

## ***EMC* EMISSION - TEST REPORT**

JQA APPLICATION No. : KL8090756

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

Model/Type No. : FS-469G

FCC ID : OXN1900MTDMABASE2

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 : February 25, 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**

	<b>Page</b>
<b>A) Documentation</b>	
Directory	<u>2</u>
Test Regulation / General Information	<u>3 - 9</u>
Test Conditions	<u>10 - 23</u>
Configuration of TUT / Operation mode of the TUT	<u>24 - 27</u>
TUT Modification / Responsible Party	<u>28</u>
Test results / Measurement Uncertainty	<u>29 - 30</u>
Summary	<u>31</u>
<b>Test System-Arrangement (Drawings)</b>	<u>32</u>
<b>Test-setup (Photographs) at worst case</b>	<u>33</u>
<b>B) Test data</b>	
Transmitter Power(TP)	<u>34</u>
Antenna Spurious Conducted Emission	<u>35 - 38</u>
Maximum Transmitter Power(EIRP)	<u>39</u>
Occupied Bandwidth	<u>40 - 43</u>
Unwanted Radiation	<u>44 - 47</u>
Frequency Stability	<u>48 - 51</u>
Maximum Permissible Exposure(MPE)	<u>52</u>

## **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 and 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   |
| 3) Product Type           | : Prototype(Serial No. : 30000001)                      |
| 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) Integrated Antenna     | : Patch Antenna ( $\lambda/2$ , $\lambda$ : Wavelength) |
| 9) Emission Designations  | : 33K5D7W   |
| 10) Nominal ERP           | : 0.1 W   |
| 11) 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" x 12" x 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.

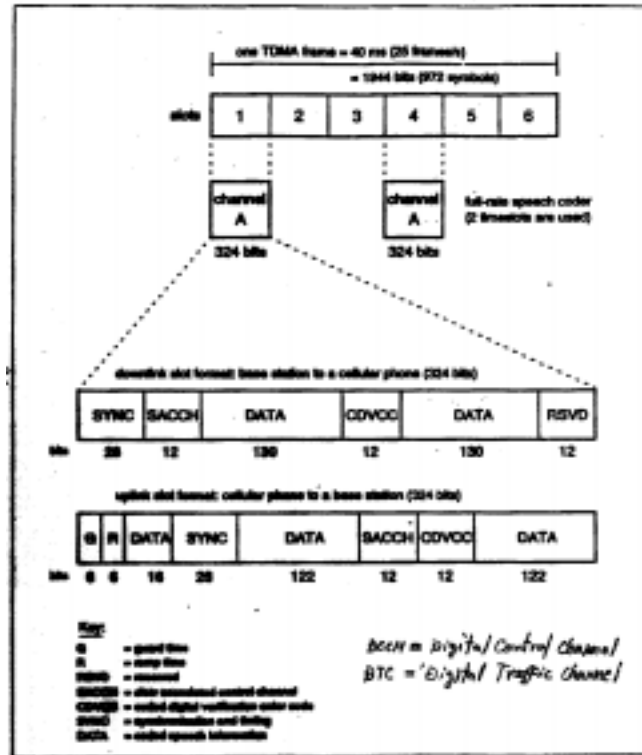
The TDMA system is the medium for linking calls between PBX and non-public system users and mobile users. The system also enables a mobile user to communicate with other mobiles.

The WBSU is wall mounted on exposed interior walls. The basic office environment is air conditioned, normally 25°C(77°F). The humidity is usually low. The WBSU is designed to operate at least in 0 (32°F) to 40°C(104°F). In an office environment, the equipment is in view but placed in locations that are out of the general traffic areas.

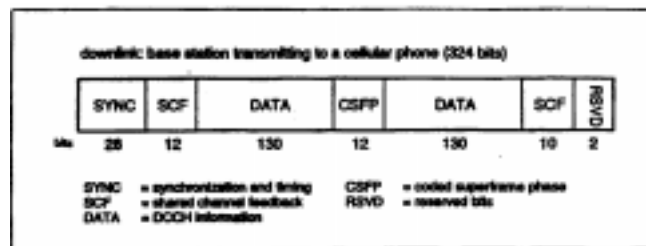
**Transmitter Technical Characteristics(§2.1033) :**

A. TX RF Power Output	: 100 mW (TX1, TX2)
B. Number of Simultaneous Traffic Channels	: 5(Refer to page 7)
C. Tunable Channels(not user tunable)	: 1997(Refer to page 15)
D. Transmitting Frequency Range	: 1930.08 to 1989.96 MHz
E. Emission Designations	: 33K5D7W
F. Power Supply	: -24 to -48Vdc
G. Frequency Stability	: $\pm 0.1\text{ppm}$ (0 ~ 40 )
H. TX Antenna Gain	: 1.0dBd (TX, TX2)
I. RX/MX Antenna Gain	: 2.0dBd (RX1/MX1, RX2/MX2)

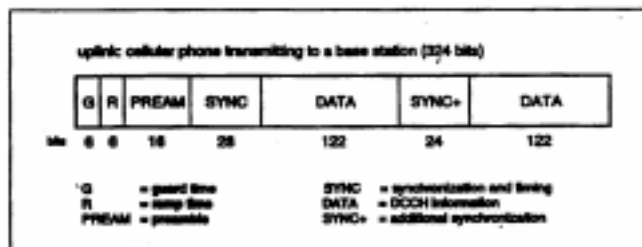
## TMDA Information :



(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 9. 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 Nyquist 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.

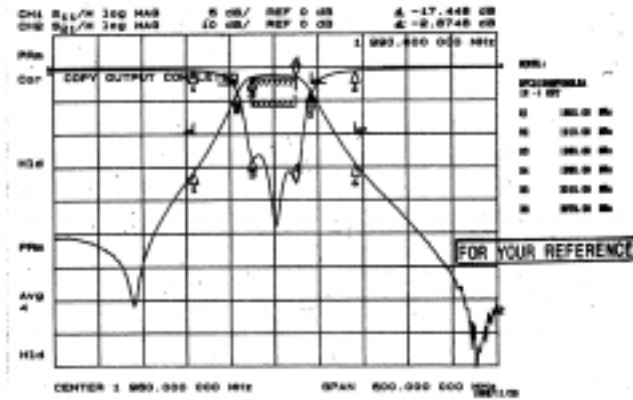
### **(6) Transmitting for TX1 and TX2**

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.

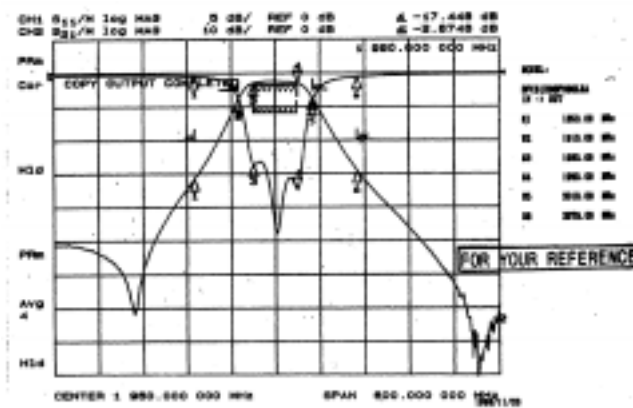
One transceiver is set several channels apart from the other transceiver. The respective channels (TX1 and TX2) are controlled to be not induced the interference by the same channel, adjacent channels or next adjacent channels.



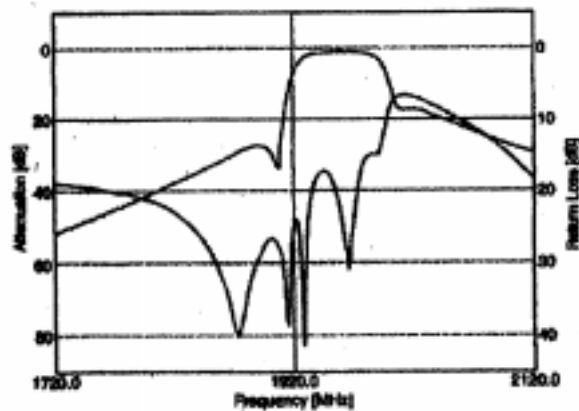
## Band Pass Filter Characteristics :



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



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



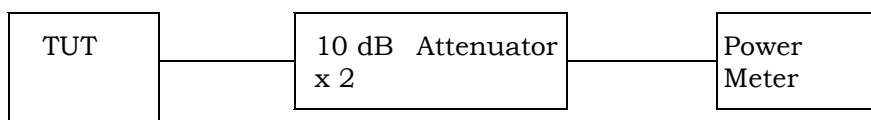
(1) Typical Frequency Response of Bass Filter #3 (Z2003:Duplexer)

## TEST CONDITIONS

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

#### Test Procedure :

The Transmitter Power was measured with a power meter, two 10 dB attenuators 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 :

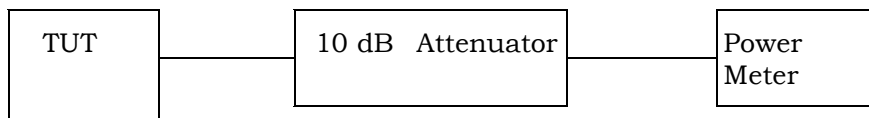
Model No.	Device ID	Last Cal. Date	Cal. Interval
● - 432B/8478B	B - 24/B-43	March, 1999	1 Year
○ - 6-20	D - 27		
● - 4T-10	D - 73	May, 1999	1 Year
● - 4T-10	D - 74	May, 1999	1 Year
○ - 8566B	A - 13		
○ - 8593A	A - 15		

#### Environmental conditions :

Temperature: 26 °C      Humidity: 30 %

**Antenna Conducted Spurious Emissionl Measurement (§2.1051)****Test Procedure :**

The Antenna Conducted Emission was measured with a spectrum analyzer, one 10 dB attenuators 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	May, 1999	1 year
○ - 4T-10	D - 74		
● - MZ5010C	D - 81	October, 1999	1 Year
● - 8566B	A - 13	November, 1999	1 Year
○ - 8593A	A - 15		
● - 8673D	B - 2	April, 1999	1 Year

**Environmental conditions :**

Temperature: 24 °C      Humidity: 30 %

### **Transmitter Power(EIRP) Measurement (§24.232)**

The measurement were performed shown as folllows.

