EMC EMISSION - TEST REPORT

JQA APPLICATION No. : KL80000155

Name of Product : 800MHz Wireless Base Station Unit (WBSU)

Model / Type No. : FS-468F-E

FCC ID : OXN800MTDMABASE3

Applicant : MITSUBISHI ELECTRIC CORPORATION
COMMUNICATION SYSTEMS BUSINESS DIVISON

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

Manufacturer : MITSUBISHI ELECTRIC CORPORATION
COMMUNICATION SYSTEMS BUSINESS DIVISON

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

Receive date of TUT : June 28, 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 22 (Ocotober 1, 1998)

Test procedure:

The tests were performed according to FCC Rules and Regulations Part 2 (Ocotober 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	: 800MHz Wireless Base Station Unit (WBSU)
2)	Model/Type No.	: FS-468F-E
3)	Product Type	: Prototype(Serial No. : 40500001)
4)	Category	: Celluar Radiotelephone Service
5)	TUT Authorization	: ○ - Verification ● - Certification ○ - D.o.C.
6)	Transmitting Frequency	: 869.040 MHz (991 ch) - 893.970 MHz (799 ch)
7)	Receiving Frequency	: 824.040 MHz (991 ch) - 848.970 MHz (799 ch)
8)	Emisson Designations	: 33K6D7W
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 800 MHz TDMA Cellular System that is being developed for the operation in the licensed Cellular 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 th WBSU converts the DC input voltage into the internal working voltage of 5V and 3.6V.

The WBSU is approximately 12" x 12" x 2". The unit weighs approximately 4kg. A security screw is provided which requires a special tool for removal.

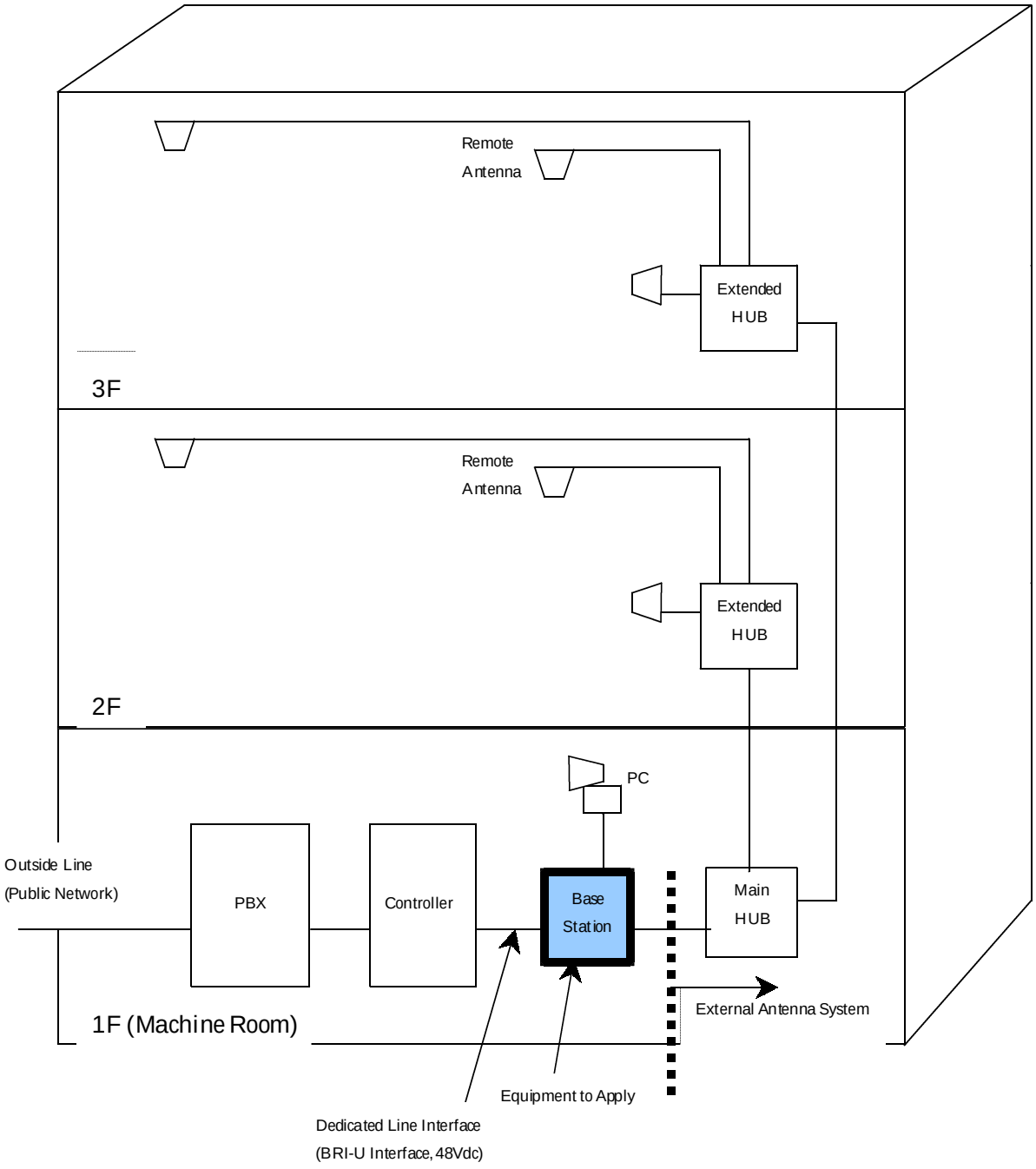
The operating frequency range of the WBSU is the standard licensed bands within the Cellular spectrum. The output level of the transceiver is from -10dBW to -37 dBW and is software controlled.

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.

In a typical installation, the WBSU (called External Antenna Type) is supposed to have an external antenna system attached, as indicated in the drawing(Refer to page 6), 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).

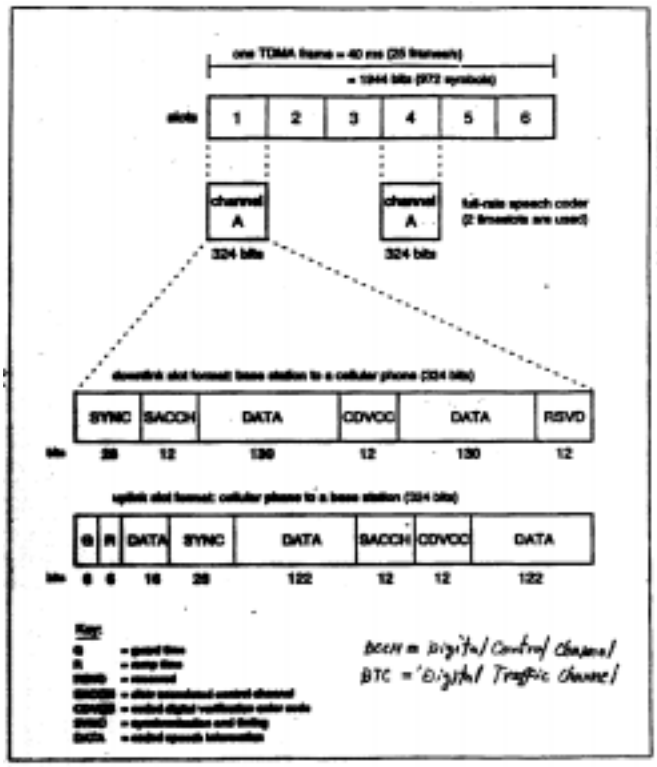


General Configuration of a Typical In-Building System (Private System)

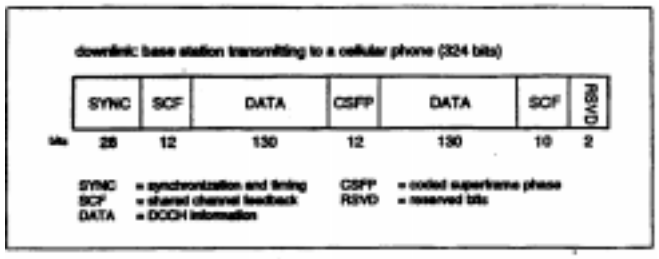
Transmitter Technical Characteristics(§2.1033) :

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)	: 832(Refer to page 17)
D.	Transmitting Frequency Range	: 869.040 MHz to 893.970 MHz
E.	Emission Designations	: 33K6D7W
F.	Power Supply	: -24 to -48Vdc
G.	Frequency Stability	: ±0.1 ppm (0°C - 40°C)

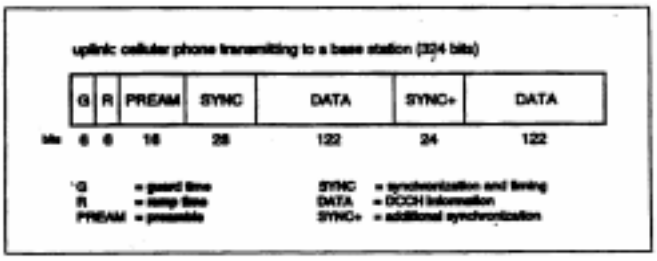
TDMA Information :



(a) DTC-Burst Format



(b) DCCH-Downlink Burst Format



(C) DCCH-Normal Uplink Burst Format

Fig. 1 IS-136 TDMA Burst Foruat

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 caused as follows. A mixing circuit employed causes the image of a carrier and the leakage of a local oscillator. A power amplifier causes harmonics due to the non-linearity. Three band pass filters(BPF #1 through #3) are introduced to reduce these sprious 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 occurrs 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 183.15MHz 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, there are no user adjustments.
For transmission power, it is also factory-tuned and no user adjustments.

(6) Operation of two radios

The WBSU contains two radio transceivers, which operate independently of each other.
Each radio communicates with a mobile in comply with the IS-138/138 air-interface specifications.
There are 832 channels(frequencies) used in this system and each frequency has six TDMA slots (three TDMA channels of full-duplex).
Each radio operates according to the instruction of the Controller Equipment located in the network side.

The two radios basically operate at the same time but the transmitters(TX1, TX2) transmit different frequencies from each other. (They never transmit the same frequencies.)
Also the two receivers(RX1,RX2) operate at the same time but at different frequencies.

There are two more receivers(MX1,MX2) in a base station for interference detection purpose.
These receivers monitor the surrounding base stations(i.e. Public and In-building Cellular base stations), transmitting the same frequencies as ourselves.
When one of the surrounding base stations is using a channel (frequencies and TDMA slot), the same channel is not used and enabled by monitoring of the MX.

(7) SECURITY CODE

Security function to protect the base station from illegal use is incorporated in the base station according to IS-136 US Standards such as Authentication and Voice Encryption to properly communicate with a mobile.

