EMC EMISSION - TEST REPORT

JQA APPLICATION No. : KL80020490S

Name of Product : Tri-Band(PCS&GSM,DCS) Cellular Phone

Model / Type No. : GS-200

FCC ID : APYHRO00027

Applicant : Sharp Corporation

Address : 2-13-1, Iida Hachihonmatsu, Higashihiroshima-city,
: Hiroshima 739-0192, JAPAN

Manufacturer : Sharp Corporation

Address : 2-13-1, Iida Hachihonmatsu, Higashihiroshima-city,
: Hiroshima 739-0192, JAPAN

Receive date of EUT : November 18, 2002

Final Judgement : passed

TEST RESULTS IN THIS REPORT are obtained in use of equipment that is traceable to National Institute of Advanced Industrial Science and Technology(AIST) under METI Japan and Communications Research Lab.(CRL) under MPHPT Japan.

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

Authorized by:

Takashi Yamanaka, Director
JQA KITA-KANSAI Testing Center

DIRECTORY

TEST REGULATION

FCC Rules and Regulations Part 24 (October 1, 2001)

1900 MHz systems
○ - Narrowband PCS
● - Broadband PCS

Test procedure:

The tests were performed according to FCC Rules and Regulations Part 2 (October 1, 2001), 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 : 1st Open Site (3, 10 and 30 m, on common plane)
: 2nd Open Site (3 and 10 m, on common plane)
Test Facility located at Tsuru : Anechoic Chamber (3 and 10 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 Equipment Under Test (EUT):

1) Name : Tri-Band (PCS&GSM,DCS) Celluar Phone
2) Model/Type No. : GS-200
3) Product Type : Prototype
4) Category : Broadband PCS
5) EUT Authorization : ○ - Verification ● - Certification ○ - D.o.C.
6) Transmitting Frequency : 1850.2 MHz (512 ch) - 1909.8 MHz (810 ch)
7) Receiving Frequency : 1930.2 MHz (512 ch) - 1989.8 MHz (810 ch)
8) Integrated Antenna : Shortened Mono-pole Antenna
9) Emission Designations : 300KGXW
10) Maximum RF Output Power : 1102.0mW(EIRP)
11) Power Rating : 3.9VDC
12) Channel Numbers and Frequencies for PCS 1900MHz
The carrier spacing is 200 kHz.
The carrier frequency is designated by the abaolute frequency channel number(ARFCN).
The carrier frequency is expessed in the equation shown as follows:

TX frequency(in MHz) = 1850.2 + 0.2 * (n -512)
RX frequency(in MHz) = 1930.2 + 0.2 * (n -512)
Where n : Channel Number($512 \leq n \geq 810$)

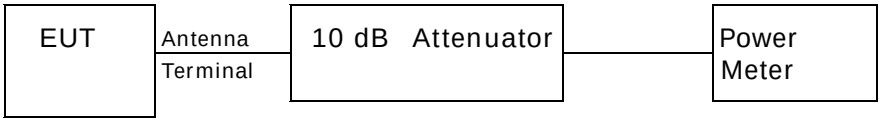
13) Modulation Type : GMSK
14) Type of Communication System : GSM

TEST CONDITIONS

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

Test Procedure :

The Transmitter Power was measured with a power meter, 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		
● - E4417A/E9321A	B - 51/B-52	July, 2002	1 Year
○ - 6-20	D - 27		
○ - 4T-10	D - 73		
● - 4T-10	D - 74	May, 2002	1 Year
○ - 2-10	D - 79		
○ - 2-10	D - 80		
○ - 8566B	A - 13		
○ - 8593A	A - 15		

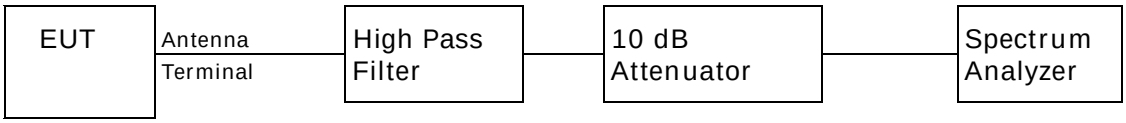
Environmental conditions :

Temperature: 22 °C Humidity: 44 %

Antenna Conducted Spurious Emission Measurement (§2.1051,§24.238))

Test Procedure :

The Antenna Conducted Emission was measured with a spectrum analyzer, one 10 dB attenuator, a high pass filter and a short, low loss cable.



Test location :

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

Used test instruments:

Model No.	Device ID	Last Cal. Date	Cal. Interval
○ - MP721C	D - 66		
● - 4T-10	D - 73	May, 2002	1 Year
○ - 4T-10	D - 74		
○ - 2-10	D - 79		
○ - 2-10	D - 80		
● - UHP-127	D - 42	May, 2002	1 Year
○ - UHP-128	D - 43		
● - 8566B	A - 13	January, 2002	1 Year
○ - 8593A	A - 15		

Environmental conditions:

Temperature: 22 °C Humidity: 40 %

Transmitter Power(EIRP) Measurement (§24.232)

The measurement were performed shown as follows.

Step 1) The test was set-up shown as Fig.2(a). In order to obtain the maximum emission, the EUT is placed at the height 1.0m on the non-conducted support, 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 EUT on the table was placed to be maximum emission against the receiving antenna polarized (Vertical and Horizontal). Then the meter reading of the spectrum analyzer at the maximum emission was A dB(μV).

Step 2) The test was set-up shown as Fig.2(b). The EUT 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 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 spectrum analyzer at the maximum emission was A dB(μV) ,same as the recorded level in Step1. Then the RF power into the substitution horn antenna was P(dBm).

The EIRP is calculated in the following equation.