Step 1) The test was set-up shown as Fig.1(a). In order to obtain the maximum emission, the TUT is placed at the height 0.8m on the wooden table, at the distance 3m from the receiving antenna(Horn Antenna) and rotated around 360 degrees. The receiving antenna height was varied from 1m to 4 m . The TUT on the table was placed to be maximum emission against the receiving antenna polalized (Vertical and Horizontal). Then the meter reading of the test receiver at the maximum emission was A dB( $\mu$ V).

Step 2) The test was set-up shown as Fig.1(b). The TUT was replaced to Horn antenna at the same polarized under the same condition as step 1. The RF power was fed to the transmitting Antenna(horn Antenna) through the RF amplifier from the signal generator. In order to obtain the maximum emission level, the height is varied from 1m to 4 m. The level of the signal generator was adjusted so that the meter reading of the test receiver at the maximum emission was A dB( $\mu$ V) ,same as the recorded level in Step1. Then the RF power into the substitution horn antenna was P(dBm).

The ERP is calculated in the followinng equation.

$$\text{EIRP(dBm)} = P(\text{dBm}) + G_h(\text{dBi})$$

Where,  $G_h(\text{dBi})$  : Gain of the substitution horn antenna

**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

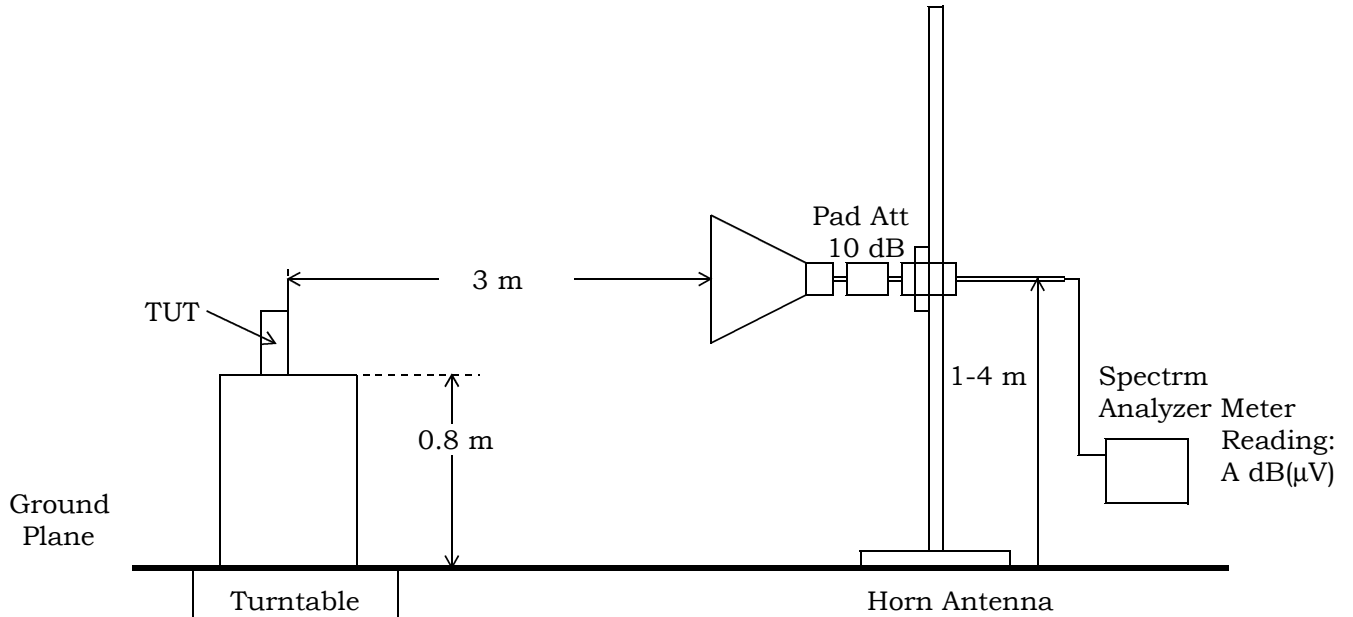
2) Interval : 1 Year

**Used test instruments :**

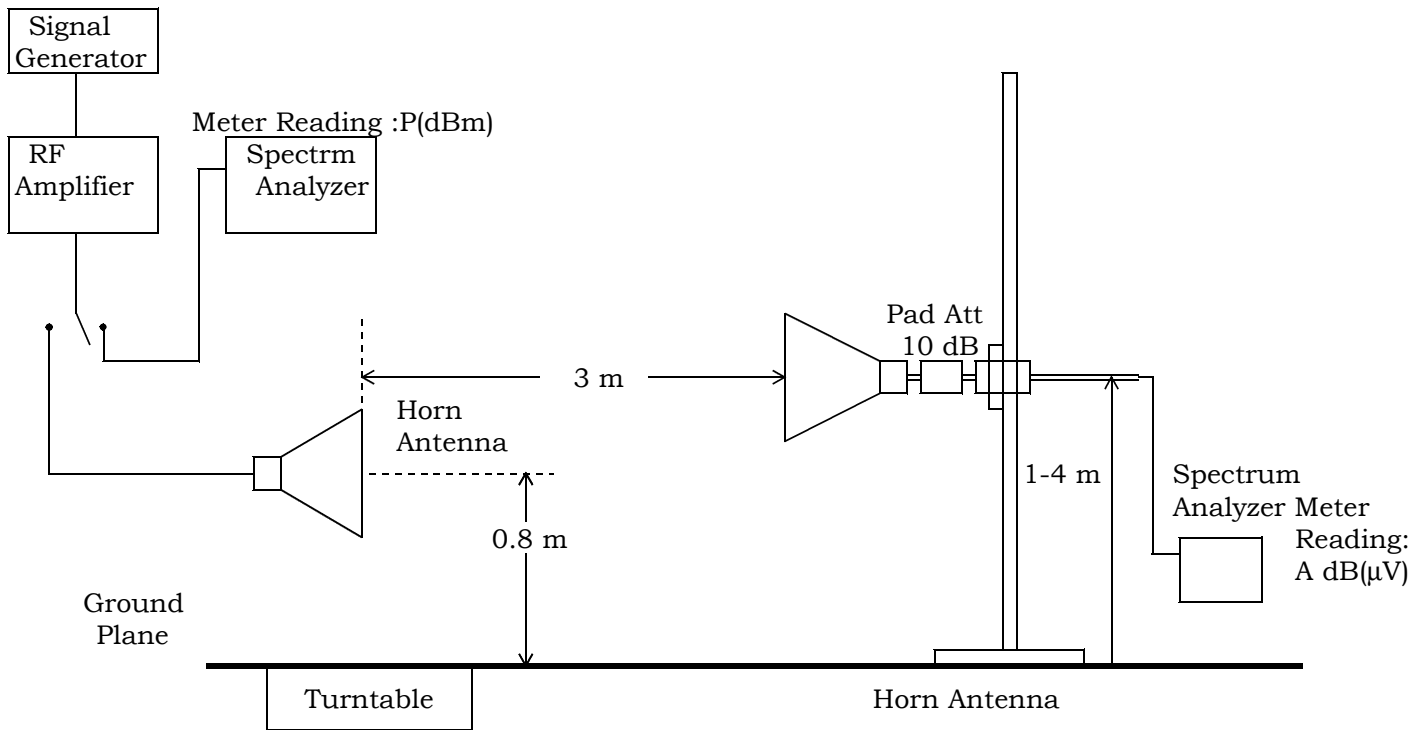
Model No.	Device ID	Last Cal. Date	Cal. Interval
● - 8566B	A - 13	November, 1999	1 year
○ - 8593A	A - 15		
○ - ESV	A - 4		
● - 4T-10	D - 73	May, 1999	1 year
○ - 4T-10	D - 74		
○ - WJ-6611-513	A - 23		
○ - WJ-6882-824	A - 21		
○ - DBL-0618N515	A - 33		
● - 91888-2	C - 41 - 1	May, 1999	1 year
● - 91888-2	C - 42 - 1	May, 1999	1 year
○ - 91889-2	C - 41 - 2		
○ - 94613-1	C - 41 - 3		
○ - 91891-2	C - 41 - 4		
○ - 94614-1	C - 41 - 5		
○ - 3160-09	C - 48		
○ - 355C	D - 22		
○ - 355D	D - 23		
○ - 8494H/8595H	D - 76		
○ - MZ5010C	D - 81		
● - 8673D	B - 2	April, 1999	1 Year
● - Cable	C - 40 - 11	May, 1999	1 year
● - Cable	C - 40 - 12	May, 1999	1 year

**Environmental conditions :**

Temperature: 18 °C      Humidity: 30 %



(a) TUT



(b) Substitution Horn Antenna

Fig.1 Maximum Transmitter Power (EIRP) Measurement

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

### Test Procedure :

The measurement was made at the modulation of the above modulation system. The bandwidth for the TUT is 33.5 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 measured 26 dB below Reference level.