For the Authentication, when a call is made with a mobile, the base station judges if it is an authorized user by calculating a specified algorithm function using a 64-bit authentication key and the other keys.
The voice encryption is conducted too by scrambling the voice information by calculating an encryption function using a 64-bit encryption key and the other keys.

Refer to US Standards(IS-136) for further details.

Band Pass Filter Characteristics :

Table.1 SPECIFICATIONS of BPF#1 (FL2001)

* Part Number: DFC3R881P025HHD
* Center frequency : f0=881.5MHz
* Band Width : 25MHz
* Insertion Loss : Less than 3.0dB
* Ripple : Less than 1.0dB
* Outband Attenuation:

Frequency	Loss
824 - 849MHz	15 dB min.
914 - 939MHz	12 dB min.

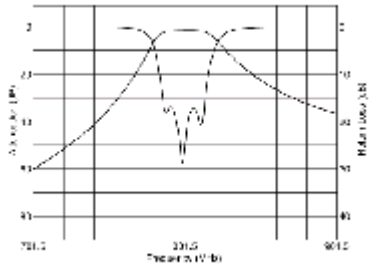


Table.2 SPECIFICATIONS of BPF#2 (FL2002)

* Part Number: DFC3R881P025BHD
* Center frequency : f0=881.5MHz
* Band Width : 25MHz
* Insertion Loss : Less than 2.6dB
* Ripple : Less than 1.0dB
* Outband Attenuation:

Frequency	Loss
f0 +/- 32.5MHz	12 dB min.

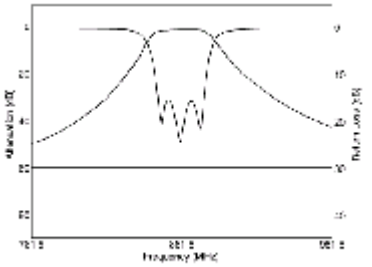
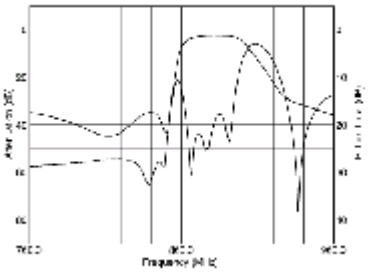


Table.3 SPECIFICATIONS of BPF#3 (Z2003 : DUPLEXER)

* Part Number: DFY2R836CR881BHA
* Center frequency : f0=881.5MHz
* Band Width : 25MHz
* Insertion Loss : Less than 3.7dB
* Ripple : Less than 1.3dB
* Outband Attenuation:

Frequency	Loss
824 - 849MHz	50 dB min.
914 - 939MHz	10 dB min.
959 - 984MHz	30 dB min.

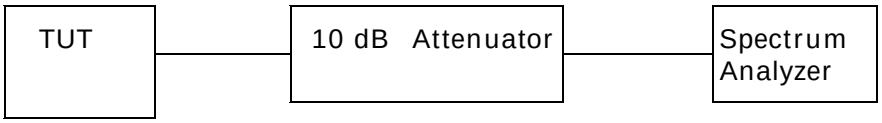


TEST CONDITIONS

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

Test Procedure :

The Transmitter Power was measured with a spectrum analyzer, one 10 dB attenuator 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 - 73		
● - 2-10	D - 79	August, 1999	1 Year
● - 8566B	A - 13	November, 1999	1 Year
○ - 8593A	A - 15		

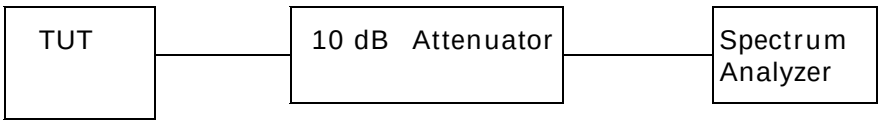
Environmental conditions :

Temperature: 23 °C Humidity: 52 %

Antenna Conducted Spurious Emissionl Measurement (§2.1051,§22.917)

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		
○ - 4T-10	D - 73		
● - 2-10	D - 79	August, 1999	1 Year
● - 8566B	A - 13	November, 1999	1 Year
○ - 8593A	A - 15		

Environmental conditions :

Temperature: 23 °C Humidity: 52 %

Transmitter Power(ERP) Measurement (§22.913)

The measurement were performed shown as follows.

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(Resonant Tune Dipole 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 polarized (Vertical and Horizontal). Then the meter reading of the test receiver at the maximum emission was A dB(μV).

Step 2) The test was set-up shown as Fig.1(b). The TUT was replaced to half-wave dipole antenna at the same polarized under the same condition as step 1. The RF power was fed to the transmitting Antenna(half-wave Dipole Antenna) from the signal generator. In order to obtain the maximum emission level, the height of the receiving antenna 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(μV) ,same as the recorded level in Step1. Then the RF power into the substitution half-wave dipole antenna was P(dBm).

The ERP is calculated in the following equation.

ERP[dBm] = P (dBm)- (Balun Loss of the half-wave Dipole Ant. (dB)) + Cable Loss(dB)

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
○ - 3 meters
○ - 10 meters

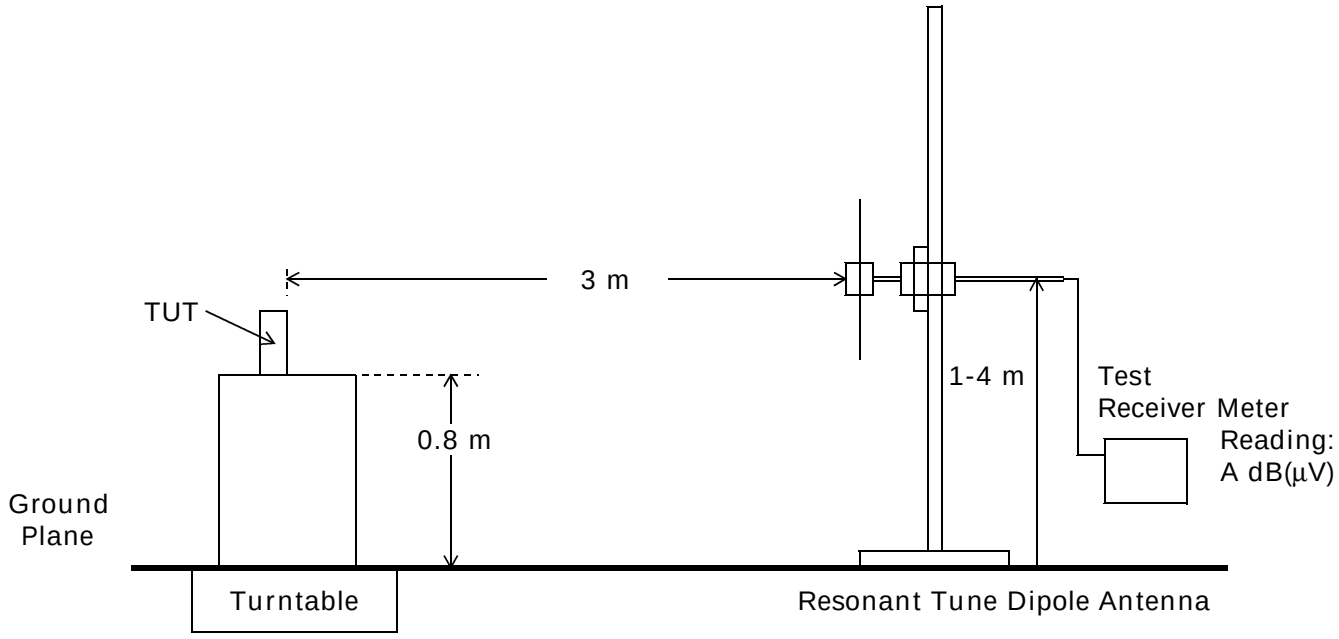
Validation of Site Attenuation:

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

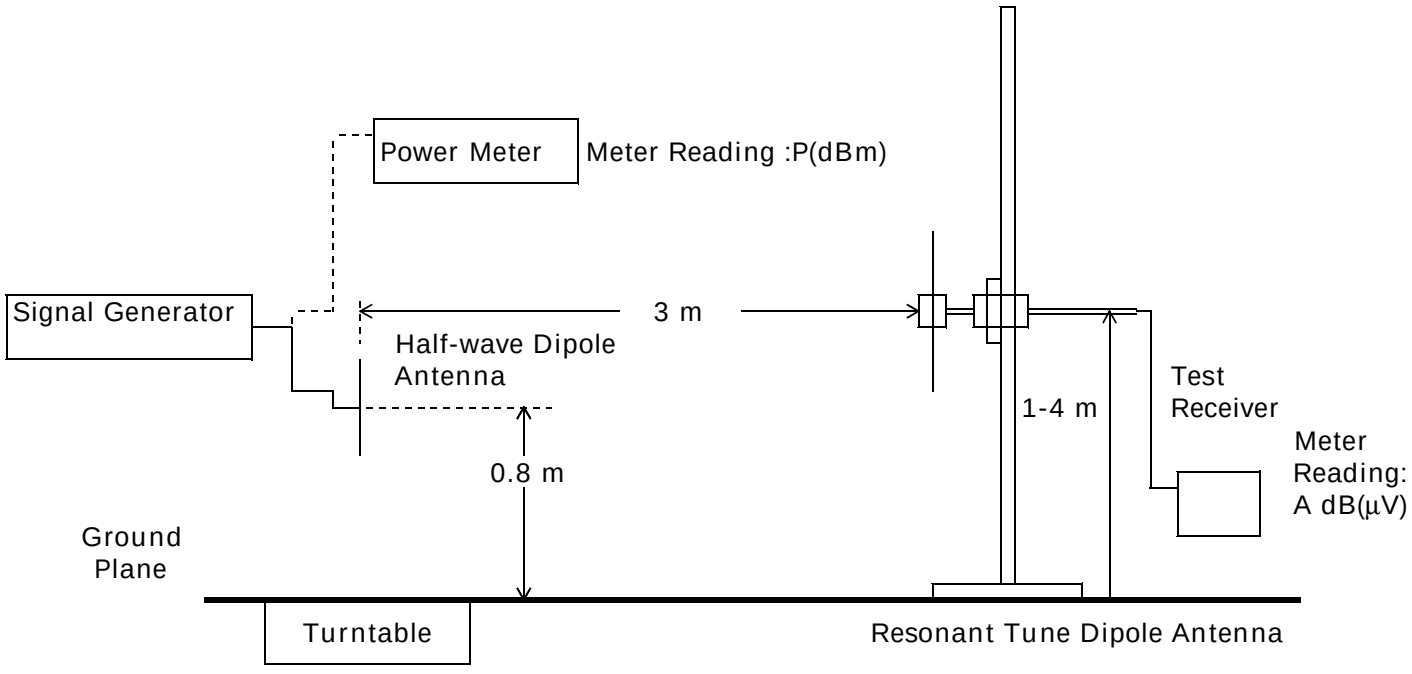
Used test instruments:

Model No.	Device ID	Last Cal. Date	Cal. Interval
● - ESV	A - 7	December, 1999	1 Year
○ - ESV/ESV-Z3	A - 6 / A - 18		
○ - ESV/ESV-Z3	A - 4 / A - 20		
○ - ESV/ESV-Z3	A - 8 / A - 19		
○ - 4396B	B - 47		
○ - 8566B	A - 13		
○ - 8593A	A - 15		
● - 432B/8478 B	B - 24 / B - 43	March, 2000	1 Year
○ - KBA-511A	C - 12		
● - KBA-611	C - 22	November, 1999	1 Year
○ - KBA-511A	C - 13		
● - KBA-611	C - 19	November, 1999	1 Year
○ - KBA-511A	C - 11		
○ - KBA-611	C - 21		
○ - Cable	H - 1		
○ - Cable	H - 2		
● - Cable	H - 5	November, 1999	1 Year
○ - Cable	H - 6		
○ - DC6180	E - 51		
● - 8673D	B - 2	April, 2000	1 Year

Temperature: 31 °C Humidity: 50 %



(a) TUT



(b)Half-wave Dipole Antenna

Fig.1 Maximum Transmitter Power(ERP) Measurement

Occupied Bandwidth Measurement(§2.1049(c)(1), §22.917)

Test Procedure :

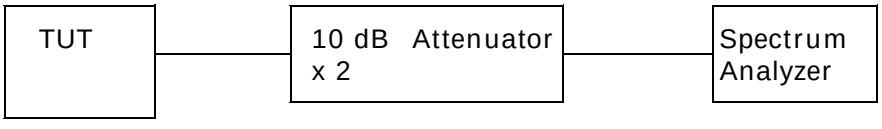
The measurement was made at the modulation of the above modulation system. The bandwidth for the TUT is 33.0 kHz. This measurement was taken with connection through two 10dB attenuators from the antenna output to the spectrum analyzer. The wave shape was captured in trace A using a Resolution Bandwidth (RES BW) of 1kHz, a Video Bandwidth (VIDEO BW) of 3 MHz. 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), §22.905,§22.917)

The measurement was made at the modulation of the modulation system shown in page 27.
The Band-edge emission measurment was performed under the modulated conditon 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 1.0 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 800MHz Systems

Band	Bandwidth (MHz)	Number of Channels	Boundary Channel Numbers	Transmitter Center Frequency (MHz)
Not Used		1	990	869.010
A"	1	33	991 ~ 1023	869.040 ~ 870.000
A	10	333	1 ~ 333	870.030 ~ 879.990
B	10	333	334 ~ 666	880.020 ~ 889.980
A'	1.5	50	667 ~ 716	890.010 ~ 891.480
B'	2.5	83	717 ~ 799	891.510 ~ 893.970



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, 2000	1 year
● - 4T-10	D - 74	May, 2000	1 year
○ - 8593A	A - 15		
○ - 2-10	D - 40		
○ - 6-20			1 Year
○ - VP-7212A	B - 41		

Environmental conditions :

Temperature: 23 °C Humidity: 52 %

Unwanted Radiation Measurement (§2.1053,§22.917)

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 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 ERP is calculated in the following equation.

a) 30 MHz - 1GHz

ERP[dBm] = P (dBm)- (Balun Loss of the half-wave Dipole Ant. (dB)) + Cable Loss(dB)

b) Above 1GHz

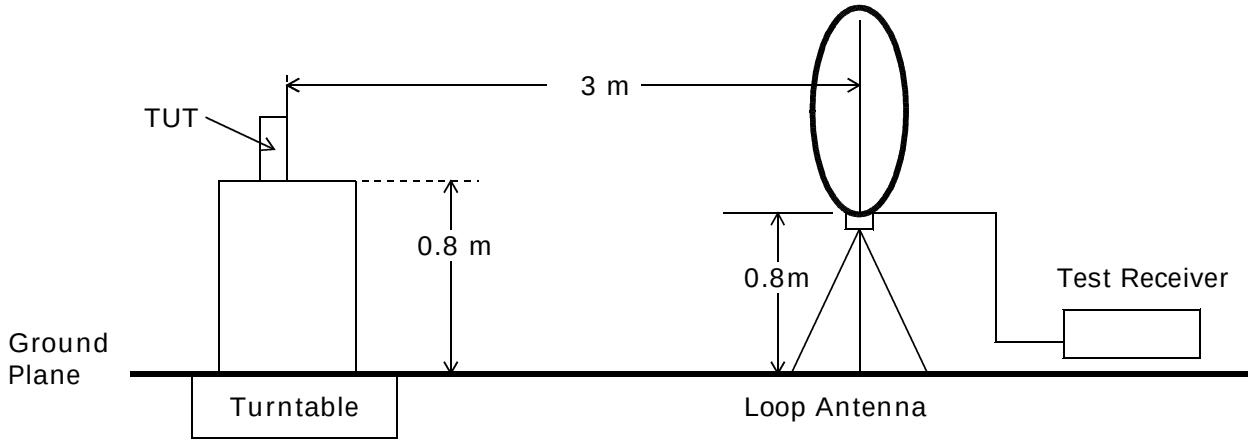
ERP(dBm) = P (dBm) + Gh(dBi) - Gd(dBi)

Where, Gh(dBi) : Gain of the substitution horn antenna
Gd(dBi) : Gain of the half-dipole antenna

In the frequency up to 30MHz, the radiated emission was carried out using the loop antenna.

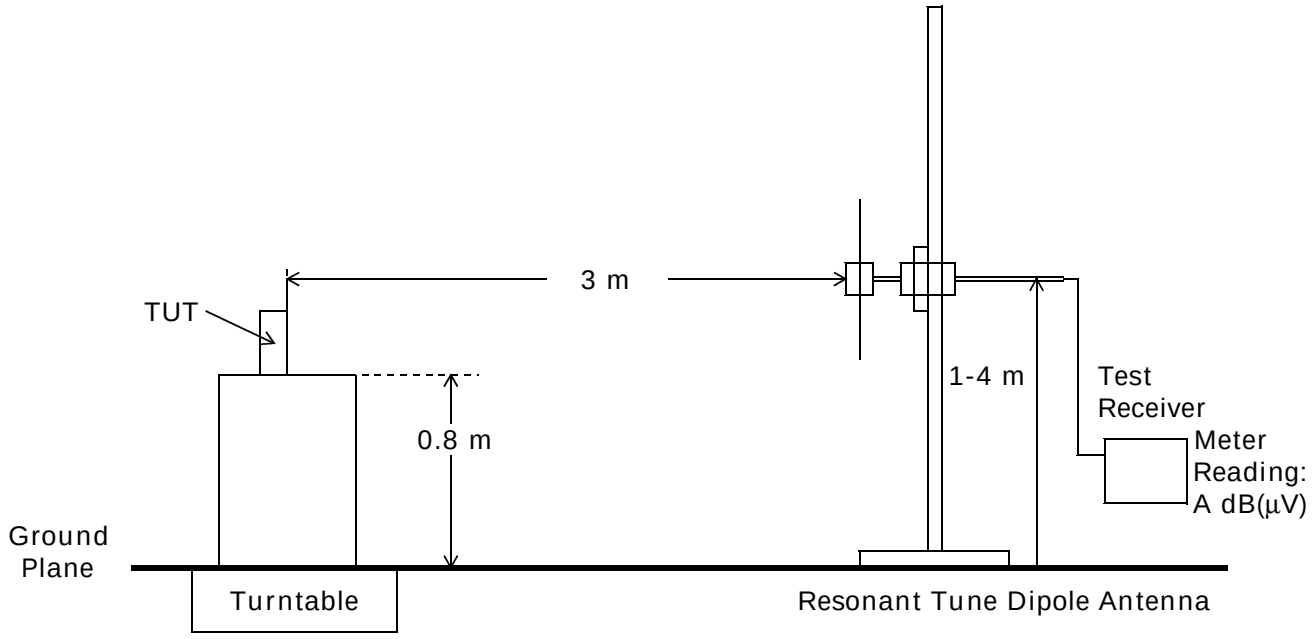
Transmitter Test Condition :