$$EIRP(dBm) = P(dBm) + Gh(dBi)$$

Where, Gh(dBi) : Gain of the substitution horn antenna

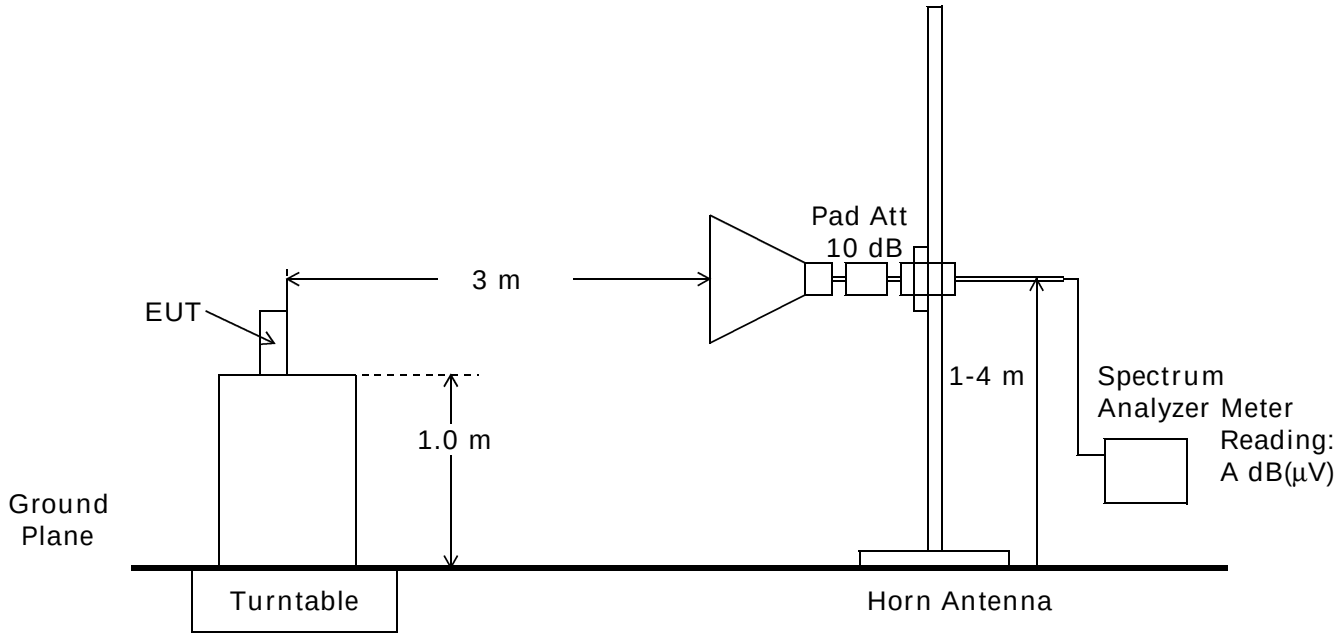
Test location:

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

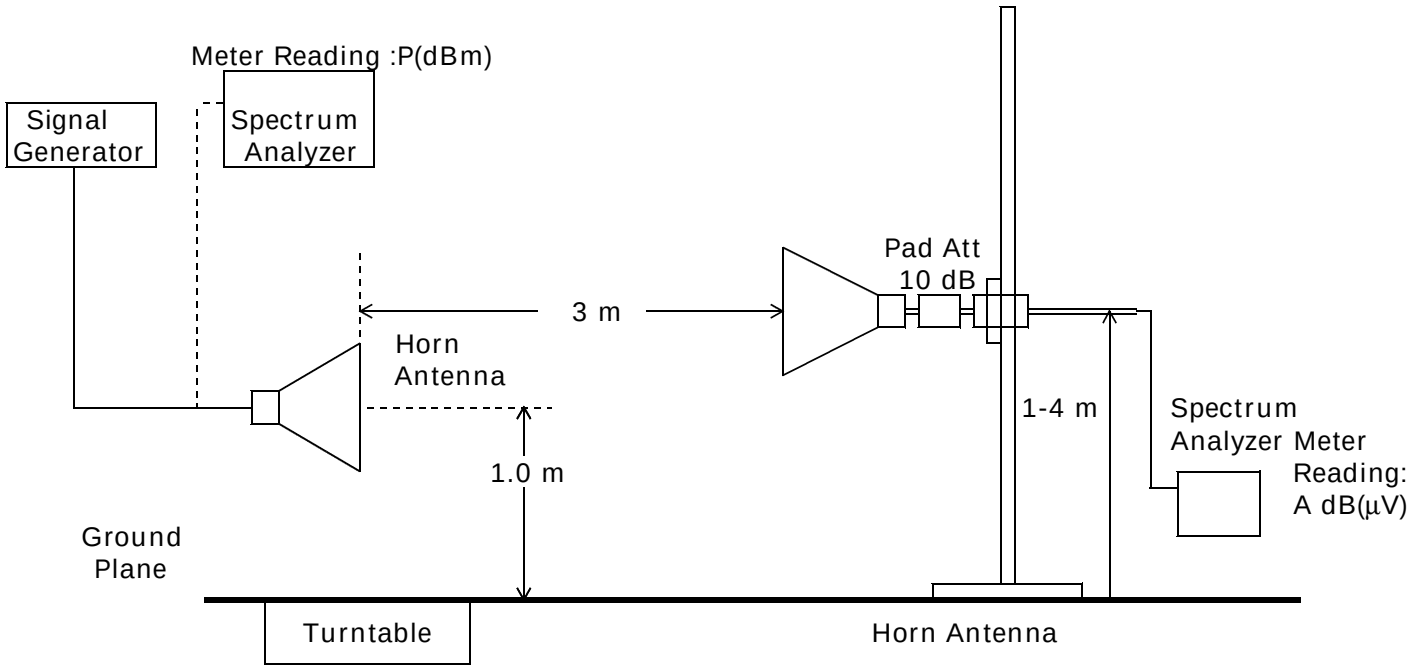
Used test instruments:

Model No.	Device ID	Last Cal. Date	Cal. Interval
○ - ESCS 30	A - 1		
○ - ESCS 30	A - 9		
● - 8566B	A - 13	January, 2002	1 Year
○ - 8593A	A - 15		
○ - ESV	A - 6		
○ - 4T-10	D - 73		
○ - 4T-10	D - 74		
○ - 2-10	D - 79		
● - 2-10	D - 80	September, 2002	1 Year
○ - WJ-6611-513	A - 23		
○ - WJ-6882-824	A - 21		
○ - DBL-0618N515	A - 33		
● - 91888-2	C - 40 - 1	May, 2002	1 Year
● - 91888-2	C - 41 - 1	May, 2002	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		
○ - MZ5010C	D - 81		
● - Cable	C - 40 - 11	May, 2002	1 Year
● - Cable	C - 40 - 12	May, 2002	1 Year
○ - 432B/8478B	B - 24/B-43		
● - ML2437A/ML2444A	B - 10/B-11	January, 2002	1 Year
○ - 8673D	B - 2		
● - MG3681A	B - 3	January, 2002	1 Year

Temperature: 22 °C Humidity: 44 %



(a) EUT



(b) Substitution Horn Antenna

Fig.2 Maximum Transmitter Power (EIRP) Measurement

Unwanted Radiation Measurement (§2.1053,§24.238)
- EIRP method -

Step 1) The spurious radiation for transmitter were measured at the distance 3m away from the TUT which was placed on a non-conducted support 1.0m 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 EUT 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.

Step 2) The EIRP measurement was carried out with according to Step 2 in page 7 . Then the RF power in the substitution antenna half-wave dipole antenna for up to 1GHz and the substitution horn antenna for above 1GHz.

The EIRP is calculated in the following equation.

A) Up to 1GHz

EIRP(dBm) = P (dBm) + Gd(dBi) - (Balun Loss of the half-wave dipole Ant. (dB)) + Cable Loss(dB)

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

B) Above 1GHz

EIRP(dBm) = P (dBm) + Gh(dBi)

Where, Gh(dBi) : Gain of the substitution horn antenna

The ERP is calculated in the following equation.