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

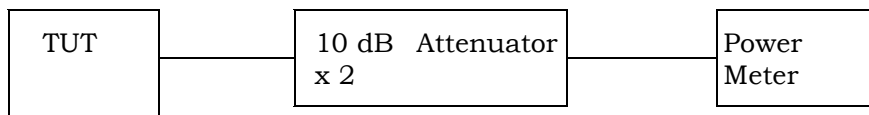
The measurement was made at the modulation of the modulation system shown in page 26.

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			1 Year
○ - VP-7212A	B-41		

**Environmental conditions :**Temperature: 18 °C      Humidity: 30 %



### **Unwanted Radiation Measurement (§2.1053,§24.238)**

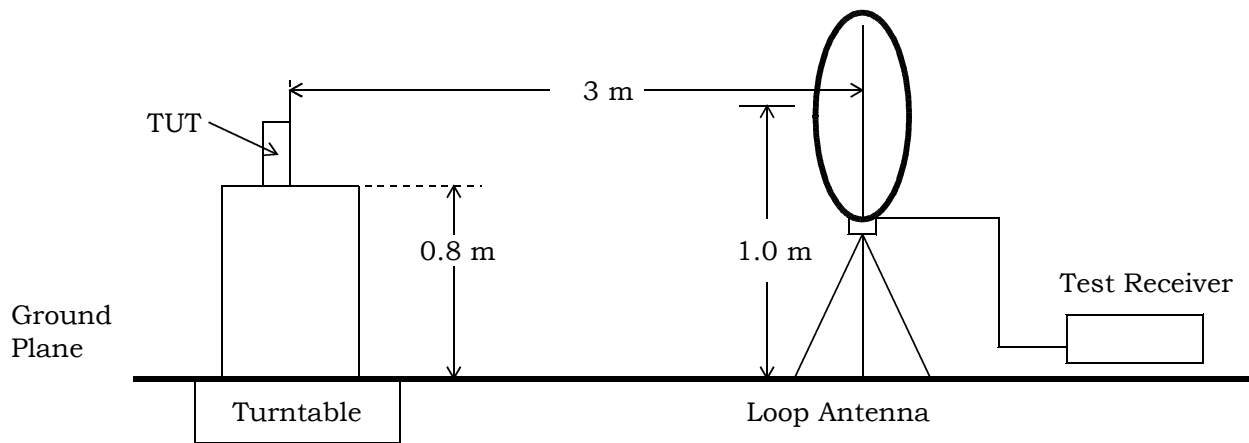
The spurious radiation for transmitter were measured at the distance 3m away from the TUT which was placed on a wooden table 0.8m in height and was varying at three orthogonal axes. The receiving antenna was oriented for vertical polarization and varied from 1 m to 4 m until the maximum emission level was detected on the measuring instrument. The TUT was rotated 360 degrees until the maximum emission was received. The measurement was also repeated with the receiving antenna in the horizontal polarization.

This test was carried out using the loop antenna for up to 30MHz, using the half-wave dipole antenna for up to 1GHz and using the horn antenna for above 1GHz.

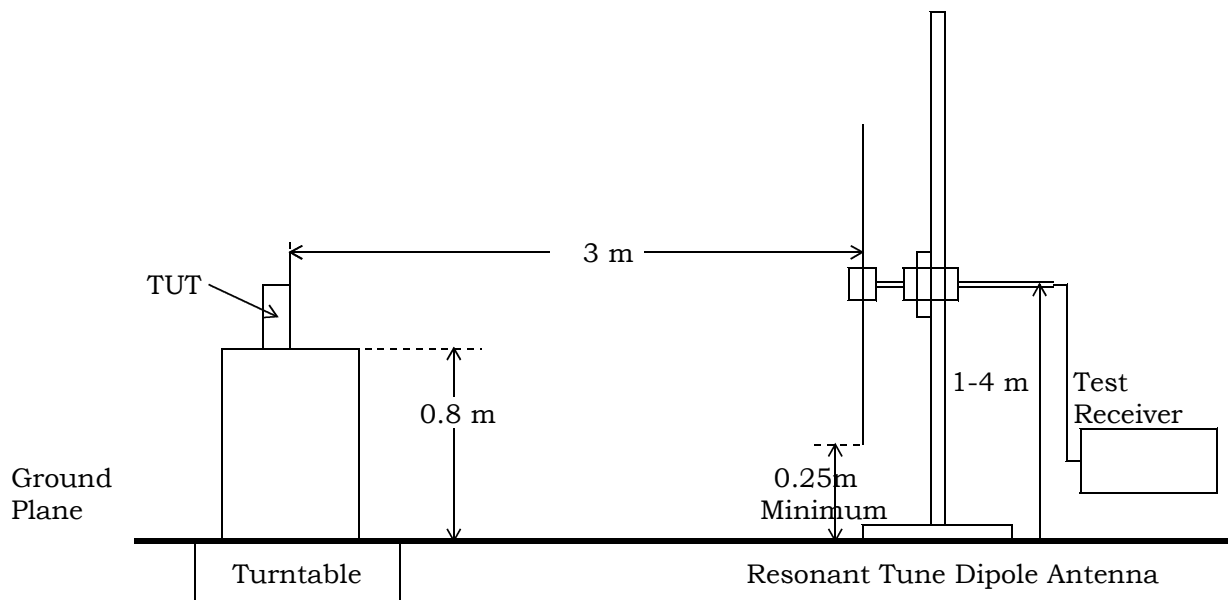
The respective measuring emission level of the spurious and harmonics were compared with the radiated emission level of fundamental frequency by specified attenuation limits,  $43+10\log_{10}(\text{TP in watt})$  [dB].

#### **Transmitter Test Condition :**

The test was made under such transmitting operation as simulating the typical fashion with the integrated antenna of the TUT.

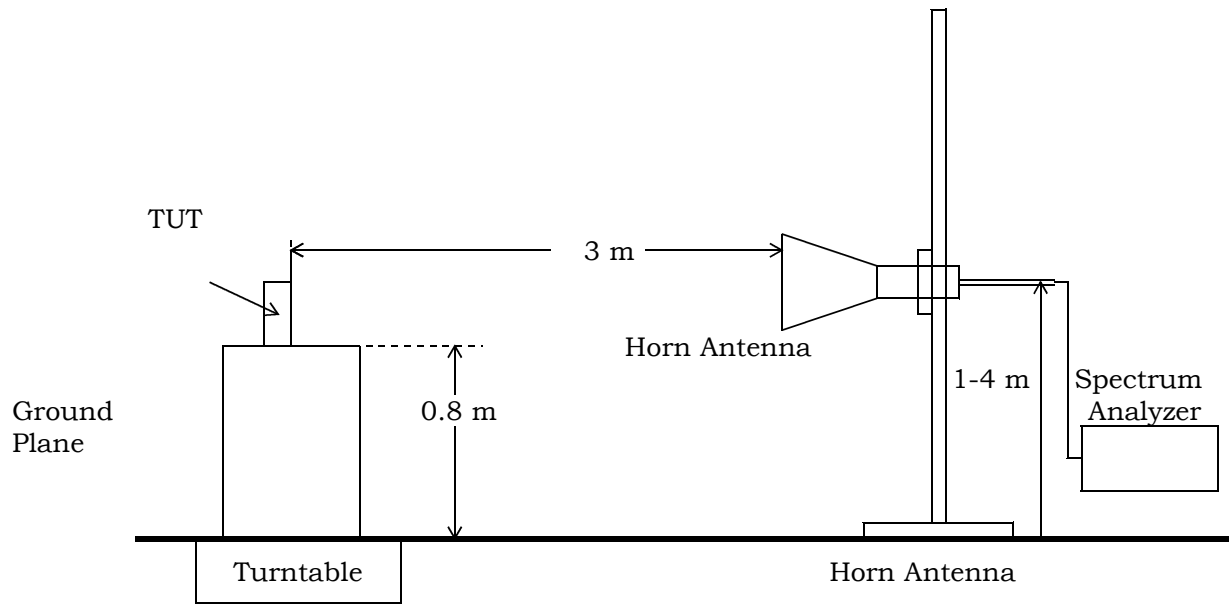


(a) Measurement set up for up to 30 MHz



(b) Measurement set up for up to 1 GHz

Fig.2 Unwanted Radiation Measurement



(c) Measurement set up for above 1GHz

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 - 41 - 1		
○ - 91889-2	C - 41 - 2		
○ - 94613-1	C - 41 - 3		
○ - 91891-2	C - 41 - 4		
○ - 94614-1	C - 41 - 5		
● - 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 %

