+P10-Amp.
C	Peak (SP)	1 MHz	1 MHz	20 msec	0 Hz	ANT+CL+P20-Amp.
D	Peak (SP)	1 MHz	1 MHz	20 msec	0 Hz	ANT+CL+P10-Amp.+Mix.
E	Peak (ESV)	120 kHz	--	--	--	ANT+CL

*) ANT: Antenna Factor/CL: Cable Loss/ P20: 20dB Att. / P10: 10dB Att. / Amp.: Amplifier Gain/
Mix.: Mixer Conversion Loss

Tester Signature : A. Hosoda

Type Name : Akio Hosoda

Frequency Stability Measurement

Measurement Results:

a) Frequency Stability Measurement versus Temperature

a-1-a) Transmitting(Reference) Frequency : 1930.080 MHz
Antenna terminal : TX1
Supply voltage to the Power and Clock Distribution Box for the TUT : -48.0 Vdc

Test Date: April 2, 2000

Ambient Temperature (°C)	Deviation (ppm) Startup	2 minutes	5 minutes	10 minutes
-30	<0.10	<0.10	<0.10	<0.10
+20	<0.10	<0.10	<0.10	<0.10
+50	<0.10	<0.10	<0.10	<0.10

a-1-b) Transmitting(Reference) Frequency : 1989.960MHz
Antenna terminal : TX1
Supply voltage to the Power and Clock Distribution Box for the TUT : -48.0 Vdc

Test Date: April 2, 2000

Ambient Temperature (°C)	Deviation (ppm) Startup	2 minutes	5 minutes	10 minutes
-30	<0.10	<0.10	<0.10	<0.10
+20	<0.10	<0.10	<0.10	<0.10
+50	<0.10	<0.10	<0.10	<0.10

a-2-a) Transmitting(Reference) Frequency : 1930.080 MHz
Antenna terminal : TX2
Supply voltage to the Power and Clock Distribution Box for the TUT : -48.0 Vdc

Test Date: April 2, 2000

Ambient Temperature (°C)	Deviation (ppm) Startup	2 minutes	5 minutes	10 minutes
-30	<0.10	<0.10	<0.10	<0.10
+20	<0.10	<0.10	<0.10	<0.10
+50	<0.10	<0.10	<0.10	<0.10

a-2-b) Transmitting(Reference) Frequency : 1989.960 MHz
Antenna terminal : TX2
Supply voltage to the Power and Clock Distribution Box for the TUT : -48.0 Vdc

Test Date: April 2, 2000

Ambient Temperature (°C)	Deviation (ppm) Startup	2 minutes	5 minutes	10 minutes
-30	<0.10	<0.10	<0.10	<0.10
+20	<0.10	<0.10	<0.10	<0.10
+50	<0.10	<0.10	<0.10	<0.10

Note : The measurement were made after all of components of the oscillator sufficiently stabilized at each temperature.

Tester Signature : A. Hosoda

Type Name : Akio Hosoda

Frequency Stability Measurement

Measurement Results:

b) Frequency Stability Measurement versus Power Supply Voltage

b-1-a) Transmitting(Reference) Frequency : 1930.080 MHz
Antenna terminal : TX1
Ambient Temperature : +20°C

Test Date: April 3, 2000

Supply Voltage to the Power and Clock Distribution Box (Vdc)	Deviation (ppm) Startup	2 minutes	5 minutes	10 minutes
-40.8(85%)	<0.10	<0.10	<0.10	<0.10
-48.0(100%)	<0.10	<0.10	<0.10	<0.10
-55.2(115%)	<0.10	<0.10	<0.10	<0.10

b-1-b) Transmitting(Reference) Frequency : 1989.960 MHz
Antenna terminal : TX1
Ambient Temperature : +20°C

Test Date: April 3, 2000

Supply Voltage to the Power and Clock Distribution Box (Vdc)	Deviation (ppm) Startup	2 minutes	5 minutes	10 minutes
-40.8(85%)	<0.10	<0.10	<0.10	<0.10
-48.0(100%)	<0.10	<0.10	<0.10	<0.10
-55.2(115%)	<0.10	<0.10	<0.10	<0.10

b-2-a) Transmitting(Reference) Frequency : 1930.080 MHz
Antenna terminal : TX2
Ambient Temperature : +20°C

Test Date: April 3, 2000

Supply Voltage to the Power and Clock Distribution Box (Vdc)	Deviation (ppm) Startup	2 minutes	5 minutes	10 minutes
-40.8(85%)	<0.10	<0.10	<0.10	<0.10
-48.0(100%)	<0.10	<0.10	<0.10	<0.10
-55.2(115%)	<0.10	<0.10	<0.10	<0.10

b-2-b) Transmitting(Reference) Frequency : 1989.960 MHz
Antenna terminal : TX2
Ambient Temperature : +20°C

Test Date: April 3, 2000

Supply Voltage to the Power and Clock Distribution Box (Vdc)	Deviation (ppm) Startup	2 minutes	5 minutes	10 minutes
-40.8(85%)	<0.10	<0.10	<0.10	<0.10
-48.0(100%)	<0.10	<0.10	<0.10	<0.10
-55.2(115%)	<0.10	<0.10	<0.10	<0.10

Note : The measurement were made after all of components of the oscillator sufficiently stabilized at each temperature.

Sample Calculation at 1930.080018 MHz for TX1, 20°C Startup -48.0Vdc) :
$((1930.080017 - 1930.080000)/1930.080000)\times 10^{6} = +8.8 \times 10^{-3}$(ppm)

Tester Signature : A. Hosoda

Type Name : Akio Hosoda

Maximum Permissible Exposure(MPE) :

The limit for Maximum Permissible Exposure(MPE) at frequency of 1.96 GHz is 1.00 mW/cm^2. (1.00 mW/cm^2 for General Population/Uncontrolled environment in §1.1310.)

The conversion from power to power density uses the following equation :

$$PD = PrG/4\pi r^2 = EIRP/4\pi r^2$$

Where : PD is Power Density(in W/m^2);
Pr is radiated power (in W) = 0.095 (W);
G is the numeric gain of the antenna(assume G = 0.0 (dBd) = 2.15 (dBi) = 1.64 ; and
EIRP is Equivalent Isotropically Radiated Power(=PrG) = 0.16 (W); and
r is the distance(in m) from the antenna

The conversion from W/m^2 to mW/cm^2 is: $mW/cm^2 = W/m^2/10$

Calculations:
At a distance of r = 1 m from the antenna, the power density is (note that this power density will only be induced on an individual if that individual was physically 1 m in line-of-site of the antenna):

Power density calculations for MPE

Items	Transmitter Antenna
Total Channels	2
Maximum EIRP(W)	0.32
Power Density(W/m^2)	0.025
Power Density(mW/cm^2)	0.0025
Minimum distance in m for MPE	0.16

At this power level, an individual would need to be within 0.16 m of the device in order to be at the limit for General Population/Uncontrolled exposure.

This TUT, at 1m away from the transmitter antenna, is well within the limits for maximum permissible exposure.