ERP[dBm] = EIRP (dBm)- Gd(dBi)

The respective calculated EIRP of the spurious and harmonics were compared with the EIRP and ERP of fundamental frequency by specified attenuation limits, $43+10\log_{10}$ (TP in watt)[dB]. Where, TP = Transmitter power at the ANT OUT under test configuration as the handsfree unit used.

The tests were carried out under one test configuration as the handsfree unit used.

Test location:

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

Validation of Site Attenuation:

1) Last Confirmed Date : Ocotber 4, 2002
2) Interval : 1 Year

Used test instruments :

Model No.	Device ID	Last Cal. Date	Cal. Interval
● - ESCS 30	A - 1	August, 2002	1 Year
○ - ESCS 30	A - 9		
○ - ESH 2	A - 2		
○ - ESH 2	A - 3		
● - HFH2-Z2	C - 2	July, 2002	1 Year
○ - HFH2-Z2	C - 3		
○ - ESV/ESV-Z3	A - 7 / A - 17		
○ - ESV/ESV-Z3	A - 6 / A - 18		
○ - ESV/ESV-Z3	A - 4 / A - 20		
○ - ESV/ESV-Z3	A - 8 / A - 19		
○ - ESVS 10	A - 5		
● - VHA9103/BBA9106	C - 43	August, 2002	1 Year
● - UHALP9107	C - 42	August, 2002	1 Year
○ - VHA9103/FBAB9177	C - 27		
○ - UHALP9108-A1	C - 26		
● - Cable	H - 6	November, 2001	1 Year

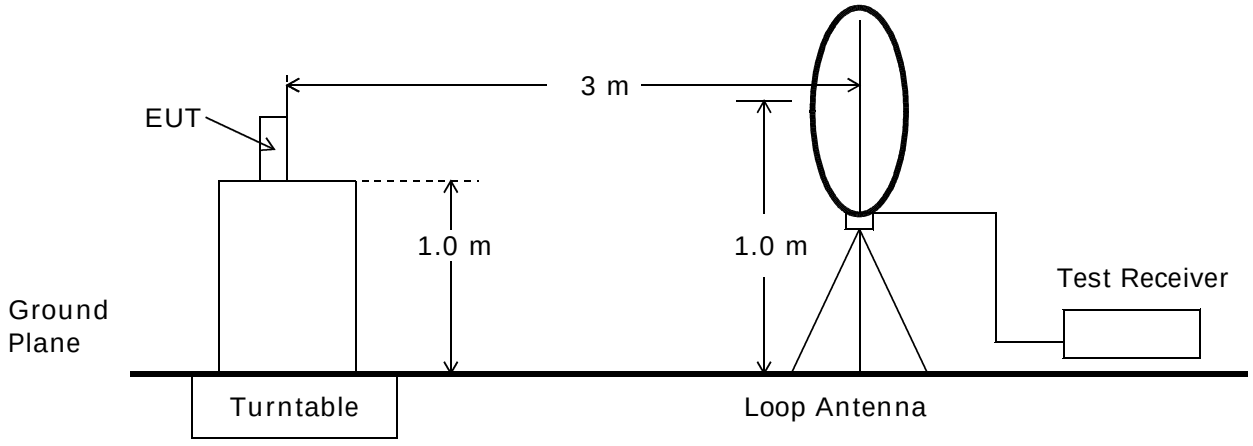
- continue -

Used test instruments :

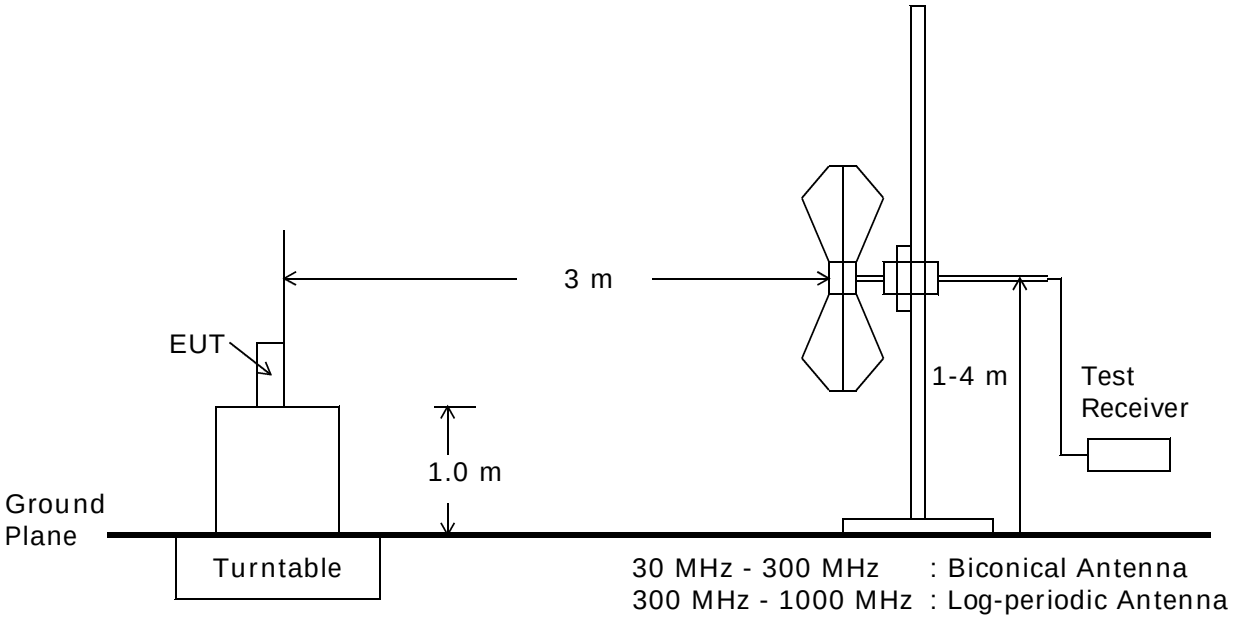
Model No.	Device ID	Last Cal. Date	Cal. Interval
● - 8566B	A - 13	January, 2002	1 Year
○ - 8593A	A - 15		
● - 4T-10	D - 73	May, 2002	1 Year
○ - 4T-10	D - 74		
● - WJ-6611-513	A - 23	May, 2002	1 Year
● - WJ-6882-824	A - 21	May, 2002	1 Year
● - DBL-0618N515	A - 33	May, 2002	1 Year
● - 91888-2	C - 41 - 1	May, 2002	1 Year
● - 91889-2	C - 41 - 2	May, 2002	1 Year
○ - 94613-1	C - 41 - 3		
○ - 91891-2	C - 41 - 4		
○ - 94614-1	C - 41 - 5		
● - 3160-04	C - 55	May, 2002	1 Year
● - 3160-05	C - 56	May, 2002	1 Year
● - 3160-06	C - 57	May, 2002	1 Year
● - 3160-07	C - 58	May, 2002	1 Year
● - 3160-08	C - 59	May, 2002	1 Year
● - 3160-09	C - 48	November, 2001	1 Year
○ - 355C	D - 22		
○ - 355D	D - 23		
● - MZ5010C	D - 81	November, 2001	1 Year
● - 8673D	B - 2	April, 2002	1 Year
● - Cable	C - 40 - 11	May, 2002	1 Year
● - Cable	C - 40 - 12	May, 2002	1 Year
○ - UHP-127	D - 42		
● - UHP-128	D - 43	May, 2002	1 Year