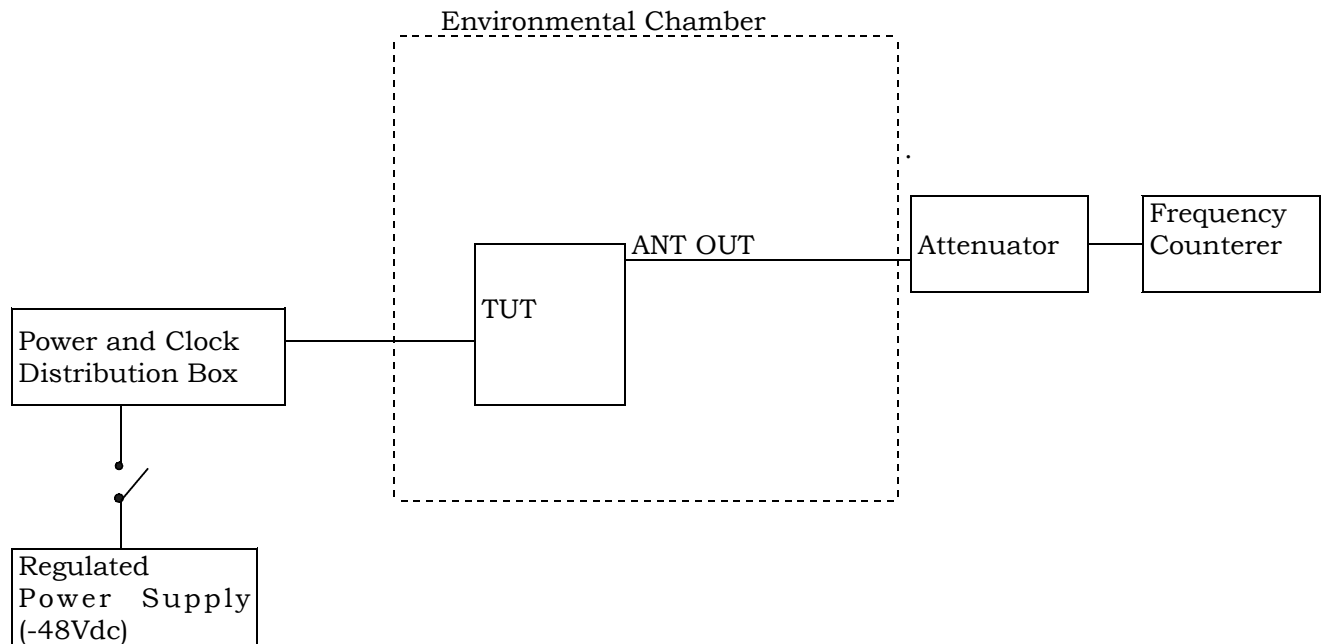
## Frequency Stability Measurement(\$2.1055, §24.235)

### 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. The reference frequency of the deviation is one which is measured at +20 °C, -48Vdc and 10 minutes after startup.

### b) Frequency Stability Measurement versus Power Supply Voltage

The TUT was placed in an environmental chamber and was tested at the temperatur 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. The reference frequency of the deviation is one which is measured at +20 °C, -48Vdc and 10 minutes after startup.



**Test location:**

KITA-KANSAI Testing Center

7-7, Ishimaru, 1-Chome, Mino-Shi, Osaka, 562-0027, Japan

○ - Shielded room

● - Enviroment 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 (30000001)	OXN1900MTDM BASE2

**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	BRI	NO	Nonmetal	NO	2.0 m
	Power and Clock Distribution Box	BS#1		Nonmetal		
2	TUT	TEST	NO	Nonmetal	NO	2.5 m
	Personal Computer	Serial		Metal		
3	Personal Computer	PS-2	YES	Metal	YES	1.8 m
	Mouse	--		--		
4	Personal Computer	PS-2	YES	Metal	NO	1.9 m
	Keyboard	--		--		
5	Personal Computer	CRT	YES	Metal	YES	1.8 m
	CRT Display	--		--		
6	Power and Clock Distribution Box	PWR	NO	--	NO	2.5 m
	DC Power Supply	--				
7	AC Power Cord (DC Power Supply)	--	NO	--	NO	1.5 m
	1 $\phi$ -3Pin Plug					
8	AC Power Cord(Personal Computer)	--	NO	--	NO	2.0 m
	1 $\phi$ -3Pin Plug					
9	AC Power Cord(CRT Display)	--	NO	--	NO	2.0 m
	1 $\phi$ -3Pin Plug					

## Test Configuration:

p

### 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 determinated 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

Excecept 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 part:**

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

**Detailed Receiver part:**

- 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) given from the CONTROLLER Outside)

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)

	● - Passed	○ - Not Passed
The requirements are		
The transmitter power is	<u>102.3</u> mW at <u>1960.020</u> MHz	
Min. limit margin	<u>29.90</u> dB at <u>1960.020</u> MHz	
Max. limit exceeding	<u>        </u> dB at <u>        </u> MHz	
Uncertainty of measurement results	<u>+0.6</u> dB(2σ)	<u>-0.6</u> dB(2σ)

Remarks: \_\_\_\_\_  
\_\_\_\_\_

### Antenna Conducted Spurious Emission

	● - Passed	○ - Not Passed
The requirements are		
Min. limit margin	<u>15.7</u> dB at <u>5790.240</u> MHz	
Max. limit exceeding	<u>        </u> dB at <u>        </u> MHz	
Uncertainty of measurement results	<u>+1.3</u> dB(2σ)	<u>-1.3</u> dB(2σ)

Remarks: \_\_\_\_\_  
\_\_\_\_\_

### Transmitter Power(EIRP)

The Maximum EIRP is	<u>0.599</u> W at <u>1960.020</u> MHz	
Uncertainty of measurement results	<u>+1.3</u> dB(2σ)	<u>-1.3</u> dB(2σ)

Remarks: \_\_\_\_\_  
\_\_\_\_\_

### Occupied Bandwidth

The requirements are

● - Passed      ○ - Not Passed

The results(Occupied Bandwidth)

Refer to page 41

The results(Band-edge Emission)

Refer to pages 42 - 43

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

13.1 dB at 5790.24 MHz

Max. limit exceeding

\_\_\_\_\_ dB at \_\_\_\_\_ MHz

Uncertainty of measurement results    9 kHz - 30 MHz  
30 MHz - 1 GHz  
1 GHz - 20 GHz

+2.5 dB(2σ)    -2.5 dB(2σ)  
+4.1 dB(2σ)    -4.2 dB(2σ)  
+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 32.

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 : February 22, 2000

End of testing : March 12, 2000

- JAPAN QUALITY ASSURANCE ORGANIZATION -

Approved by :