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

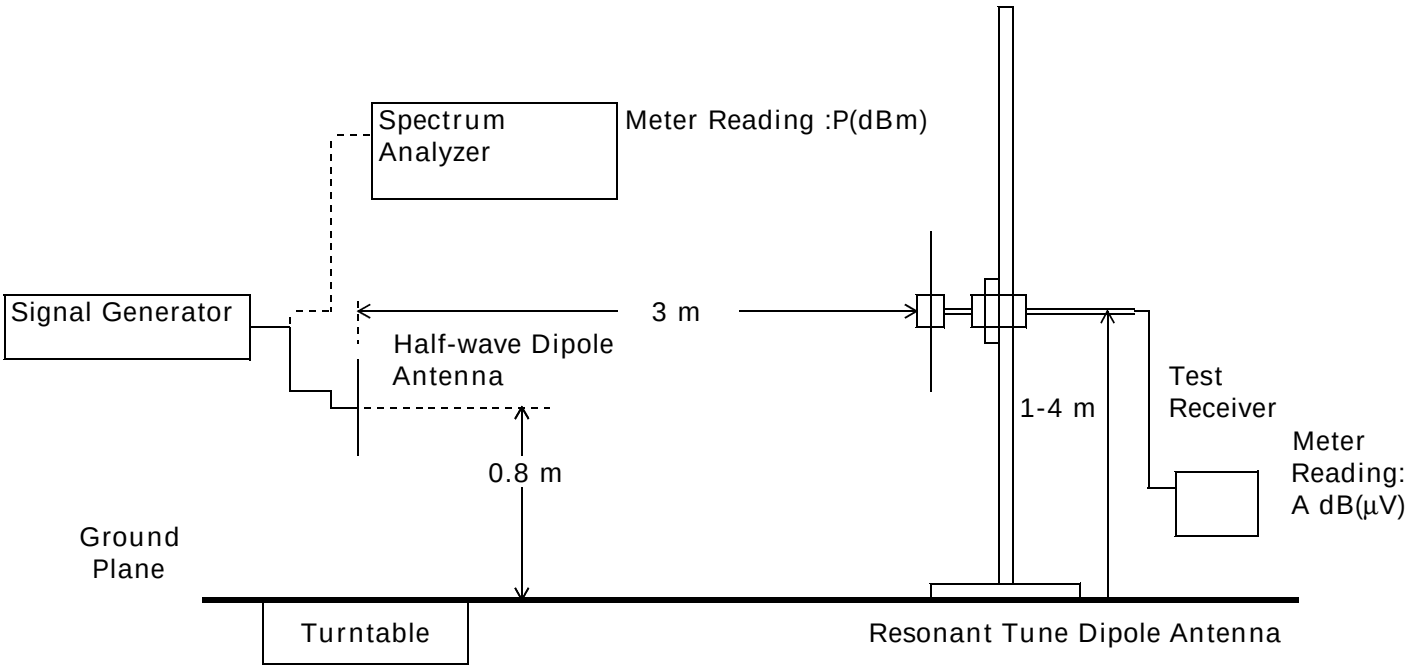


(a) Measurement set up for up to 30 MHz

Fig.2 Unwanted Radiation Measurement



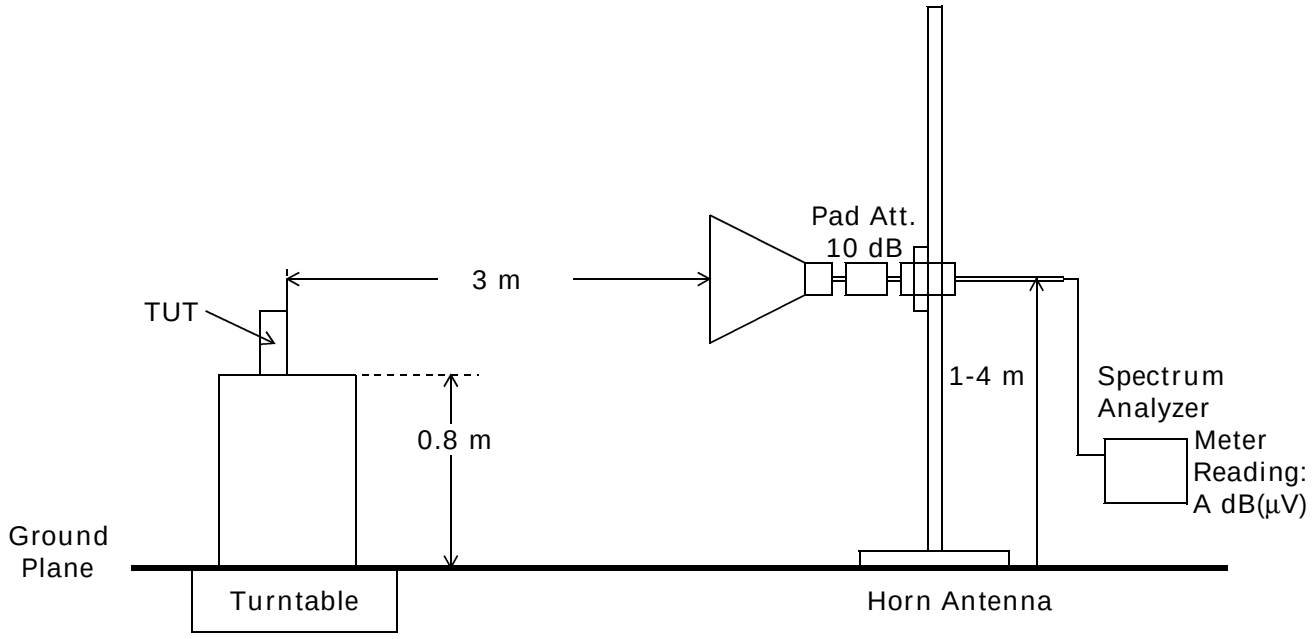
(b-1) TUT



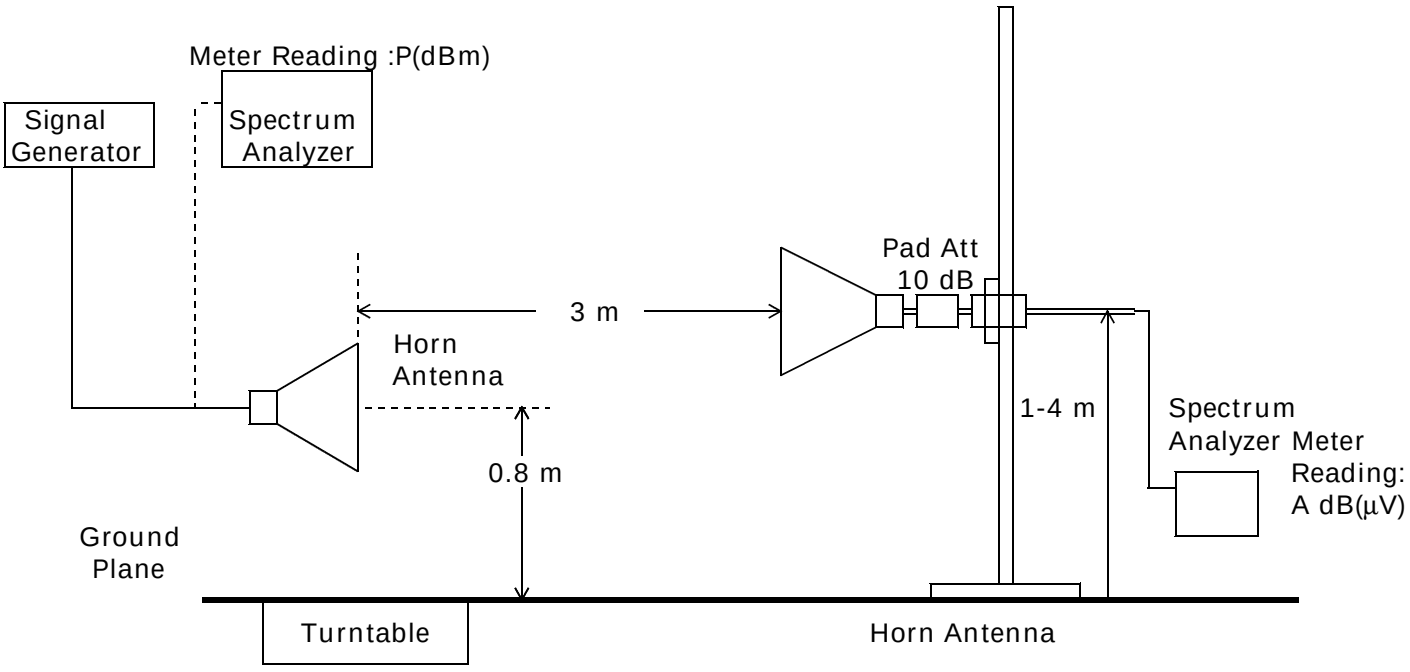
(b-2)Substitution Half-wave Dipole Antenna

(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, 2000	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	November, 1999	1 Year
● - KBA-611	C - 19	November, 1999	1 Year
○ - 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, 2000	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, 2000	1 Year
● - 4T-10	D - 74	May, 2000	1 Year
● - WJ-6611-513	A - 23	May, 2000	1 Year
● - WJ-6882-824	A - 21	May, 2000	1 Year
● - DBL-0618N515	A - 33	October, 1999	1 Year
● - UHF-128	D - 43	April, 2000	1 Year
● - 91888-2	C - 40 - 1	May, 2000	1 Year
● - 91888-2	C - 41 - 1	May, 2000	1 Year
● - 91889-2	C - 41 - 1	May, 2000	1 Year
● - 91889-2	C - 41 - 2	May, 2000	1 Year
○ - 94613-1	C - 41 - 3		
○ - 91891-2	C - 41 - 4		
○ - 94614-1	C - 41 - 5		
○ - 3160-04	C - 55		
○ - 3160-05	C - 56		
○ - 3160-06	C - 57		
○ - 3160-07	C - 58		
○ - 3160-08	C - 59		
○ - 3160-09	C - 48		
○ - 3160-10	C - 49		
○ - TRA-603D	D - 24		
○ - 8494H/8595H	D - 76		
○ - MZ5010C	D - 81		
● - Cable	C - 40 - 11	May, 2000	1 Year
● - Cable	C - 40 - 12	May, 2000	1 Year

Environmental conditions :

Temperature: 26 °C Humidity: 55 %

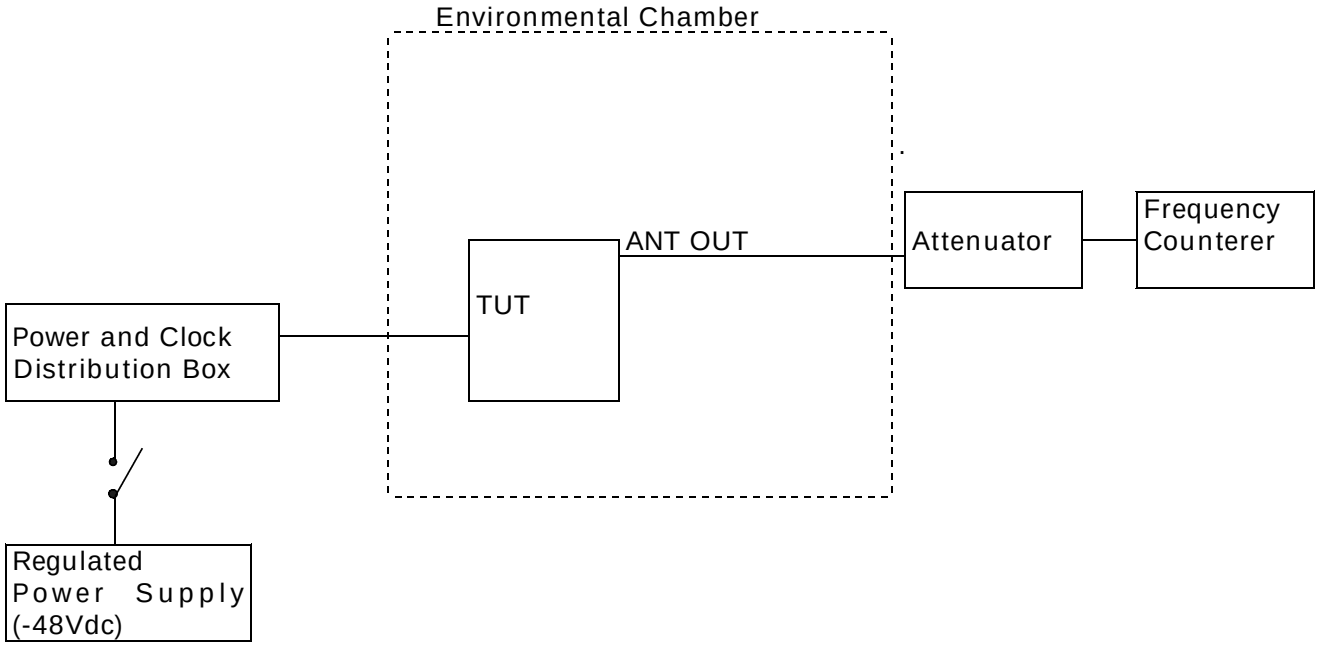
Frequency Stability Measurement(§2.1055, §22.355)

a) Frequency Stability Measurement versus Temperature

The TUT was placed in an environmental chamber and was tested in the range from -30 to +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 from -30 to +50 degrees Celsius at the interval of 10 degrees.