Environmental conditions :

Temperature: 22 °C Humidity: 44 %

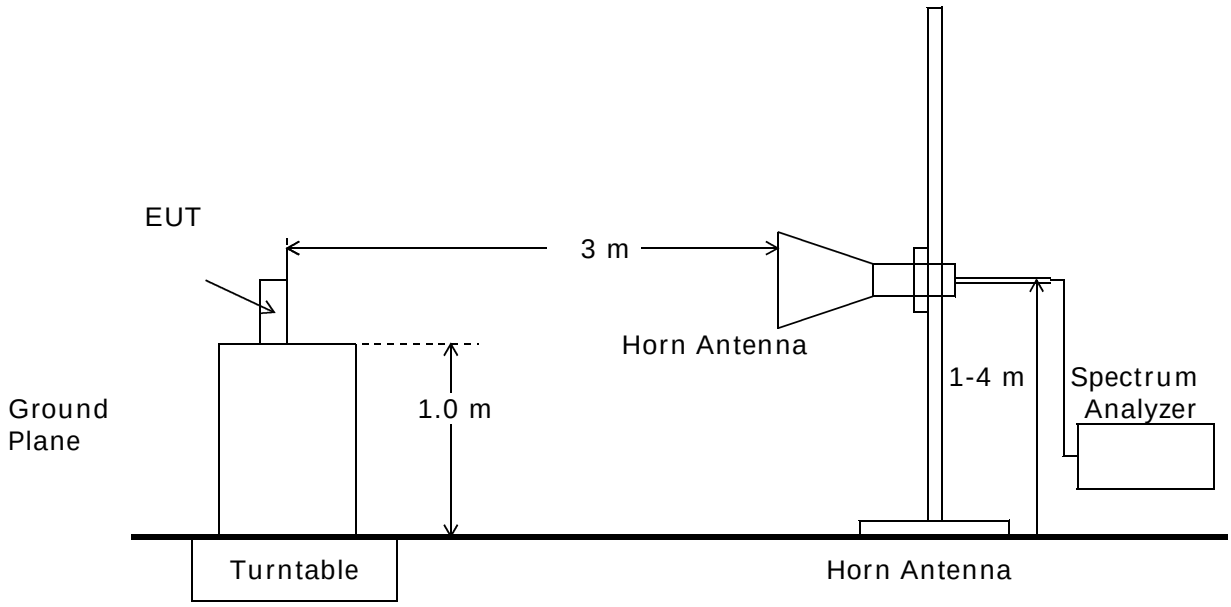


(a) Measurement set up for up to 30 MHz



(b) Measurement set up for up to 1 GHz

Fig.3 Unwanted Radiation Measurement



(c) Measurement set up for above 1GHz

Fig.3 Unwanted Radiation Measurement

Occupied Bandwidth Measurement (§2.1049, §24.238)

Test Procedure :

The measurement test-setup is shown in Fig.5.

The setting of the spectrum analyzer are shown as follows :

Res. Bandwidth	:	10 kHz
Video Bandwidth	:	30 kHz
Span	:	1 MHz
Sweep Time	:	AUTO
Trace	:	Maxhold

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:

Model No.	Device ID	Last Cal. Date	Cal. Interval
● - 4T-10	D - 73	May, 2002	1 Year
○ - 4T-10	D - 74		
○ - 2-10	D - 79		
○ - 2-10	D - 80		
● - 8566B	A - 13	January, 2002	1 Year
○ - 8593A	A - 15		

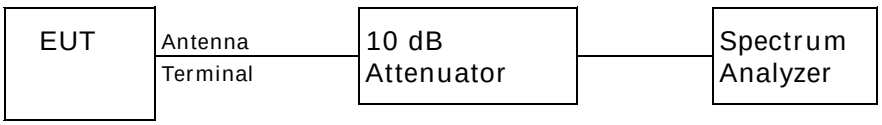


Fig.5 Occupied Bandwidth Measurement

Environmental conditions:

Temperature: 22 °C Humidity: 40 %

Band-Edge Emission Measurement(§22.917,§24.238)

Test Procedure :

The measurement test-setup is shown in Fig.6.

The setting of the spectrum analyzer are shown as follows :

TX Frequency	:	1850.20 MHz / 1909.8 MHz
Band-edge Frequency	:	1850.00 MHz / 1910.0 MHz
Res. Bandwidth	:	3 kHz
Video Bandwidth	:	10 kHz
Span	:	1 MHz
Sweep Time	:	AUTO
Trace	:	Maxhold

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:

● - 4T-10	D - 73	May, 2002	1 Year
○ - 4T-10	D - 74		
○ - 2-10	D - 79		
○ - 2-10	D - 80		
● - 8566B	A - 13	January, 2002	1 Year
○ - 8593A	A - 15		

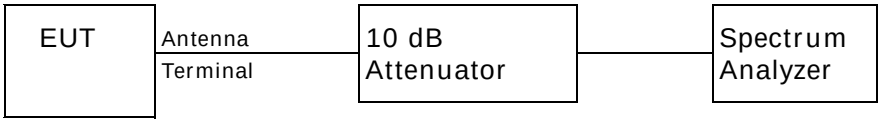


Fig.6 Band-Edge Emission Measurement

Environmental conditions:

Temperature: 22 °C Humidity: 40 %

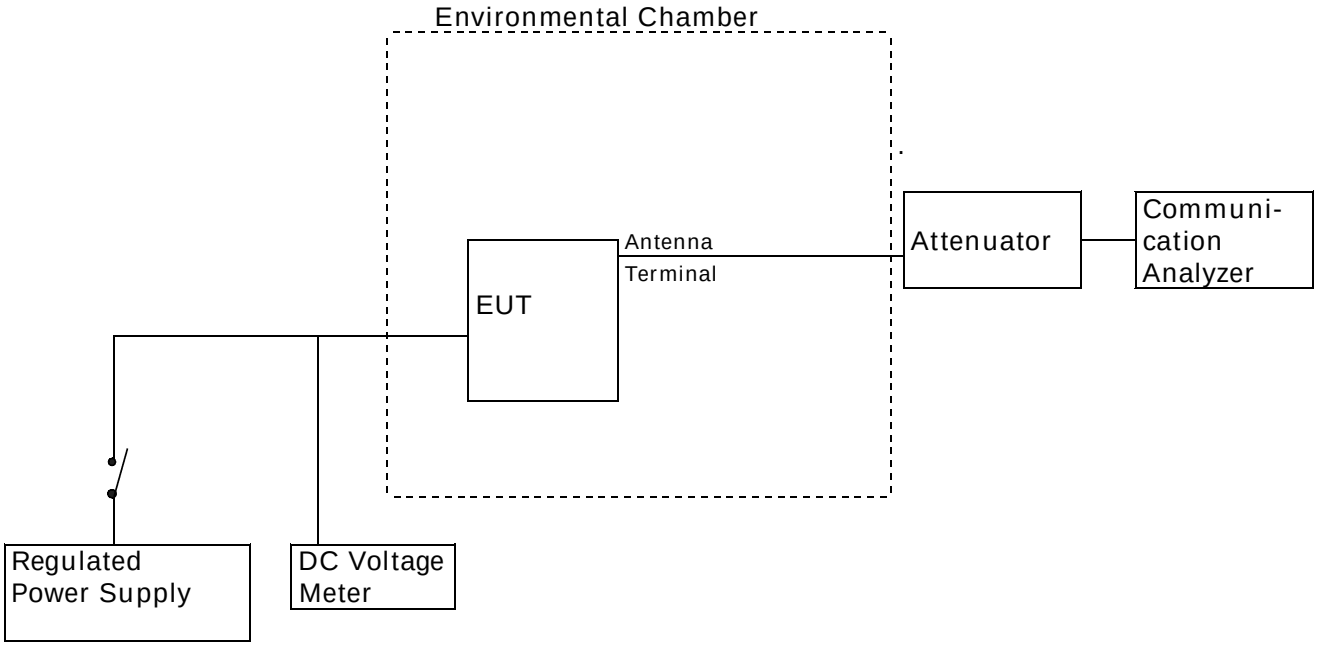
Frequency Stability Measurement(§2.1055, §24.235)

a) Frequency Stability Measurement versus Temperature

The EUT was placed in an environmental chamber and was tested in the range from -30 to +50 degrees Celsius. The EUT was stabilized at each temperature. The power(3.9VDC) supplied 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 EUT was placed in an environmental chamber and was tested at the temperature of +20 degrees Celsius. The EUT was stabilized at the temperature. The power(3.9VDC) and the power(3.7VDC, the Ending Voltage) was applied to the EUTd allowed to stabilize for 10 minutes. The transmitting frequency was measured at startup and 2 minutes, 5 minutes and 10 minutes after startup.



Test location:

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

Used test instruments and sites :

Model No.	Device ID	Last Cal. Date	Cal. Interval
● - PL-3G	02304009	July, 2002	1 Year
● - EL100-06T4	14201089	July, 2002	1 Year
● - 2011-39	B - 33	April, 2002	1 Year
● - 6032A	F - 5	April, 2002	1 Year
○ - TR5212	B - 30		
● - MT8801C	6200026442	August, 2002	1 Year

CONFIGURATION OF EUT

The Equipment Under Test (EUT) consists of :

Description	Applicant (Manufacturer)	Model No. (Serial No.)	FCC ID
Tri-Band (PCS&GSM,DCS) Cellular Phone	Sharp Corporation (Sharp Corporation)	GS-200 (---)	APYHRO00027
Lithium-ION Battery	Sharp Corporation (Sharp Corporation)	XN-1BT11 (---)	N/A
AC Charger	Sharp Corporation (Sharp Corporation)	XN-1QC14 (---)	N/A
Head Set	Sharp Corporation (Sharp Corporation)	--- (---)	N/A

The measurement was carried out with the following equipment connected :

Description	Grantee/Distributor	Model No. (Serial No.)	FCC ID
None			

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

	Description	Port	Shielded Cable	Shell Material	Ferrite Core	Cable Length
1	EUT	Serial	NO	Nonmetal	NO	1.8 m
	AC Charger	---		Nonmetal		
2	EUT	Head Set	NO	Nonmetal	NO	1.2 m
	Head Set	---		Nonmetal		

Test Configuration:

Operation - mode of the EUT:

The tests were carried out under one modulation type shown as follows :
Modulation Burst Signal : DATA TSC 5 in accordance with GSM 05.02.

The Radiated Emission tests were carried under 3 test configurations in page 25 shown as follows:

	Test Configuration	The condition of the transmitting antenna
1	Single Unit	Integrated antenna
2	AC Charger used	Integrated antenna
3	Head Set used	Integrated antenna

Test system:

The EUT is 1900MHz PCS(GSM) Cellular phone.

The EUT has 2 ports shown as follows :
1) Head Set port : is connected to the Head Set.
2) Serial port : is connected to the AC Charger or the personal computer.

Special accessories:

None

Detailed Transmitter portion:

Transmitting frequency : 1850.2 MHz(512ch) - 1909.8 MHz(810ch)
Local frequency : 3860.4 MHz(512ch) - 3979.6 MHz(810ch)

Detailed Receiver portion:

Receiving frequency : 1930.2 MHz(512ch) - 1989.8 MHz(810ch)
Local frequency : 3860.4 MHz(512ch) - 3979.6 MHz(810ch)

Other Clock Frequency:

Clock Display : 32.768 kHz
Reference frequency : 26.0 MHz

EUT 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 931.1 mW at 1850.200 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 More than 6.2 dB at 18800.000 MHz

Max. limit exceeding _____ dB at _____ MHz

Uncertainty of measurement results +2.4 dB(2σ) -2.4 dB(2σ)

Remarks:

Transmitter Power(EIRP)

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

The Maximum EIRP is 1102.0 mW at 1850.200 MHz

Min. limit margin 2.6 dB at 1850.200 MHz

Max. limit exceeding _____ dB at _____ MHz

Uncertainty of measurement results +1.3 dB(2σ) -1.3 dB(2σ)

Remarks:

Unwanted Radiation (9 kHz - 20 GHz)

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

Min. limit margin 19.1 dB at 3819.600 MHz

Max. limit exceeding _____ dB at _____ MHz

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

Remarks:

Occupied Bandwidth

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

The results(Occupied Bandwidth) Refer to page 39 - 41
The results(Band-edge Emission) Refer to pages 43 - 44

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

Remarks:

Frequency Stability

Max. Frequency Deviation : -47.2 Hz at 1880.000 MHz
Uncertainty of measurement results ±0.05 ppm

Remarks:

SUMMARY

GENERAL REMARKS :

The EUT was tested according to the requirements of FCC Rules and Regulations Part 24 (October 1, 2001) under the test configuration, as shown in page 25.