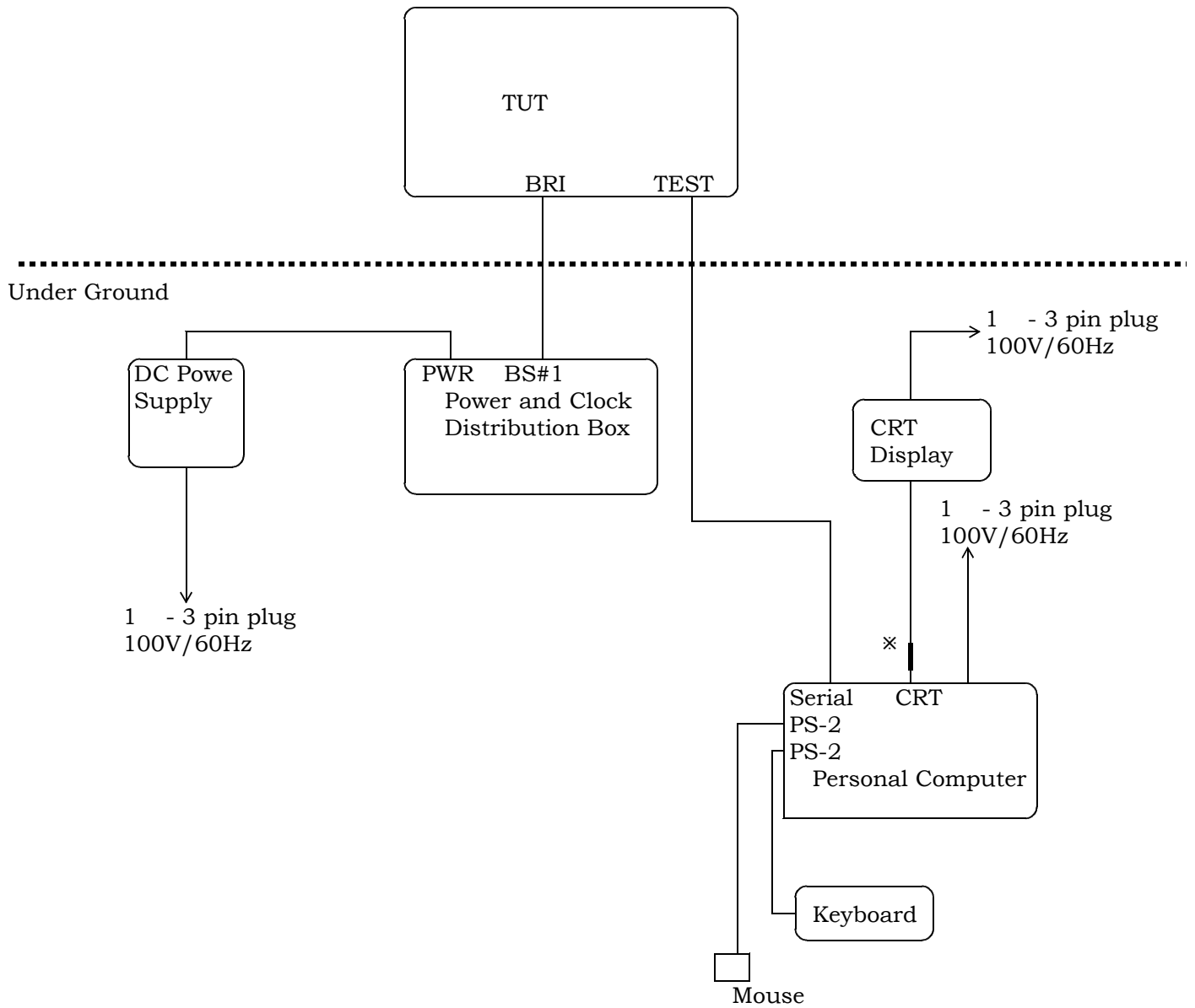
Takashi Yamanaka  
Manager  
EMC Div.  
JQA KITA-KANSAI Testing Center

Issued by :



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

**Test System-Arrangement (Drawings)**



Note ) ※: Applied Feritte Core



**Test-Setup (Photographs) at worst case**

## Transmitter Power(TP) Measurement

Test Date: March 17, 2000  
Temp.: 26 ; Humi.: 30 %

### Measurement Results:

1) Transmitting Antenna Terminal : TX1

Frequency (MHz)	Corr. Factor (dB)	Meter Reading (dBm)	(dBm)	Result (mW)	Limits (W)	Margin (dB)
1930.080	20.1	-1.43	18.67	73.6	100.0	+31.33
1960.020	20.1	-0.36	19.74	94.2	100.0	+30.26
1989.960	20.1	-1.61	18.49	70.6	100.0	+31.51

2) Transmitting Antenna Terminal : TX2

Frequency (MHz)	Corr. Factor (dB)	Meter Reading (dBm)	(dBm)	Result (mW)	Limits (W)	Margin (dB)
1930.080	20.1	-1.19	18.91	77.8	100.0	+31.09
1960.020	20.1	0.00	20.10	102.3	100.0	+29.90
1989.960	20.1	-1.61	18.49	70.6	100.0	+31.51

Sample of calculated result at 1960.020 MHz, as the Minimum Margin point:

$$\begin{array}{rcl} \text{Correction Factor} & = & 20.1 \text{ dB} \\ +) \text{ Meter Reading} & = & 0.0 \text{ dBm} \\ \hline \text{Result} & = & 20.1 \text{ dBm} \end{array} : 10^{(20.1/10)} = 102.3 \text{ (mW)}$$

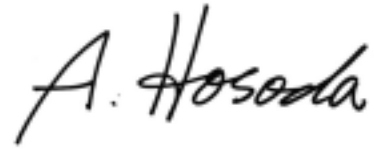
Minimum Margin :  $50.0 - 20.1 = 29.9 \text{ (dB)}$

The point shown on "\_\_\_" is the Minimum Margin Point.

Note : 1. The correction factor includes the attenuator loss and the cable loss.

Tester Signature : \_\_\_\_\_

Type Name : Akio Hosoda



## Antenna Conducted Spurious Emission Measurement

Test Date: March 17, 2000  
Temp.: 24 ; 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)
119.380	10.1	-53.0	-42.9	-14.0	+28.9	C
1084.400	10.3	-42.0	-31.7	-14.0	+17.7	A
1930.080	10.4	8.6	19.0	---	---	A
3860.160	10.7	-72.0	-61.3	-14.0	+47.3	A
5790.240	10.8	-40.5	-29.7	-14.0	+15.7	A
7720.320	11.4	-60.5	-49.1	-14.0	+35.1	A
9650.400	11.5	-57.0	-45.5	-14.0	+31.5	A
11580.480	11.4	<-72.0	<-60.6	-14.0	>+46.6	A
13510.560	11.4	<-72.0	<-60.6	-14.0	>+46.6	A
15440.640	11.4	<-72.0	<-60.6	-14.0	>+46.6	A
17370.720	11.4	<-72.0	<-60.6	-14.0	>+46.6	A
19300.800	20.9	<-72.0	<-51.1	-14.0	>+37.1	B

\* : Limit = 19.0(at 1930.08 MHz) - [ 43 + 10log(0.1)] = -14.0 (dBm)

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)
477.510	10.1	-69.0	-58.9	-14.8	+44.1	C
661.590	10.2	-64.0	-53.8	-14.8	+39.0	C
802.540	10.2	-47.0	-36.8	-14.8	+22.0	C
1084.400	10.3	-54.0	-43.7	-14.8	+28.9	A
1930.080	10.4	7.8	18.2	---	---	A
2049.410	10.4	-64.0	-53.6	-14.8	+38.8	A
3860.160	10.7	-68.0	-57.3	-14.8	+42.5	A
5790.240	10.8	-41.6	-30.8	-14.8	+16.0	A
7720.320	11.4	-54.4	-43.0	-14.8	+28.2	A
9650.400	11.4	-59.0	-47.5	-14.8	+32.7	A
11580.480	11.4	<-72.0	<-60.6	-14.8	>+45.8	A
13510.560	11.4	<-72.0	<-60.6	-14.8	>+45.8	A
15440.640	11.4	<-72.0	<-60.6	-14.8	>+45.8	A
17370.720	11.4	<-72.0	<-60.6	-14.8	>+45.8	A
19300.800	20.9	<-72.0	<-51.1	-14.8	>+36.3	B

\* : Limit = 18.2(at 1930.08 MHz) - [ 43 + 10log(0.1)] = -14.8 (dBm)

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)
1960.020	10.4	9.2	19.6	---	---	A
2109.300	10.4	-60.7	-50.3	-13.4	+36.9	A
3920.040	10.7	-70.4	-59.7	-13.4	+46.3	A
5225.50	10.7	-71.0	-60.3	-13.4	+46.9	A
5880.060	10.8	-47.5	-36.7	-13.4	+23.3	A
7840.080	11.4	-55.0	-43.6	-13.4	+30.2	A
9800.100	11.5	-57.0	-45.5	-13.4	+32.1	A
11760.120	11.4	<-72.0	<-60.6	-13.4	>+47.2	A
13720.140	11.4	<-72.0	<-60.6	-13.4	>+47.2	A
15680.160	11.4	<-72.0	<-60.6	-13.4	>+47.2	A
17640.180	11.4	<-72.0	<-60.6	-13.4	>+47.2	A
19600.200	21.4	<-72.0	<-50.6	-13.4	>+37.2	B

\* : Limit = 19.6(at 1960.02 MHz) - [ 43 + 10log(0.1)] = -13.4 (dBm)

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)
149.320	10.1	-53.0	-42.9	-13.4	+29.5	C
1129.330	10.2	-41.7	-31.5	-13.4	+18.1	A
1960.020	10.4	9.2	19.6	---	---	A
2109.300	10.4	-60.5	-50.1	-13.4	+36.7	A
3920.040	10.7	-69.3	-58.6	-13.4	+45.2	A
5880.060	10.8	-47.5	-36.7	-13.4	+23.3	A
7840.080	11.4	-53.5	-42.1	-13.4	+28.7	A
9800.100	11.5	-64.3	-52.8	-13.4	+39.4	A
11760.120	11.4	<-72.0	<-60.6	-13.4	>+47.2	A
13720.140	11.4	<-72.0	<-60.6	-13.4	>+47.2	A
15680.160	11.4	<-72.0	<-60.6	-13.4	>+47.2	A
17640.180	11.4	<-72.0	<-60.6	-13.4	>+47.2	A
19600.200	21.4	<-72.0	<-50.6	-13.4	>+37.2	B