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.



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, 2000	1 Year
● - 6032A	F - 5	April, 2000	1 Year
● - TR5212	B - 30	March, 2000	1 Year
○ - 538B	13006007-B		

CONFIGURATION OF TUT

The Transmitter Under Test (TUT) consists of :

Description	Applicant (Manufacturer)	Model No. (Serial No.)	FCC ID
800MHz Wireless Base Station Unit (WBSU)	MITSUBISHI ELECTRIC CORPORATION (MITSUBISHI ELECTRIC CORPORATION)	FS-468F-E (40500001)	OXN800MTDMA 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 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

Excecpt 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 : 869.040 MHz(991ch) - 893.970 MHz(799ch)

Detailed Receiver portion :

Receiving frequency : 824.040 MHz(991ch) - 848.970 MHz(799ch)

1) RX portion
- 1st Local frequency : 685.890 MHz(991ch) - 710.820 MHz(799ch)
- 2nd Local frequency : 137.70 MHz
- 1st Intermediate frequency : 138.15 MHz
- 2nd Intermediate frequency : 450 kHz

2) MX portion
- MX Receiving frequency : 869.040 MHz(991ch) - 893.970 MHz(799ch)
- MX IF Local frequency : 954.420 MHz(991ch) - 979.350 MHz(799ch)
- Intermediate frequency : 85.38 MHz
- MX Local frequency : 268.53 MHz

3) Modulator & Mixer IC
- Mixer Local frequency : 685.890 MHz(991ch) - 710.820 MHz(799ch)
- MOD Local frequency : 183.15 MHz

Other Clock Frequency:

VCXO : 19.2 MHz(128kHz Reference clock(+/-0.1ppm) given from the CONTROLLER Outside
LO for RF loopback Test : 45.00 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 transmitter power is	107.2	mW	at	869.040	MHz and
			at	881.400	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	16.4	dB	at	4345.20	MHz
Max. limit exceeding		dB	at		MHz
Uncertainty of measurement results	+1.3	dB(2σ)		-1.3	dB(2σ)

Remarks:

Transmitter Power(ERP)

The requirements are	● - **Passed**			○ - **Not Passed**	
The Maximum ERP is	2.692	mW	at	881.400	MHz
Min. limit margin	52.7	dB	at	881.400	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 45
The results(Band-edge Emission) Refer to pages 46 - 47

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 - 10 GHz)

The requirements are ● - **Passed** ○ - **Not Passed**

Min. limit margin 39.1 dB at 4345.20 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	- 10 GHz	+3.1	dB(2σ)	-3.2	dB(2σ)

Remarks:

Frequency Stability

Frequency Stability : Less than 0.10 ppm at 869.040 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 22 (October 1, 1998) under the test configuration, as shown in page 35.

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 : July 6, 2000

End of testing : July 14, 2000

- JAPAN QUALITY ASSURANCE ORGANIZATION -

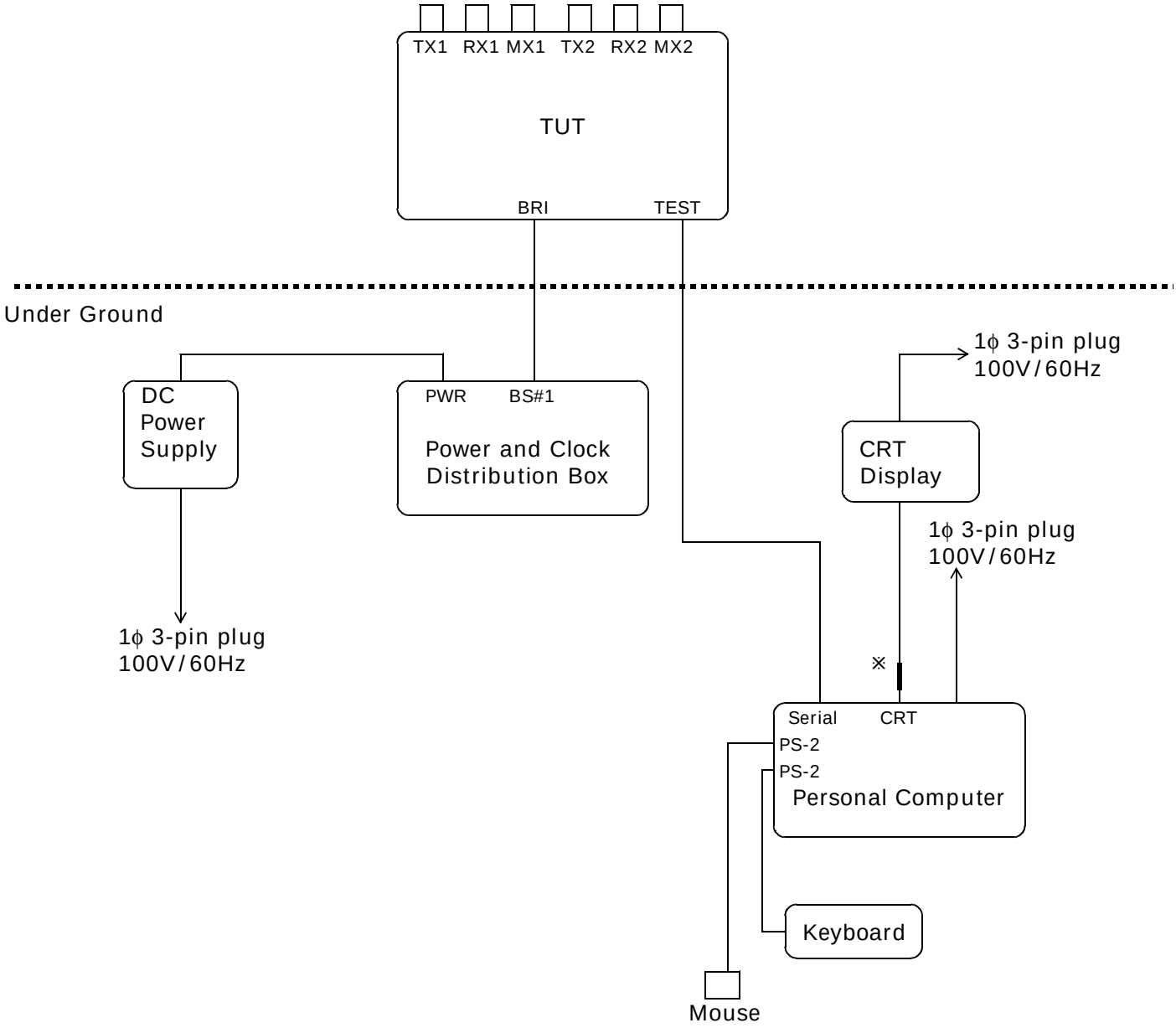
Approved by :

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

Issued by :

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

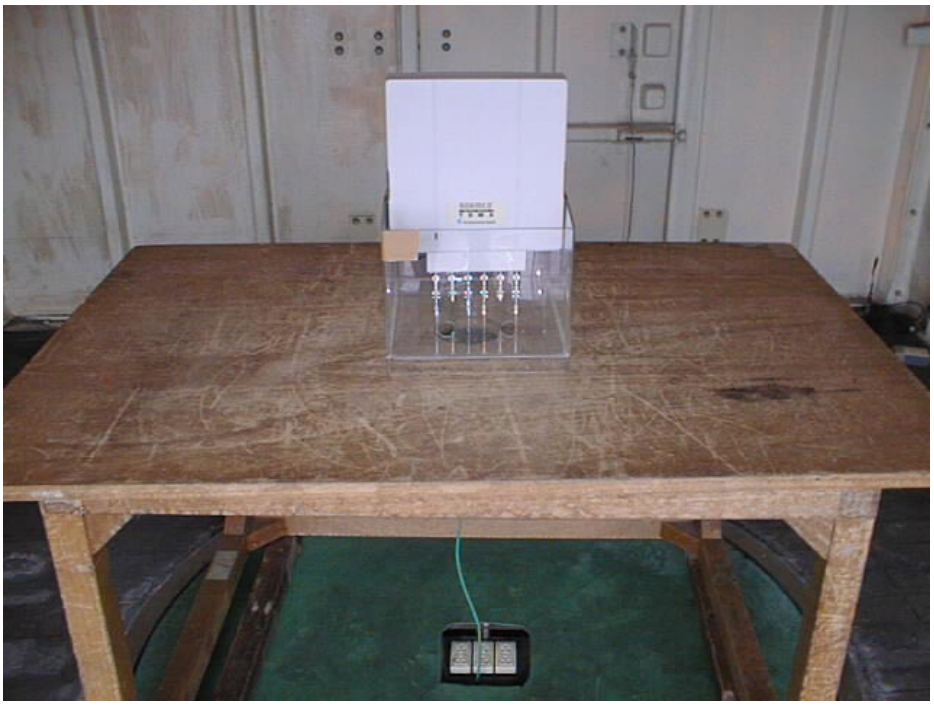
Test System-Arrangement (Drawings)



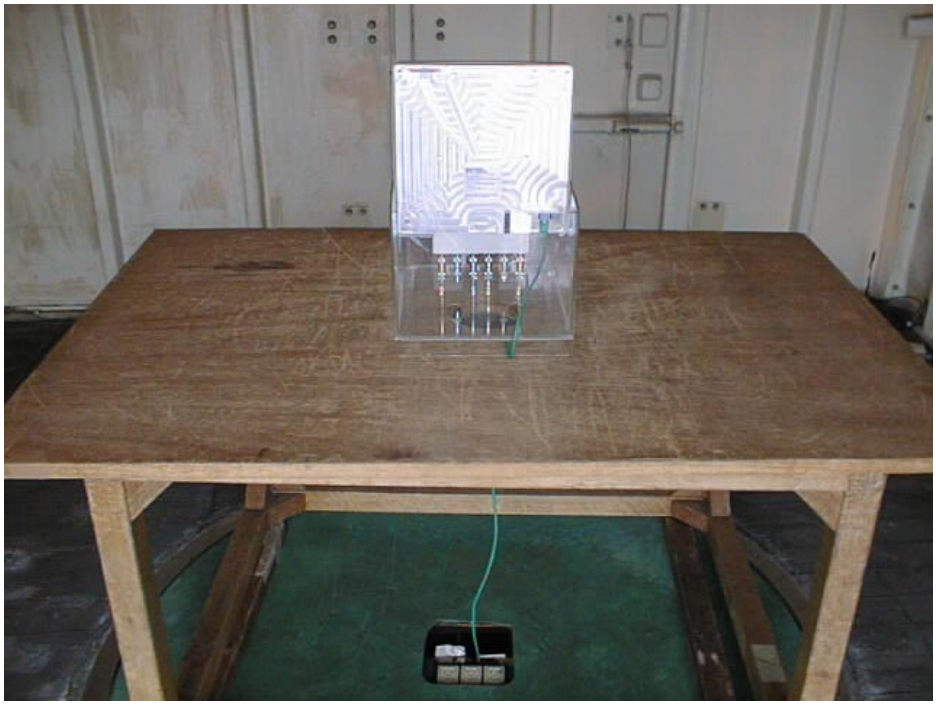
Note) ※ - Applied Ferrite Core

Test-Setup (Photographs) at worst case

Radiated Emission



Front View



Rear View

Transmitter Power(TP) Measurement

Test Date: July 6, 2000
Temp.: 23 °C ; Humi.: 52 %

Measurement Results:

1) Transmitting Antenna Terminal : TX1

Frequency (MHz)	Corr. Factor (dB)	Meter Reading (dBm)	Result (dBm)	Result (mW)
869.040	10.1	10.2	20.3	107.2
881.400	10.1	10.2	20.3	107.2
893.970	10.1	10.1	20.2	104.7

2) Transmitting Antenna Terminal : TX2

Frequency (MHz)	Corr. Factor (dB)	Meter Reading (dBm)	Result (dBm)	Result (mW)
869.040	10.1	10.1	20.2	104.7
881.400	10.1	9.8	19.9	97.7
893.970	10.1	9.9	20.0	100.0

Sample of calculated result at 869.040 MHz, as he Maximum Level Point:

	Correction Factor	=	10.1 dB
+)	Meter Reading	=	10.2 dBm
	Result	=	20.3 dBm : $10^{(20.3/10)}$ = 107.2(mW)

The point shown on "___ " is the Maximum Level Point.

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

Tester Signature : A. Hosoda

Type Name : Akio Hosoda

Antenna Conducted Spurious Emission Measurement

Test Date: July 6, 2000
Temp.: 23 °C ; Humi.: 52 %

Measurement Results:

1-a) Transmitting Frequency : 869.04 MHz
Transmitting Antenna Terminal : TX1

Frequency (MHz)	Corr. Factor (dB)	Meter Reading (dBm)	Result (dBm)	Limits (dBm)	Margin (dB)	Remarks (Note2)
1738.08	10.6	<-77.0	<-66.4	-13.0	>+53.4	B
2607.12	10.4	<-77.0	<-66.6	-13.0	>+53.6	A
3476.16	10.5	<-77.0	<-66.5	-13.0	>+53.5	A
4345.20	10.5	-39.9	-29.4	-13.0	+16.4	A
5214.24	10.8	<-77.0	<-66.2	-13.0	>+53.2	A
6083.28	10.8	<-77.0	<-66.2	-13.0	>+53.2	A
6952.32	10.9	<-77.0	<-66.1	-13.0	>+53.1	A
7821.36	11.0	<-77.0	<-66.0	-13.0	>+53.0	A
8690.40	11.0	<-77.0	<-66.0	-13.0	>+53.0	A

1-b) Transmitting Frequency : 881.40 MHz
Transmitting Antenna Terminal : TX1

Frequency (MHz)	Corr. Factor (dB)	Meter Reading (dBm)	Result (dBm)	Limits (dBm)	Margin (dB)	Remarks (Note2)
1762.80	10.6	<-77.0	<-66.4	-13.0	>+53.4	B
2644.20	10.4	<-77.0	<-66.6	-13.0	>+53.6	A
3525.60	10.5	<-77.0	<-66.5	-13.0	>+53.5	A
4407.00	10.5	-53.8	-43.3	-13.0	+30.3	A
5288.40	10.8	<-77.0	<-66.2	-13.0	>+53.2	A
6169.80	10.8	<-77.0	<-66.2	-13.0	>+53.2	A
7051.20	10.9	<-77.0	<-66.1	-13.0	>+53.1	A
7932.60	11.0	<-77.0	<-66.0	-13.0	>+53.0	A
8814.00	11.0	<-77.0	<-66.0	-13.0	>+53.0	A

1-c) Transmitting Frequency : 893.97 MHz
Transmitting Antenna Terminal : TX1

Frequency (MHz)	Corr. Factor (dB)	Meter Reading (dBm)	Result (dBm)	Limits (dBm)	Margin (dB)	Remarks (Note2)
1787.94	10.6	<-77.0	<-66.4	-13.0	>+53.4	B
2681.91	10.4	<-77.0	<-66.6	-13.0	>+53.6	A
3575.88	10.5	<-77.0	<-66.5	-13.0	>+53.5	A
4469.85	10.6	-61.7	-51.1	-13.0	+38.1	A
5363.82	10.8	<-77.0	<-66.2	-13.0	>+53.2	A
6257.79	10.8	<-77.0	<-66.2	-13.0	>+53.2	A
7151.76	10.9	<-77.0	<-66.1	-13.0	>+53.1	A
8045.73	11.0	<-77.0	<-66.0	-13.0	>+53.0	A
8939.70	11.0	<-77.0	<-66.0	-13.0	>+53.0	A

2-a) Transmitting Frequency : 869.04 MHz
Transmitting Antenna Terminal : TX2

Frequency (MHz)	Corr. Factor (dB)	Meter Reading (dBm)	Result (dBm)	Limits (dBm)	Margin (dB)	Remarks (Note2)
1738.08	10.6	<-77.0	<-66.4	-13.0	>+53.4	B
2607.12	10.4	-73.6	-63.2	-13.0	+50.2	A
3476.16	10.5	<-77.0	<-66.5	-13.0	>+53.5	A
4345.20	10.5	-40.5	-30.0	-13.0	+17.0	A
5214.24	10.8	-74.2	-63.4	-13.0	+50.4	A
6083.28	10.8	-73.1	-62.3	-13.0	+49.3	A
6952.32	10.9	<-77.0	<-66.1	-13.0	>+53.1	A
7821.36	11.0	<-77.0	<-66.0	-13.0	>+53.0	A
8690.40	11.0	<-77.0	<-66.0	-13.0	>+53.0	A

2-b) Transmitting Frequency : 881.40 MHz
Transmitting Antenna Terminal : TX2

Frequency (MHz)	Corr. Factor (dB)	Meter Reading (dBm)	Result (dBm)	Limits (dBm)	Margin (dB)	Remarks (Note2)
1762.80	10.6	<-77.0	<-66.4	-13.0	>+53.4	B
2644.20	10.4	-74.7	-64.3	-13.0	+51.3	A
3525.60	10.5	<-77.0	<-66.5	-13.0	>+53.5	A
4407.00	10.5	-54.0	-43.5	-13.0	+30.5	A
5288.40	10.8	-68.4	-57.6	-13.0	+44.6	A
6169.80	10.8	-76.8	-66.0	-13.0	+53.0	A
7051.20	10.9	<-77.0	<-66.1	-13.0	>+53.1	A
7932.60	11.0	<-77.0	<-66.0	-13.0	>+53.0	A
8814.00	11.0	<-77.0	<-66.0	-13.0	>+53.0	A

2-c) Transmitting Frequency : 893.97 MHz
Transmitting Antenna Terminal : TX2

Frequency (MHz)	Corr. Factor (dB)	Meter Reading (dBm)	Result (dBm)	Limits (dBm)	Margin (dB)	Remarks (Note2)
1787.94	10.6	<-77.0	<-66.4	-13.0	>+53.4	B
2681.91	10.4	-75.3	-64.9	-13.0	+51.9	A
3575.88	10.5	<-77.0	<-66.5	-13.0	>+53.5	A
4469.85	10.6	-61.3	-50.7	-13.0	+37.7	A
5363.82	10.8	-69.1	-58.3	-13.0	+45.3	A
6257.79	10.8	<-77.0	<-66.2	-13.0	>+53.2	A
7151.76	10.9	<-77.0	<-66.1	-13.0	>+53.1	A
8045.73	11.0	<-77.0	<-66.0	-13.0	>+53.0	A
8939.70	11.0	<-77.0	<-66.0	-13.0	>+53.0	A

Sample of calculated result at 4345.20 MHz, as the Minimum Margin point:

Correction Factor	=	10.5 dB
+) Meter Reading	=	-39.9 dBm
Result	=	-29.4 dBm

Minimum Margin : -13.0 - (-29.4) = 16.4(dB)
The point shown on "___ " is the Minimum Margin Point.

Applied limits :
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(W)] = 10log[TP(mW)] - 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+P10
B	Peak (SP)	1 MHz	1 MHz	20 msec	0 Hz	CL+P10+HPF
C	Peak (ESV)	120 kHz	--	--	--	CL+P10

*)CL: Cable Loss/ P20: 20dB Att. / P10: 10dB Att. / Amp.: Amplifier Gain/ HPF: Hight Pass Filter

Tester Signature : A. Hosoda

Type Name : Akio Hosoda

Transmitter Power(ERP) Measurement

Test Date: July 14 , 2000
Temp.: 31 °C ; Humi.: 50 %

Measurement Results:

1) Transmitting Antenna Terminal : TX1

Frequency (MHz)	Maximum Transmitter Power ERP(mW)		Limits (W)	Margin (dB)
	Hori.	Vert.		
869.040	0.072	0.525	500.0	+59.8
881.400	0.081	0.891	500.0	+57.5
893.970	0.069	0.813	500.0	+57.9

2) Transmitting Antenna Terminal : TX2

Frequency (MHz)	Maximum Transmitter Power ERP(mW)		Limits (W)	Margin (dB)
	Hori.	Vert.		
869.040	0.708	1.905	500.0	+54.2
881.400	0.646	2.692	500.0	+52.7
893.970	0.661	1.905	500.0	+54.2

Minimum Margin : 10log(500.0/(2.692/1000)) = 52.7(dB)
The point shown on "___ " is the Minimum Margin Point.

Tester Signature : A. Hosoda

Type Name : Akio Hosoda

Occupied Bandwidth Measurement

Test Date: July 6 , 2000
Temp.: 23 °C ; Humi.: 52 %

1) Occupied Bandwidth measurement

Measurement Results:

Attached Graph : Refer to page 45.