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 : November 18, 2002

End of testing : November 28, 2002

- JAPAN QUALITY ASSURANCE ORGANIZATION -

Approved by :

A. Hosoda

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

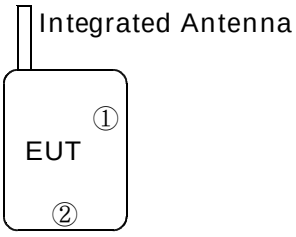
Issued by :

S. Kino

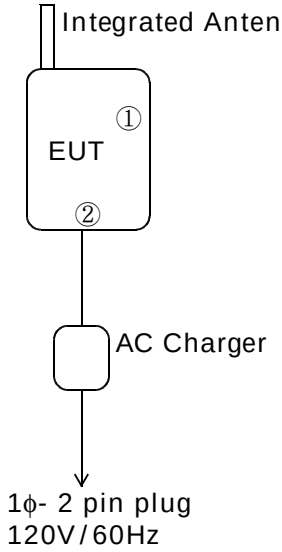
Shigeru Kinoshita
Deputy Manager
EMC Div.
JQA KITA-KANSAI Testing Center

Test System-Arrangement (Drawings)

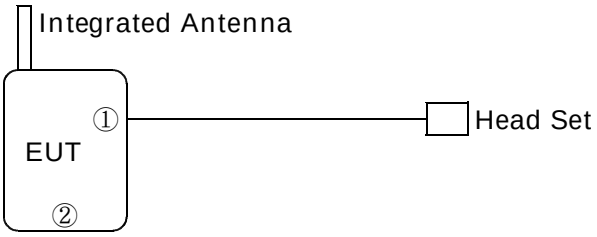
1) Single Unit



2) AC Charger used



3) Head Set usd



Note:

① : Head Set
② : Serial

Test-Setup (Photographs) at worst case

Radiated Emission 9kHz - 20 GHz:

Horizontal Polarization

Vertical Polarization

Transmitter Power(TP) Measurement

Test Date: November 22, 2002
Temp.: 22 °C; Humi.: 44 %

CH	Frequency	Correction Factor	Meter Reading Peak	Results Peak	
	[MHz]	[dB]	[dBm]	[dBm]	[mW]
512	1850.200	10.20	19.49	29.69	931.1
661	1880.000	10.20	19.48	29.68	929.0
810	1909.800	10.20	19.45	29.65	922.6

Sample of calculated result at 1850.200 MHz, as he Maximum Level Point:
Correction Factor = 10.20 dB
+) Meter Reading = 19.49 dBm
Result = 29.69 dBm : $10^{(29.69/10)}$ = 931.1 (mW)
The point shown on "___ " is the Maximum Level Point.

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

Tester : Akio Hosoda

Antenna Conducted Spurious Emission Measurement

Test Date: November 28, 2002
Temp.: 22 °C ; Humi.: 40 %

Measurement Results:

Test Configuration : Single Unit
Transmitting Frequency :1850.200 MHz (512ch)

Frequency [MHz]	Correction Factor [dB]	Meter Readings (dBm)	Limits (dBm)	Results (dBm)	Margin [dB]	Remarks (Note 2)
3700.400	11.8	-53.6	-13.0	-41.8	+28.8	C
5550.600	12.0	-61.2	-13.0	-49.2	+36.2	C
7400.800	12.1	< -59.0	-13.0	< -46.9	> +33.9	C
9251.000	12.8	< -60.9	-13.0	< -48.1	> +35.1	C
11101.200	13.0	< -61.0	-13.0	< -48.0	> +35.0	C
12951.400	13.5	< -56.9	-13.0	< -43.4	> +30.4	C
14801.600	13.4	< -56.5	-13.0	< -43.1	> +30.1	C
16651.800	15.2	< -57.5	-13.0	< -42.4	> +29.4	C
18502.000	33.9	< -56.4	-13.0	< -22.5	> + 9.5	C

Transmitting Frequency :1880.000 MHz (661ch)

Frequency [MHz]	Correction Factor [dB]	Meter Readings (dBm)	Limits (dBm)	Results (dBm)	Margin [dB]	Remarks (Note 2)
3760.000	11.8	-51.2	-13.0	-39.4	+26.4	C
5640.000	12.0	< -59.6	-13.0	< -47.6	> +34.6	C
7520.000	12.1	< -60.9	-13.0	< -48.8	> +35.8	C
9400.000	12.8	< -59.1	-13.0	< -46.3	> +33.3	C
11280.000	13.0	< -59.9	-13.0	< -46.9	> +33.9	C
13160.000	13.5	< -57.5	-13.0	< -44.0	> +31.0	C
15040.000	13.4	< -55.9	-13.0	< -42.5	> +29.5	C
16920.000	15.2	< -57.3	-13.0	< -42.2	> +29.2	C
18800.000	33.9	< -53.1	-13.0	< -19.2	> + 6.2	C

Transmitting Frequency : 1909.800 MHz (810ch)

Frequency [MHz]	Correction Factor [dB]	Meter Readings (dBm)	Limits (dBm)	Results (dBm)	Margin [dB]	Remarl (Note 2
3819.600	11.8	-49.5	-13.0	-37.7	+24.7	C
5729.400	12.0	-59.6	-13.0	-47.6	+34.6	C
7639.200	12.1	-57.2	-13.0	-45.1	+32.1	C
9549.000	12.8	< -62.5	-13.0	< -49.7	> +36.7	C
11458.800	13.0	< -62.9	-13.0	< -49.9	> +36.9	C
13368.600	13.5	< -58.5	-13.0	< -45.0	> +32.0	C
15278.400	13.4	< -57.1	-13.0	< -43.7	> +30.7	C
17188.200	15.2	< -56.8	-13.0	< -41.7	> +28.7	C
19098.000	33.9	< -53.5	-13.0	< -19.6	> + 6.6	C

Sample of calculated result at 18800.000 MHz, as the Minimum Margin point:

	Correction Factor	= 33.9 dB
+)	Meter Reading	= <-53.1 dBm
	Result	= <-22.5 dBm

Minimum Margin : -13.0 - (<-19.2) = >6.2(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 20 GHz.
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(D-43)
C	Peak (SP)	1 MHz	1 MHz	20 msec	0 Hz	CL+P10+HPF(D-42)
D	Peak (ESV)	120 kHz	--	--	--	CL+P10

*)CL: Cable Loss + DC-Cutter Loss/ P10: 10dB Att. / HPF: High Pass Filter Loss

Tester : Shigeru Kinoshita

Transmitter Power(EIRP) Measurement

Test Date: November 18, 2002
Temp.: 22 °C; Humi.: 44 %

Measurement Results:

1)Emission Measurement in Fig.2(a)

CH	Frequency [MHz]	Meter Reading [dBuV] Horizontal Mh	Meter Reading [dBuV] Vertical Mv	Remarks Note 1
512	1850.200	94.3	93.2	A
661	1880.000	94.1	93.0	A
810	1909.800	93.8	91.1	A

2)Substitution Measurement in Fig.2(b)

CH	Frequency [MHz]	Meter Reading [dBuV] Horizontal Msh	Meter Reading [dBuV] Vertical Msv	Supplied Power to Substitution Antenna [dBm] Ps	Gain of Substitution Antenna [dBi] Gs	Remarks Note 1
512	1850.200	87.5	87.8	9.52	14.1	A
661	1880.000	87.7	87.9	9.54	14.2	A
810	1909.800	88.1	88.4	9.45	14.4	A