\* : Limit = 19.6(at 1960.02 MHz) - [ 43 + 10log(0.1)] = -13.4 (dBm)

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)
1989.960	10.4	8.0	18.4	---	---	A
2169.200	10.4	-60.7	-50.3	-14.6	+35.7	A
3543.500	10.4	-67.0	-56.6	-14.6	+42.0	A
3979.920	10.7	-70.0	-59.3	-14.6	+44.7	A
5315.300	10.7	-67.0	-56.3	-14.6	+41.7	A
5969.880	10.8	-54.3	-43.5	-14.6	+28.9	A
7959.840	11.4	-54.9	-43.5	-14.6	+28.9	A
9949.800	11.5	-58.5	-47.0	-14.6	+32.4	A
11939.760	11.4	<-72.0	<-60.6	-14.6	>+46.0	A
13929.720	11.4	<-72.0	<-60.6	-14.6	>+46.0	A
15919.680	11.4	<-72.0	<-60.6	-14.6	>+46.0	A
17909.640	11.4	<-72.0	<-60.6	-14.6	>+46.0	A
19899.600	21.4	<-72.0	<-50.6	-14.6	>+36.0	B

\* : Limit = 18.4(at 1989.96 MHz) - [ 43 + 10log(0.1)] = -14.6 (dBm)

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)
179.260	10.1	-54.0	-43.9	-14.5	+29.4	C
1174.290	10.3	-45.3	-35.0	-14.5	+20.5	A
1989.960	10.4	8.1	18.5	---	---	A
3543.620	10.6	-68.0	-57.4	-14.5	+42.9	A
3979.920	10.7	-70.0	-59.3	-14.5	+44.8	A
5969.880	10.8	-52.7	-41.9	-14.5	+27.4	A
7959.840	11.4	-60.3	-48.9	-14.5	+34.4	A
9949.800	11.5	-58.3	-46.8	-14.5	+32.3	A
11939.760	11.4	<-72.0	<-60.6	-14.5	>+46.1	A
13929.720	11.4	<-72.0	<-60.6	-14.5	>+46.1	A
15919.680	11.4	<-72.0	<-60.6	-14.5	>+46.1	A
17909.640	11.4	<-72.0	<-60.6	-14.5	>+46.1	A
19899.600	21.4	<-72.0	<-50.6	-14.5	>+36.1	B

\* : Limit = 18.5(at 1989.96 MHz) - [ 43 + 10log(0.1)] = -14.5 (dBm)

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

$$\begin{array}{rcl} \text{Correction Factor} & = & 10.8 \text{ dB} \\ +) \text{ Meter Reading} & = & -40.5 \text{ dBm} \\ \hline \text{Result} & = & -29.7 \text{ dBm} \end{array}$$

Minimum Margin :  $-14.0 - (-29.7) = 15.7(\text{dB})$

The point shown on "\_\_\_" is the Minimum Margin Point.

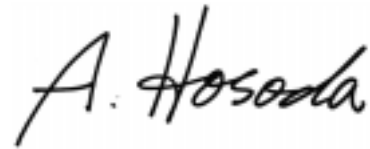
- Note : 1. The spectrum was checked from 9 kHz up to the tenth harmonic frequency.  
2. All emissions not listed were found to be more than 20dB below the limit.

**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+P20
B	Peak (SP)	1 MHz	1 MHz	20 msec	0 Hz	CL+P20+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

Tester Signature : \_\_\_\_\_



Type Name : Akio Hosoda

## Transmitter Power(EIRP) Measurement

Test Date: March 12, 2000

Temp.: 18 ; Humi.: 30 %

### Measurement Results:

1) Transmitting Antenna Terminal : TX1

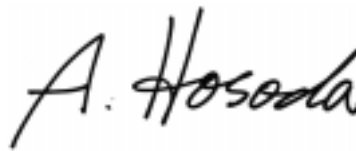
Frequency (MHz)	Maximum Transmitter Power EIRP(W)	
	Hori.	Vert.
1930.080	0.434	0.198
1960.020	0.599	0.280
1989.960	0.444	0.208

2) Transmitting Antenna Terminal : TX2

Frequency (MHz)	Maximum Transmitter Power EIRP(W)	
	Hori.	Vert.
1930.080	0.125	0.041
1960.020	0.154	0.066
1989.960	0.157	0.122

The point shown on "\_\_\_" is the Maximum level Point.

Tester Signature : \_\_\_\_\_



Type Name : Akio Hosoda

## Occupied Bandwidth Measurement

Test Date: March 9, 2000  
Temp.: 18 ; Humi.: 30 %

### 1) Occupied Bandwidth measurement

#### Measurement Results:

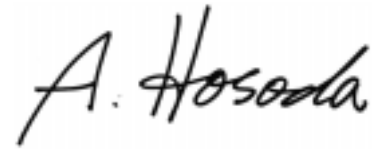
Attached Graph : Refer to page 42.

### 2) Band-edge Emission measurement

#### Measurement Results:

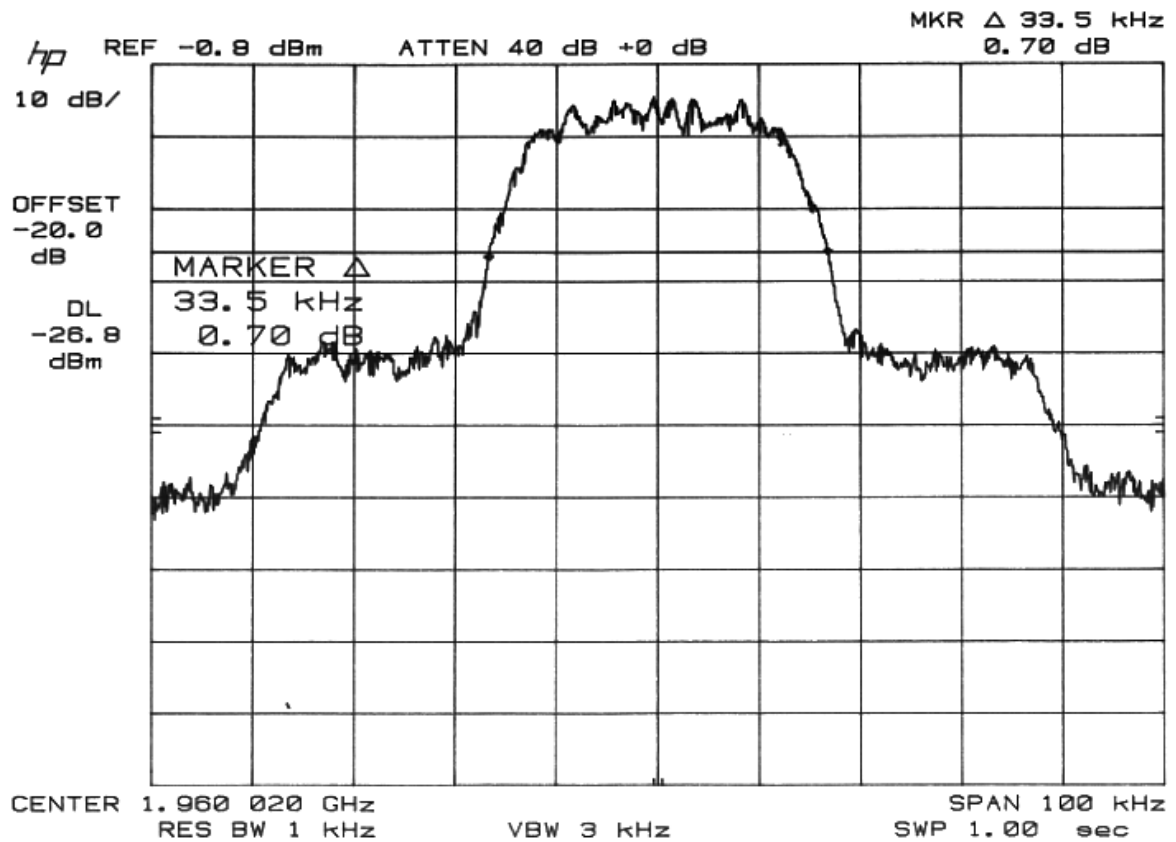
Attached Graph : Refer to pages 43 - 44.  
Note : Specified limits(\$24.238)