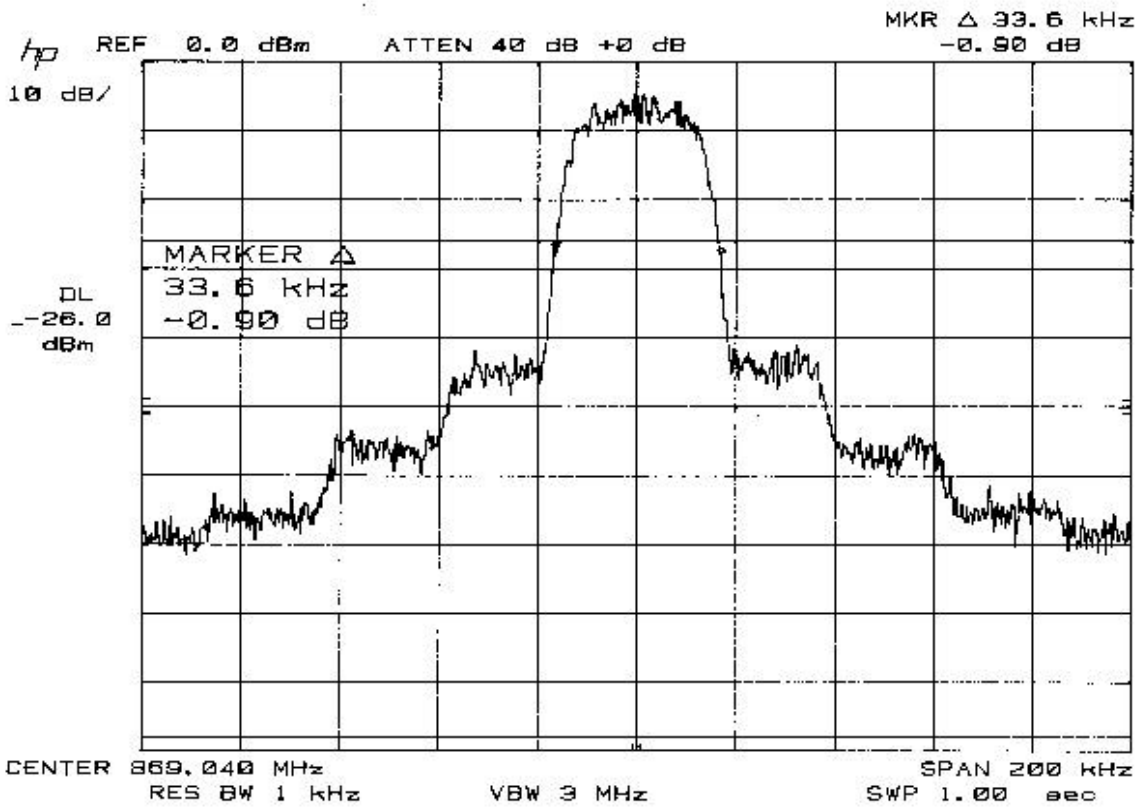
2) Band-edge Emission measurement

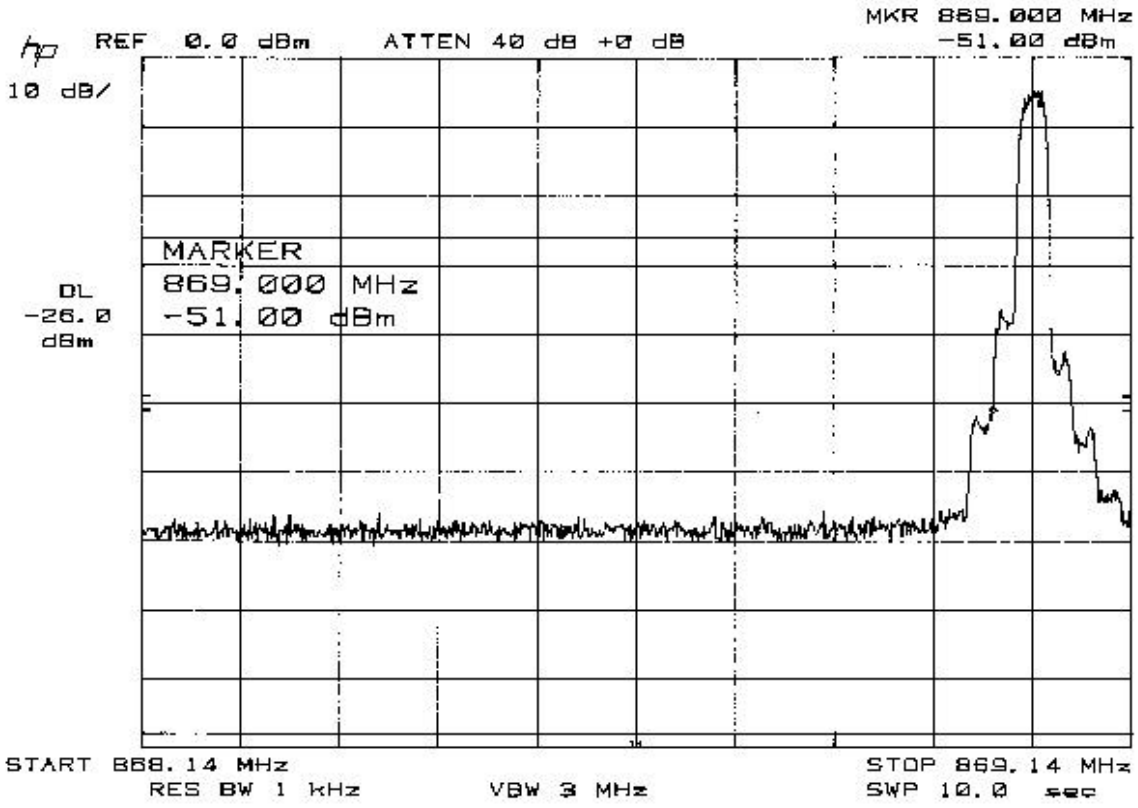
Measurement Results:

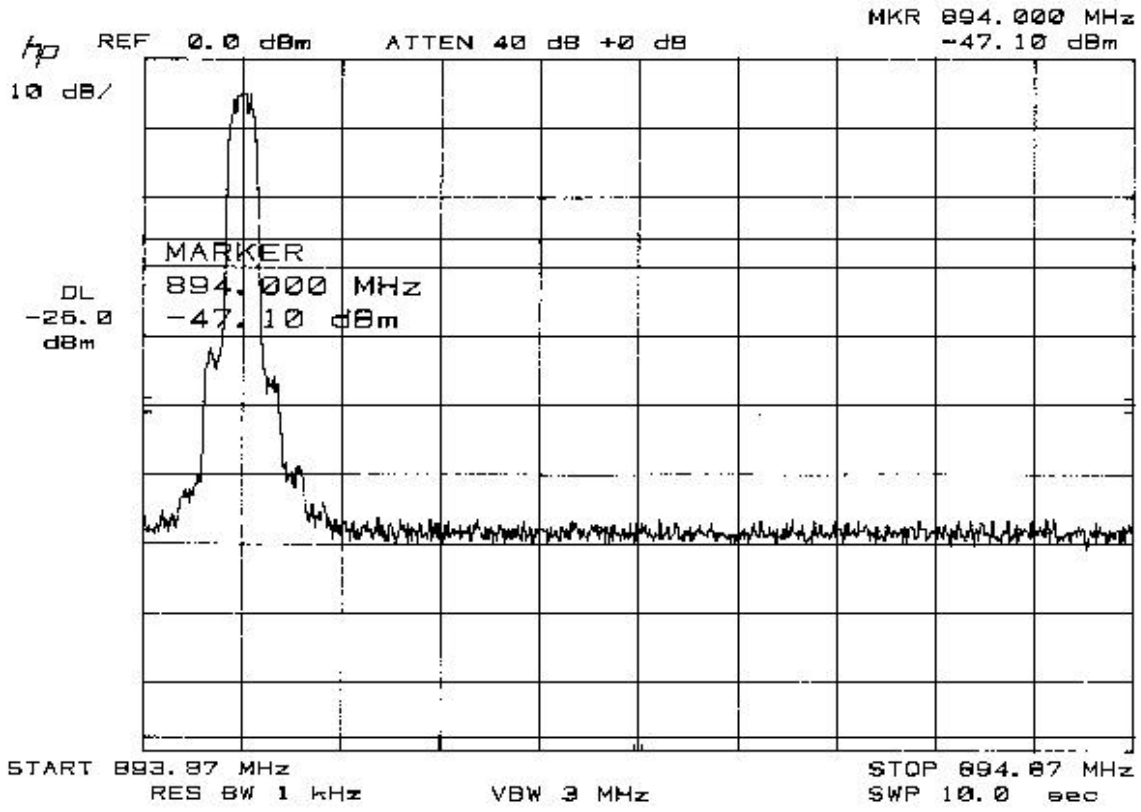
Attached Graph : Refer to pages 46 - 47.
Note : Specified limits(§22.917)

Tester Signature : A. Hosoda

Type Name : Akio Hosoda


MKR Δ 33.6 kHz
-0.90 dB
REF 0.0 dBm
ATTEN 40 dB +0 dB
10 dB/
MARKER Δ
33.6 kHz
-0.90 dB
DL
-26.0
dBm
CENTER 869.040 MHz
SPAN 200 kHz
RES BW 1 kHz
VBW 3 MHz
SWP 1.00 sec


MKR 869.000 MHz
-51.00 dBm
REF 0.0 dBm
ATTEN 40 dB +0 dB
10 dB/
MARKER
869.000 MHz
-51.00 dBm
DL
-26.0
dBm
START 868.14 MHz
RES BW 1 kHz
VBW 3 MHz
STOP 869.14 MHz
SWP 10.0 sec


MKR 894.000 MHz
-47.10 dBm
REF 0.0 dBm
ATTEN 40 dB +0 dB
10 dB/
MARKER
894.000 MHz
-47.10 dBm
DL
-26.0
dBm
START 893.87 MHz
RES BW 1 kHz
VBW 3 MHz
STOP 894.87 MHz
SWP 10.0 sec

Unwanted Radiation Measurement

Test Date: July 10, 2000
Temp.: 26 °C ; Humi.: 55 %

Measurement Results:

1-a) Transmitting Frequency : 869.04 MHz
Transmitting Antenna Terminal : TX1

Frequency (MHz)	ERP [dBm] Hori.	ERP [dBm] Vert.	Limits [dBm]	Margin (dB)	Remarks (Note 3)
1738.08	<-84.2	<-84.2	-13.0	>+71.2	E
2607.12	-63.1	-66.1	-13.0	+50.1	B
3476.16	<-66.3	<-66.3	-13.0	>+53.3	B
4345.20	-52.1	-56.1	-13.0	+39.1	B
5214.24	<-61.4	<-61.4	-13.0	>+48.4	B
6083.28	<-57.7	<-57.7	-13.0	>+44.7	B
6952.32	<-57.5	<-57.5	-13.0	>+44.5	B
7821.36	-56.3	-56.3	-13.0	+43.3	C
8690.40	<-61.8	<-61.8	-13.0	>+48.8	C