3)Calculated Result

CH	Frequency [MHz]	Peak EIRP [dBm] Horizontal EIRPh	Peak EIRP [dBm] Vertical EIRPv	Maximum Peak EIRP [W]	Limits [dBm]	Margin [dB]
512	1850.200	30.4	29.0	1.102	33.0	+ 2.6
661	1880.000	30.1	28.8	1.033	33.0	+ 2.9
810	1909.800	29.6	26.6	0.902	33.0	+ 3.5

Sample of calculated result at 1850.200 MHz, as the Minimum Margin point:

	Meter Reading Mh in Fig.2(a)	=	94.3 dB(μV)
	Meter Reading -Msh in Fig.2(b)	=	-87.5 dB(μV)
	Supplied Power to Sub. Ant.	=	9.52 dB
+)	Gain of Sub. Ant.	=	14.1 dB
	Result	=	30.4 dBm

Peak EIRP = 30.4 dBm : $10^{(30.4/10)}$ = 1096.5 (mW)

EIRPh = Mh - Msh + Ps + Gs

EIRPv = Mv - Msv + Ps + Gs

Minimum Margin : 33.0 - 30.4 = 2.6(dB)

The point shown on "___ " is the Minimum Margin Point.

Remarks:

Note 3	Detector Function	RES. B.W	V.B.W	Sweep T	Span
A	Peak (SP)	1 MHz	1 MHz	20 msec	0 Hz

Tester : Shigeru Kinoshita

Unwanted Radiation Measurement

Test Date: November 18, 2002
Temp.: 22 °C; Humi.: 44 %

Measurement Results:

Test Configuration : Single Unit
Transmitting Frequency :1850.200 MHz(512ch)

Frequency [MHz]	EIRP [dBm] Hori.	EIRP [dBm] Vert.	Limits [dBm]	Margin [dB]	Remarks (Note 3)
3700.400	-33.2	-37.2	-13.0	+20.2	E
5550.600	-44.7	-41.7	-13.0	+28.7	B
7400.800	-44.6	-40.6	-13.0	+27.6	B
9251.000	< -59.3	< -59.3	-13.0	> +46.3	C
11101.200	< -58.3	< -58.3	-13.0	> +45.3	C
12951.400	< -54.4	< -54.4	-13.0	> +41.4	C
14801.600	< -54.7	< -54.7	-13.0	> +41.7	C
16651.800	< -54.6	< -54.6	-13.0	> +41.6	C
18502.000	< -43.2	< -43.2	-13.0	> +30.2	D

Test Configuration : Single Unit
Transmitting Frequency :1880.000 MHz(611ch)

Frequency [MHz]	EIRP [dBm] Hori.	EIRP [dBm] Vert.	Limits [dBm]	Margin [dB]	Remarks (Note 3)
3760.000	-35.2	-37.2	-13.0	+22.2	E
5640.000	-44.5	-38.5	-13.0	+25.5	B
7520.000	-41.5	-42.5	-13.0	+28.5	B
9400.000	< -59.2	< -59.2	-13.0	> +46.2	C
11280.000	< -58.3	< -58.3	-13.0	> +45.3	C
13160.000	< -54.4	< -54.4	-13.0	> +41.4	C
15040.000	< -54.8	< -54.8	-13.0	> +41.8	C
16920.000	< -54.6	< -54.6	-13.0	> +41.6	C
18800.000	< -43.4	< -43.4	-13.0	> +30.4	D

Test Configuration : Single Unit
Transmitting Frequency :1909.800 MHz(810ch)

Frequency	EIRP [dBm]		Limits	Margin [dB]	Remarks (Note 3)
[MHz]	Hori.	Vert.	[dBm]		
3819.600	-33.1	-39.1	-13.0	+20.1	VB
5729.400	-44.3	-40.3	-13.0	+27.3	B
7639.200	-43.1	-43.1	-13.0	+30.1	B
9549.000	< -59.1	< -59.1	-13.0	> +46.1	C
11458.800	< -58.3	< -58.3	-13.0	> +45.3	C
13368.600	< -54.4	< -54.4	-13.0	> +41.4	C
15278.400	< -54.6	< -54.6	-13.0	> +41.6	C
17188.200	< -54.7	< -54.7	-13.0	> +41.7	C
19098.000	< -43.2	< -43.2	-13.0	> +30.2	D

Test Configuration : AC Charger used
Transmitting Frequency :1850.200 MHz(512ch)

Frequency	EIRP [dBm]		Limits	Margin [dB]	Remarks (Note 3)
[MHz]	Hori.	Vert.	[dBm]		
3700.400	-36.2	-34.2	-13.0	+21.2	E
5550.600	-46.7	-39.7	-13.0	+26.7	B
7400.800	-42.6	-40.6	-13.0	+27.6	B
9251.000	< -59.3	< -59.3	-13.0	> +46.3	C
11101.200	< -58.3	< -58.3	-13.0	> +45.3	C
12951.400	< -54.4	< -54.4	-13.0	> +41.4	C
14801.600	< -54.7	< -54.7	-13.0	> +41.7	C
16651.800	< -54.6	< -54.6	-13.0	> +41.6	C
18502.000	< -43.2	< -43.2	-13.0	> +30.2	D

Test Configuration : AC Charger used
Transmitting Frequency :1880.000 MHz(611ch)

Frequency	EIRP [dBm]		Limits	Margin [dB]	Remarks (Note 3)
[MHz]	Hori.	Vert.	[dBm]		
3760.000	-38.2	-40.2	-13.0	+25.2	E
5640.000	-45.5	-38.5	-13.0	+25.5	B
7520.000	-41.5	-42.5	-13.0	+28.5	B
9400.000	< -59.2	< -59.2	-13.0	> +46.2	C
11280.000	< -58.3	< -58.3	-13.0	> +45.3	C
13160.000	< -54.4	< -54.4	-13.0	> +41.4	C
15040.000	< -54.8	< -54.8	-13.0	> +41.8	C
16920.000	< -54.6	< -54.6	-13.0	> +41.6	C
18800.000	< -43.4	< -43.4	-13.0	> +30.4	D

Test Configuration : AC Charger used
Transmitting Frequency :1909.800 MHz(810ch)

Frequency [MHz]	EIRP [dBm] Hori.	EIRP [dBm] Vert.	Limits [dBm]	Margin [dB]	Remarks (Note 3)
3819.600	-32.1	-36.1	-13.0	+19.1	E
5729.400	-45.3	-40.3	-13.0	+27.3	B
7639.200	-43.1	-41.1	-13.0	+28.1	B
9549.000	< -59.1	< -59.1	-13.0	> +46.1	C
11458.800	< -58.3	< -58.3	-13.0	> +45.3	C
13368.600	< -54.4	< -54.4	-13.0	> +41.4	C
15278.400	< -54.6	< -54.6	-13.0	> +41.6	C
17188.200	< -54.7	< -54.7	-13.0	> +41.7	C
19098.000	< -43.2	< -43.2	-13.0	> +30.2	D