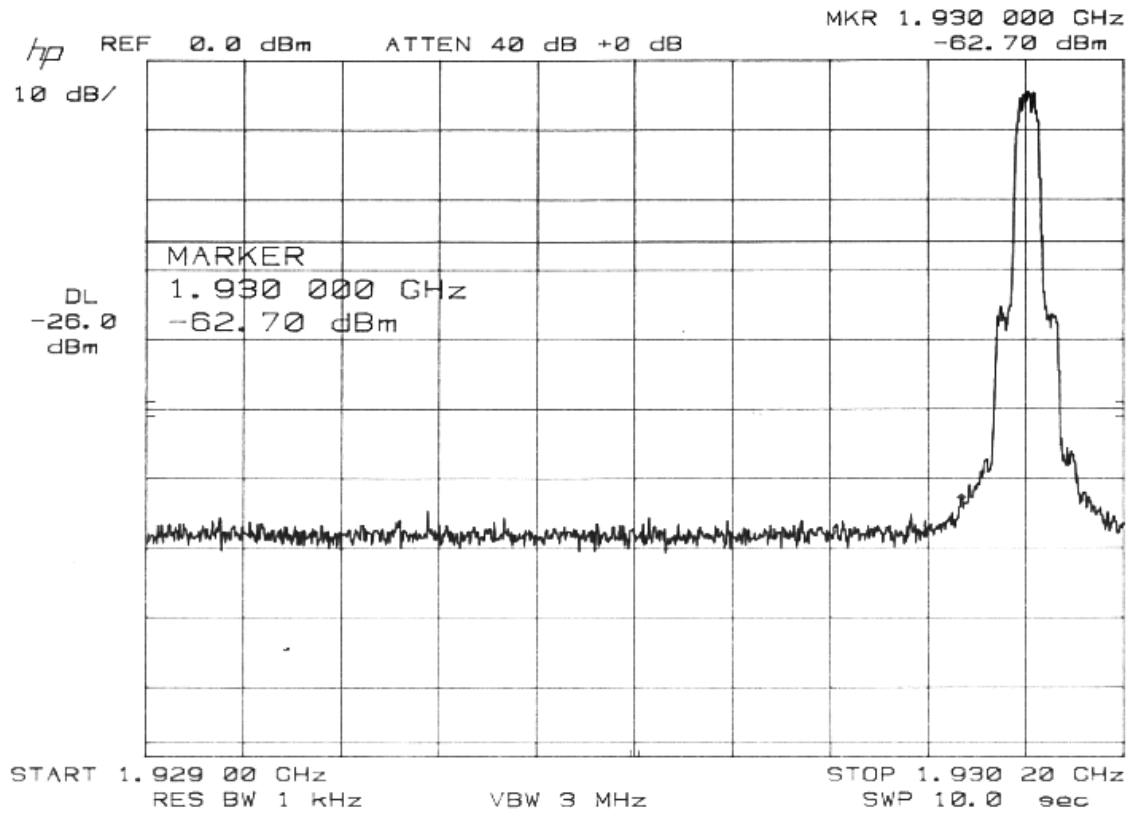
Tester Signature : \_\_\_\_\_

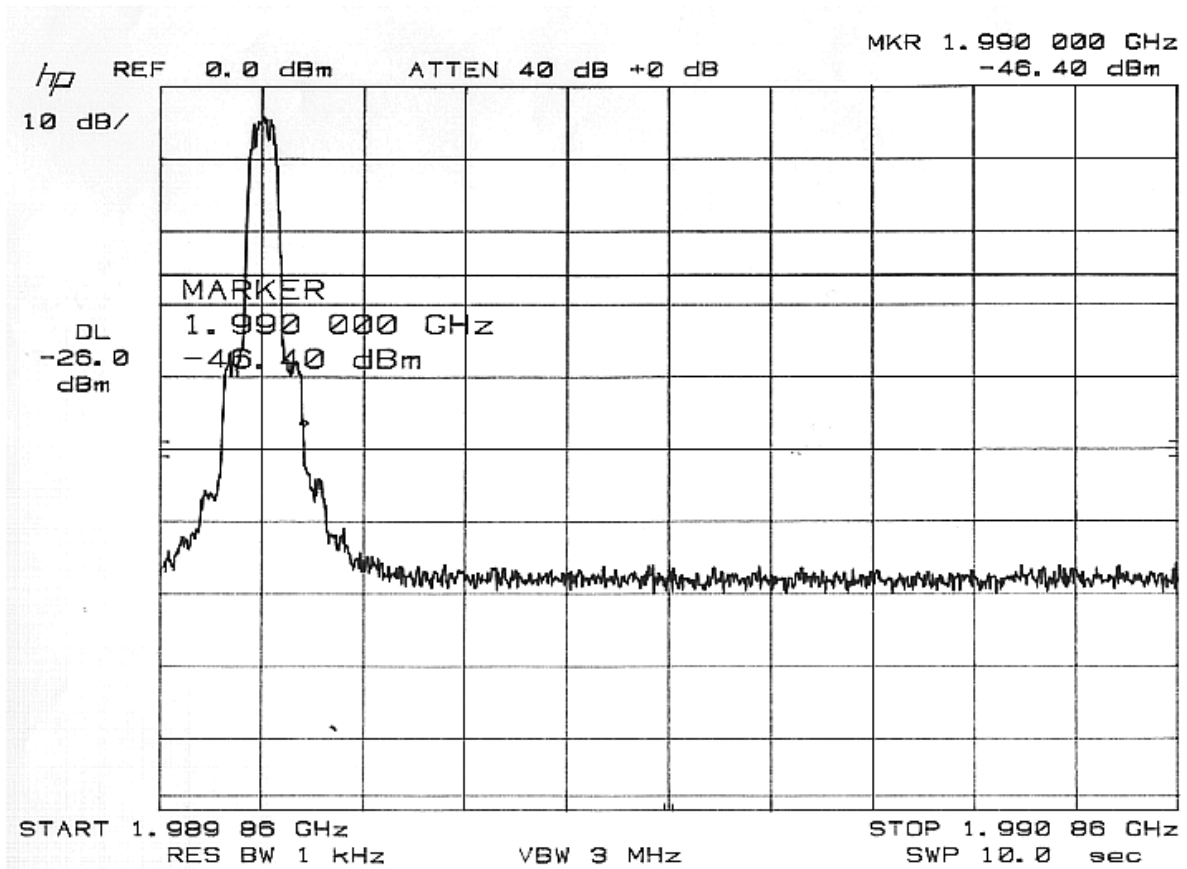


Type Name : Akio Hosoda









## Unwanted Radiation Measurement

Test Date: February 22, 2000

Temp.: 24 ; Humi.: 28 %

### Measurement Results:

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

Frequency (MHz)	Corr. Factor (dB)	Meter Reading [dB(μV)]		Results [dB(μV/m)]		Limits* [dB(μV/m)]	Margin (dB)	Remarks (Note 3)
		Horiz.	Vert.	Horiz.	Vert.			
1930.08	22.1	99.5	96.1	121.6	118.2	---	---	A
3860.16	3.0	<50.0	<50.0	<53.0	<53.0	88.6	>+35.6	B
5790.24	6.8	62.8	58.9	69.6	65.7	88.6	+19.0	B
7720.32	10.6	53.9	53.8	64.5	64.4	88.6	+24.1	B
9650.40	6.1	54.9	54.1	61.0	60.2	88.6	+27.6	C
11580.48	6.8	<45.0	<45.0	<51.8	<51.8	88.6	>+36.8	C
13510.56	10.9	<45.0	<45.0	<55.9	<55.9	88.6	>+32.7	C
15440.64	10.7	<45.0	<45.0	<55.7	<55.7	88.6	>+32.9	C
17370.72	10.8	<45.0	<45.0	<55.8	<55.8	88.6	>+32.8	C
19300.80	20.9	<45.0	<45.0	<65.9	<65.9	88.6	>+22.7	D

※ : Limit = 121.6(Maximum at 1930.08 MHz) - [ 43 + 10log(0.1)] = 88.6 [dB(μV/m)]

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

Frequency (MHz)	Corr. Factor (dB)	Meter Reading [dB(μV)]		Results [dB(μV/m)]		Limits* [dB(μV/m)]	Margin (dB)	Remarks (Note 3)
		Horiz.	Vert.	Horiz.	Vert.			
1930.08	22.1	94.1	89.3	116.2	111.4	---	---	A
3860.16	3.0	<50.0	<50.0	<53.0	<53.0	83.2	>+30.2	B
5790.24	6.8	63.3	58.0	70.1	64.8	83.2	+13.1	B
7720.32	10.6	53.0	50.1	63.6	60.7	83.2	+19.6	B
9650.40	6.1	55.3	55.8	61.4	61.9	83.2	+21.3	C
11580.48	6.8	<45.0	<45.0	<51.8	<51.8	83.2	>+31.4	C
13510.56	10.9	<45.0	<45.0	<55.9	<55.9	83.2	>+27.3	C
15440.64	10.7	<45.0	<45.0	<55.7	<55.7	83.2	>+27.5	C
17370.72	10.8	<45.0	<45.0	<55.8	<55.8	83.2	>+27.4	C
19300.80	20.9	<45.0	<45.0	<65.9	<65.9	83.2	>+17.3	D

※ : Limit = 116.2(Maximum at 1930.08 MHz) - [ 43 + 10log(0.1)] = 83.2 [dB(μV/m)]