1-b) Transmitting Frequency : 881.40 MHz
Transmitting Antenna Terminal : TX1

Frequency (MHz)	ERP [dBm] Hori.	ERP [dBm] Vert.	Limits [dBm]	Margin (dB)	Remarks (Note 3)
1762.80	<-84.2	<-84.2	-13.0	>+71.2	E
2644.20	<-67.9	-66.9	-13.0	+53.9	B
3525.60	-65.3	-65.3	-13.0	+52.3	B
4407.00	<-61.1	<-61.1	-13.0	>+48.1	B
5288.40	<-61.3	<-61.3	-13.0	>+48.3	B
6169.80	<-57.7	<-57.7	-13.0	>+44.7	B
7051.20	<-57.5	<-57.5	-13.0	>+44.5	B
7932.60	<-65.1	<-65.1	-13.0	>+52.1	C
8814.00	<-61.8	<-61.8	-13.0	>+48.8	C

1-c) Transmitting Frequency : 893.97 MHz
Transmitting Antenna Terminal : TX1

Frequency (MHz)	ERP [dBm]		Limits [dBm]	Margin (dB)	Remarks (Note 3)
	Hori.	Vert.			
1787.94	<-84.6	<-84.6	-13.0	>+71.6	E
2681.91	<-67.7	<-67.7	-13.0	>+54.7	B
3575.88	-61.2	-64.2	-13.0	+48.2	B
4469.85	<-61.0	<-61.0	-13.0	>+48.0	B
5363.82	<-61.3	<-61.3	-13.0	>+48.3	B
6257.79	<-57.6	<-57.6	-13.0	>+44.6	B
7151.76	<-57.3	<-57.3	-13.0	>+44.3	B
8045.73	<-65.1	<-65.1	-13.0	>+52.1	C
8939.70	<-61.9	<-61.9	-13.0	>+48.9	C

2-a) Transmitting Frequency : 869.04 MHz
Transmitting Antenna : TX2

Frequency (MHz)	ERP [dBm]		Limits [dBm]	Margin (dB)	Remarks (Note 3)
	Hori.	Vert.			
1738.08	<-84.2	<-84.2	-13.0	>+71.2	E
2607.12	<-68.1	-67.1	-13.0	+54.1	B
3476.16	<-66.3	-65.3	-13.0	+52.3	B
4345.20	-52.1	-52.1	-13.0	+39.1	B
5214.24	<-61.4	<-61.4	-13.0	>+48.4	B
6083.28	<-57.7	<-57.7	-13.0	>+44.7	B
6952.32	<-57.5	<-57.5	-13.0	>+44.5	B
7821.36	-55.3	-58.3	-13.0	+42.3	C
8690.40	<-61.8	<-61.8	-13.0	>+48.8	C

2-b) TerminalTransmitting Frequency : 881.40 MHz
Transmitting Antenna Terminal : TX2

Frequency (MHz)	ERP [dBm]		Limits [dBm]	Margin (dB)	Remarks (Note 3)
	Hori.	Vert.			
1762.80	<-84.2	<-84.2	-13.0	>+71.2	E
2644.20	-66.9	-66.9	-13.0	+53.9	B
3525.60	<-66.3	-65.3	-13.0	+52.3	B
4407.00	<-61.1	<-61.1	-13.0	>+48.1	B
5288.40	<-61.3	<-61.3	-13.0	>+48.3	B
6169.80	<-57.7	<-57.7	-13.0	>+44.7	B
7051.20	<-57.5	<-57.5	-13.0	>+44.5	B
7932.60	<-65.1	<-65.1	-13.0	>+52.1	C
8814.00	<-61.8	<-61.8	-13.0	>+48.8	C

2-c) Transmitting Frequency : 893.97 MHz
Transmitting Antenna Terminal : TX2

Frequency (MHz)	ERP [dBm]		Limits [dBm]	Margin (dB)	Remarks (Note 3)
	Hori.	Vert.			
1787.94	<-84.6	<-84.6	-13.0	>+71.6	E
2681.91	-66.7	-66.7	-13.0	+53.7	B
3575.88	-64.2	-62.2	-13.0	+49.2	B
4469.85	<-61.0	<-61.0	-13.0	>+48.0	B
5363.82	<-61.3	<-61.3	-13.0	>+48.3	B
6257.79	<-57.6	<-57.6	-13.0	>+44.6	B
7151.76	<-57.3	<-57.3	-13.0	>+44.3	B
8045.73	<-65.1	<-65.1	-13.0	>+52.1	C
8939.70	<-61.9	<-61.9	-13.0	>+48.9	C

Sample of calculated result at 4345.20 MHz, as the Minimum Margin point:
Minimum Margin : -13.0 - (-52.1) = 39.1(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+P10
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 (SP)	1 MHz	1 MHz	20 msec	0 Hz	ANT+CL+HPF+P10-Amp.
F	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/ HPF : High Pass Filter 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 : 869.040 MHz
Transmitting Antenna terminal : TX1
Supply voltage to the Power and Clock Distribution Box for the TUT : -48.0 Vdc
Test Date: July 7, 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
-10	<0.10	<0.10	<0.10	<0.10
0	<0.10	<0.10	<0.10	<0.10
+10	<0.10	<0.10	<0.10	<0.10
+20	<0.10	<0.10	<0.10	<0.10
+30	<0.10	<0.10	<0.10	<0.10
+40	<0.10	<0.10	<0.10	<0.10
+50	<0.10	<0.10	<0.10	<0.10

a-1-b) Transmitting(Reference) Frequency : 881.400 MHz
Transmitting Antenna terminal : TX1
Supply voltage to the Power and Clock Distribution Box for the TUT : -48.0 Vdc
Test Date: July 7, 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
-10	<0.10	<0.10	<0.10	<0.10
0	<0.10	<0.10	<0.10	<0.10
+10	<0.10	<0.10	<0.10	<0.10
+20	<0.10	<0.10	<0.10	<0.10
+30	<0.10	<0.10	<0.10	<0.10
+40	<0.10	<0.10	<0.10	<0.10
+50	<0.10	<0.10	<0.10	<0.10

a-1-c) Transmitting(Reference) Frequency : 893.970 MHz
Transmitting Antenna terminal : TX1
Supply voltage to the Power and Clock Distribution Box for the TUT : -48.0 Vdc
Test Date: July 7, 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
-10	<0.10	<0.10	<0.10	<0.10
0	<0.10	<0.10	<0.10	<0.10
+10	<0.10	<0.10	<0.10	<0.10
+20	<0.10	<0.10	<0.10	<0.10
+30	<0.10	<0.10	<0.10	<0.10
+40	<0.10	<0.10	<0.10	<0.10
+50	<0.10	<0.10	<0.10	<0.10

a-2-a) Transmitting(Reference) Frequency : 869.040 MHz
Transmitting Antenna terminal : TX2
Supply voltage to the Power and Clock Distribution Box for the TUT : -48.0 Vdc
Test Date: July 7, 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
-10	<0.10	<0.10	<0.10	<0.10
0	<0.10	<0.10	<0.10	<0.10
+10	<0.10	<0.10	<0.10	<0.10
+20	<0.10	<0.10	<0.10	<0.10
+30	<0.10	<0.10	<0.10	<0.10
+40	<0.10	<0.10	<0.10	<0.10
+50	<0.10	<0.10	<0.10	<0.10

a-2-b) Transmitting(Reference) Frequency : 881.400 MHz
Transmitting Antenna terminal : TX2
Supply voltage to the Power and Clock Distribution Box for the TUT : -48.0 Vdc
Test Date: July 7, 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
-10	<0.10	<0.10	<0.10	<0.10
0	<0.10	<0.10	<0.10	<0.10
+10	<0.10	<0.10	<0.10	<0.10
+20	<0.10	<0.10	<0.10	<0.10
+30	<0.10	<0.10	<0.10	<0.10
+40	<0.10	<0.10	<0.10	<0.10
+50	<0.10	<0.10	<0.10	<0.10

a-2-c) Transmitting(Reference) Frequency : 893.970 MHz
Transmitting Antenna terminal : TX2
Supply voltage to the Power and Clock Distribution Box for the TUT : -48.0 Vdc
Test Date: July 7, 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
-10	<0.10	<0.10	<0.10	<0.10
0	<0.10	<0.10	<0.10	<0.10
+10	<0.10	<0.10	<0.10	<0.10
+20	<0.10	<0.10	<0.10	<0.10
+30	<0.10	<0.10	<0.10	<0.10
+40	<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 : 869.040 MHz
Transmitting Antenna terminal : TX1
Ambient Temperature : +20°C

Test Date: July 8, 2000

Suplly 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 : 881.400 MHz
Transmitting Antenna terminal : TX1
Ambient Temperature : +20°C

Test Date: July 8, 2000

Suplly 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-c) Transmitting(Reference) Frequency : 893.970 MHz
Transmitting Antenna terminal : TX1
Ambient Temperature : +20°C

Test Date: July 8, 2000

Suplly 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 : 869.040 MHz
Transmitting Antenna terminal : TX2
Ambient Temperature : +20°C

Test Date: July 8, 2000

Suplly 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 : 881.400 MHz
Transmitting Antenna terminal : TX2
Ambient Temperature : +20°C

Test Date: July 8, 2000

Suplly 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

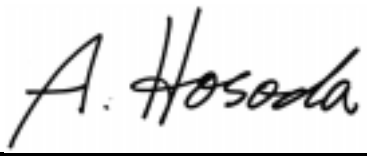
b-2-c) Transmitting(Reference) Frequency : 893.970 MHz
Transmitting Antenna terminal : TX2
Ambient Temperature : +20°C

Test Date: July 8, 2000

Suplly 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 Caluculation at 869.040 MHz for TX1,20°C Startup -48.0Vdc) :
((869.0400063 - 869.0400000)/869.0400000)x10^{6} = +7.2 x10^{-3}(ppm)

Tester Signature : 

Type Name : Akio Hosoda

Maximum Permissible Exposure(MPE) :

The limit for Maximum Permissible Exposure(MPE) at frequency of 894 MHz is 0.60 mW/cm^2. (f[MHz]/1500 mW/cm^2 for General Population/Uncontrolled environment in §1.1310.) Since the total power of all channels is less than 1000 WERP(1640 WEIRP), compliance testing with the MPE limits of §1.1307 is not required.

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);
G is the numeric gain of the antenna; and
ERP is Effective Radiated Power = 3.00 (mW); and
EIRP is Equivalent Isotropically Radiated Power(=PrG) = 1.64 x ERP = 4.92 (mW); 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
Measured Maximum EIRP(W)	0.005
Power Density(W/m^2)	40.0E-5
Power Density(mW/cm^2)	4.0E-5
Minimum distance in m for MPE	0.008

At this power level, an individual would need to be within 0.0008 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.