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

Frequency (MHz)	Corr. Factor (dB)	Meter Reading [dB(μV)]		Results [dB(μV/m)]		Limits* [dB(μV/m)]	Margin (dB)	Remarks (Note 3)
		Horiz.	Vert.	Horiz.	Vert.			
1960.02	21.9	101.1	97.8	123.0	119.7	---	---	A
3920.04	3.0	50.0	50.0	<53.0	<53.0	90.0	>+37.0	B
5880.06	9.3	53.1	50.6	62.4	59.9	90.0	+27.6	B
7840.08	1.2	54.9	50.2	56.1	51.4	90.0	+33.9	B
9800.10	6.2	55.3	51.4	61.5	57.6	90.0	+28.5	C
11760.12	6.9	<45.0	<45.0	<51.9	<51.9	90.0	>+38.1	C
13720.14	10.9	<45.0	<45.0	<55.9	<55.9	90.0	>+34.1	C
15680.16	10.7	<45.0	<45.0	<55.7	<55.7	90.0	>+34.3	C
17640.18	10.9	<45.0	<45.0	<55.9	<55.9	90.0	>+34.1	C
19600.20	21.4	<45.0	<45.0	<66.4	<66.4	90.0	>+23.6	D

※ : Limit = 123.0(Maximum at 1960.02 MHz) - [ 43 + 10log(0.1)] = 90.0 [dB(μV/m)]

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

Frequency (MHz)	Corr. Factor (dB)	Meter Reading [dB(μV)]		Results [dB(μV/m)]		Limits* [dB(μV/m)]	Margin (dB)	Remarks (Note 3)
		Horiz.	Vert.	Horiz.	Vert.			
1960.02	21.9	95.2	91.5	117.1	113.4	---	---	A
3920.04	3.0	<50.0	<50.0	<53.0	<53.0	84.1	>+31.1	B
5880.06	9.3	54.3	49.8	63.6	59.1	84.1	+20.5	B
7840.08	1.2	53.1	51.6	54.3	52.8	84.1	+29.8	B
9800.10	6.2	53.8	52.9	60.0	59.1	84.1	+24.1	C
11760.12	6.9	<45.0	<45.0	<51.9	<51.9	84.1	>+32.2	C
13720.14	10.9	<45.0	<45.0	<55.9	<55.9	84.1	>+28.2	C
15680.16	10.7	<45.0	<45.0	<55.7	<55.7	84.1	>+28.4	C
17640.18	10.9	<45.0	<45.0	<55.9	<55.9	84.1	>+28.2	C
19600.20	21.4	<45.0	<45.0	<66.4	<66.4	84.1	>+17.7	D

※ : Limit = 117.1(Maximum at 1960.02 MHz) - [ 43 + 10log(0.1)] = 84.1 [dB(μV/m)]

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

Frequency (MHz)	Corr. Factor (dB)	Meter Reading [dB(μV)]		Results [dB(μV/m)]		Limits* [dB(μV/m)]	Margin (dB)	Remarks (Note 3)
		Horiz.	Vert.	Horiz.	Vert.			
1989.96	22.0	99.7	96.4	121.7	118.5	---	---	A
3979.92	6.5	<50.0	<50.0	<56.5	<56.5	88.7	>+32.2	B
5969.88	-0.4	51.9	49.1	51.5	48.7	88.7	+37.2	B
7959.84	0.7	61.4	58.2	62.1	58.9	88.7	+26.6	B
9949.80	6.3	52.7	50.3	59.0	56.6	88.7	+29.7	C
11939.76	6.9	<45.0	<45.0	<51.9	<51.9	88.7	>+36.8	C
13929.72	10.9	<45.0	<45.0	<55.9	<55.9	88.7	>+32.8	C
15919.68	10.6	<45.0	<45.0	<55.6	<55.6	88.7	>+33.1	C
17909.64	11.1	<45.0	<45.0	<56.1	<56.1	88.7	>+32.6	C
19899.60	11.5	<45.0	<45.0	<56.5	<56.5	88.7	>+32.2	D

※ : Limit = 121.7(Maximum at 1989.96 MHz) - [ 43 + 10log(0.1)] = 88.7 [dB(μV/m)]

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

Frequency (MHz)	Corr. Factor (dB)	Meter Reading [dB(μV)]		Results [dB(μV/m)]		Limits* [dB(μV/m)]	Margin (dB)	Remarks (Note 3)
		Horiz.	Vert.	Horiz.	Vert.			
1989.96	22.0	95.2	94.1	117.2	116.1	---	---	A
3979.92	6.5	<50.0	<50.0	<56.5	<56.5	84.2	>+27.7	B
5969.88	-0.4	59.0	54.6	58.6	54.2	84.2	+25.6	B
7959.84	0.7	60.0	55.4	60.7	56.1	84.2	+23.5	B
9949.80	6.3	56.2	54.0	62.5	60.3	84.2	+21.7	C
11939.76	6.9	<45.0	<45.0	<51.9	<51.9	84.2	>+32.3	C
13929.72	10.9	<45.0	<45.0	<55.9	<55.9	84.2	>+28.3	C
15919.68	10.6	<45.0	<45.0	<55.6	<55.6	84.2	>+28.6	C
17909.64	11.1	<45.0	<45.0	<56.1	<56.1	84.2	>+28.1	C
19899.60	11.5	<45.0	<45.0	<56.5	<56.5	84.2	>+27.7	D

※ : Limit = 117.2(Maximum at 1989.96 MHz) - [ 43 + 10log(0.1)] = 84.2 [dB(μV/m)]

Sample of calculated result at 5790.24 MHz, as the Minimum Margin point:

$$\begin{array}{rcl} \text{Correction Factor} & = & 6.8 \text{ dB} \\ +) \text{ Meter Reading} & = & 63.3 \text{ dB}(\mu\text{V}) \\ \hline \text{Result} & = & 70.1 \text{ dB}(\mu\text{V}/\text{m}) \end{array}$$

Minimum Margin :  $83.2 - 70.1 = 13.1(\text{dB})$

The point shown on "\_\_\_" is the Minimum Margin Point.

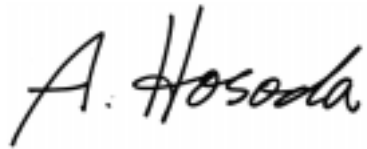
- Note : 1. The spectrum was checked from 9 kHz up to the tenth harmonic frequency.  
2. All emissions not listed were found to be more than 20dB below the limit.

**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+P20-Amp.
C	Peak (SP)	1 MHz	1 MHz	20 msec	0 Hz	ANT+CL+P10-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 : \_\_\_\_\_



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: March 2, 2000

Ambient Temperature (°C)	Startup	Deviation (ppm)		
		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: March 2, 2000

Ambient Temperature (°C)	Startup	Deviation (ppm)		
		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: March 2, 2000

Ambient Temperature (°C)	Startup	Deviation (ppm)		
		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: March 2, 2000

Ambient Temperature (°C)	Startup	Deviation (ppm)		
		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 : 

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: March 3, 2000

Suplly Voltage to the Power and Clock Distribution Box (Vdc)	Startup	Deviation (ppm)		
		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: March 3, 2000

Suplly Voltage to the Power and Clock Distribution Box (Vdc)	Startup	Deviation (ppm)		
		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: March 3, 2000

Suplly Voltage to the Power and Clock Distribution Box (Vdc)	Startup	Deviation (ppm)		
		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

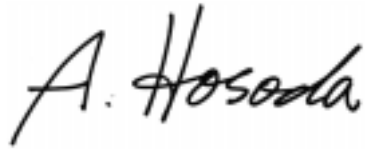
Test Date: March 3, 2000

Suplly Voltage to the Power and Clock Distribution Box (Vdc)	Startup	Deviation (ppm)		
		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 Caluculation at 1930.080018 MHz for TX1,20°C Startup -48.0Vdc) :  
 $((1930.080017 - 1930.080000) / 1930.080000) \times 10^6 = +8.8 \times 10^{-3} (\text{ppm})$

Tester Signature : \_\_\_\_\_



Type Name : Akio Hosoda

### Maximum Permissible Expourse(MPE) :

The limit for Maximum Permissible Exposure(MPE) at frequency of 1.96 GHz is 1.00 mW/cm<sup>2</sup>. (1.00 mW/cm<sup>2</sup> for General Population/Uncotrolled enviroment 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<sup>2</sup>);

Pr is radiated power (in W);

G is the numeric gain of the antenna; and

EIRP is Equivalent Isotropically Radiated Power(=PrG); and

r is the distance(in m) from the antenna

The conversion from W/m<sup>2</sup> to mW/cm<sup>2</sup> is:mW/cm<sup>2</sup> = W/m<sup>2</sup>/10

Caluculations:

At adistance 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 calculatioms for MPE

Items	Transmitter Antenna
Total Channells	2
Maximum EIRP(W)	1.2
Power Density(W/m <sup>2</sup> )	0.096
Power Density(mW/cm <sup>2</sup> )	0.0096
Minimum distance in m for MPE	0.31

At this power level, an individual would need to be within 0.31 m of the device in order to be at the limit for General Population/Uncotrolled exposure.

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