Test Configuration : Head Set used
Transmitting Frequency :1850.200 MHz(512ch)

Frequency	EIRP [dBm]		Limits	Margin [dB]	Remarks (Note 3)
[MHz]	Hori.	Vert.	[dBm]		
3700.400	-34.2	-36.2	-13.0	+21.2	E
5550.600	-48.7	-42.7	-13.0	+29.7	B
7400.800	-41.6	-44.6	-13.0	+28.6	B
9251.000	< -59.3	< -59.3	-13.0	> +46.3	C
11101.200	< -58.3	< -58.3	-13.0	> +45.3	C
12951.400	< -54.4	< -54.4	-13.0	> +41.4	C
14801.600	< -54.7	< -54.7	-13.0	> +41.7	C
16651.800	< -54.6	< -54.6	-13.0	> +41.6	C
18502.000	< -43.2	< -43.2	-13.0	> +30.2	D

Test Configuration : Head Set used
Transmitting Frequency :1880.000 MHz(611ch)

Frequency	EIRP [dBm]		Limits	Margin [dB]	Remarks (Note 3)
[MHz]	Hori.	Vert.	[dBm]		
3760.000	-35.2	-38.2	-13.0	+22.2	E
5640.000	-44.5	-39.5	-13.0	+26.5	B
7520.000	-43.5	-44.5	-13.0	+30.5	B
9400.000	< -59.2	< -59.2	-13.0	> +46.2	C
11280.000	< -58.3	< -58.3	-13.0	> +45.3	C
13160.000	< -54.4	< -54.4	-13.0	> +41.4	C
15040.000	< -54.8	< -54.8	-13.0	> +41.8	C
16920.000	< -54.6	< -54.6	-13.0	> +41.6	C
18800.000	< -43.4	< -43.4	-13.0	> +30.4	D

Test Configuration : Head Set used
Transmitting Frequency :1909.800 MHz(810ch)

Frequency	EIRP [dBm]		Limits	Margin [dB]	Remarks (Note 3)
[MHz]	Hori.	Vert.	[dBm]		
3819.600	-33.6	-37.1	-13.0	+20.6	E
5729.400	-47.3	-41.3	-13.0	+28.3	B
7639.200	-43.1	-43.1	-13.0	+30.1	B
9549.000	< -59.1	< -59.1	-13.0	> +46.1	C
11458.800	< -58.3	< -58.3	-13.0	> +45.3	C
13368.600	< -54.4	< -54.4	-13.0	> +41.4	C
15278.400	< -54.6	< -54.6	-13.0	> +41.6	C
17188.200	< -54.7	< -54.7	-13.0	> +41.7	C
19098.000	< -43.2	< -43.2	-13.0	> +30.2	D

Sample of calculated result at 3819.600 MHz, as the Minimum Margin point:
Minimum Margin : -13.0 -(-32.1) = 19.1(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 20 GHz.
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+P20-Amp.
C	Peak (SP)	1 MHz	1 MHz	20 msec	0 Hz	CL+P10-Amp.
D	Peak (SP)	1 MHz	1 MHz	20 msec	0 Hz	P10-Amp.+Mix.
E	Peak (SP)	1 MHz	1 MHz	20 msec	0 Hz	CL+HPF+P10-Amp.
F	Peak (ESV)	120 kHz	--	--	--	CL

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

Tester : Shigeru Kinoshita

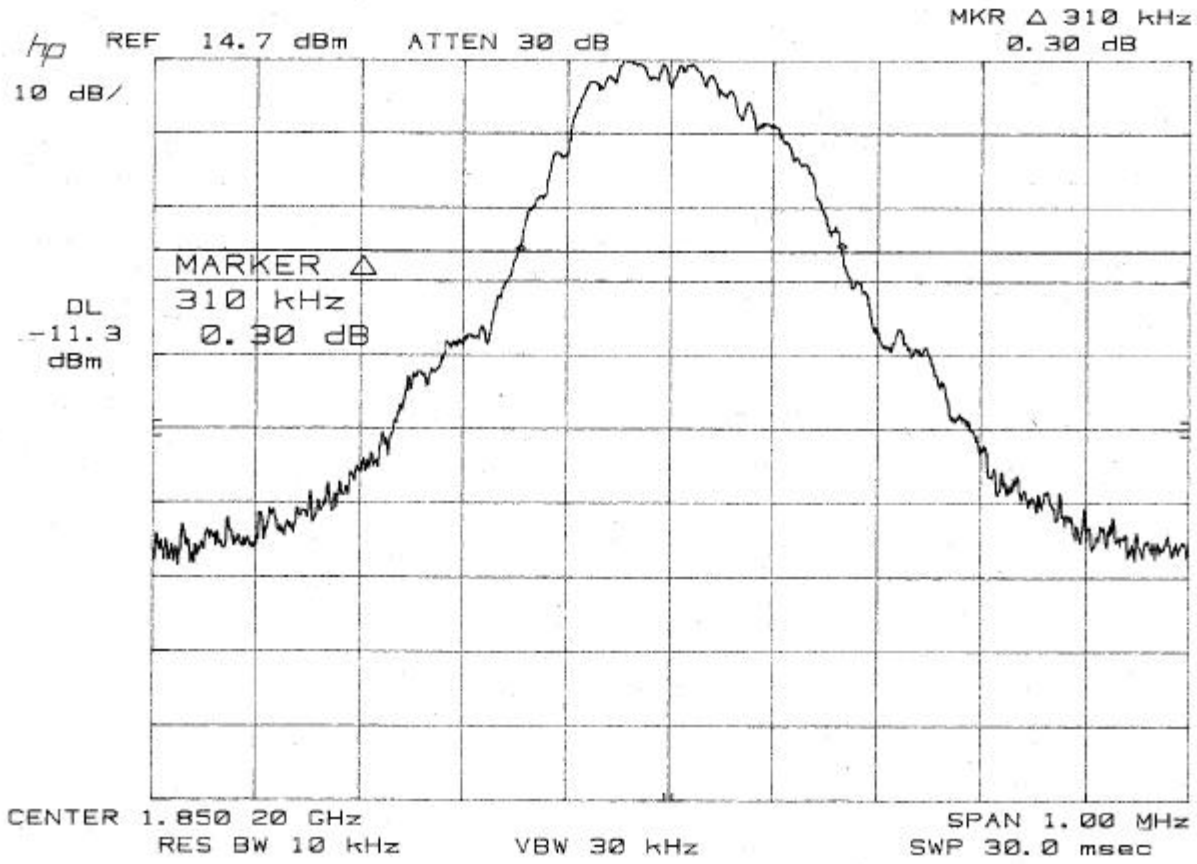
Occupied Bandwidth Measurement

Test Date: November 28, 2002
Temp.: 22 °C ; Humi.: 40 %

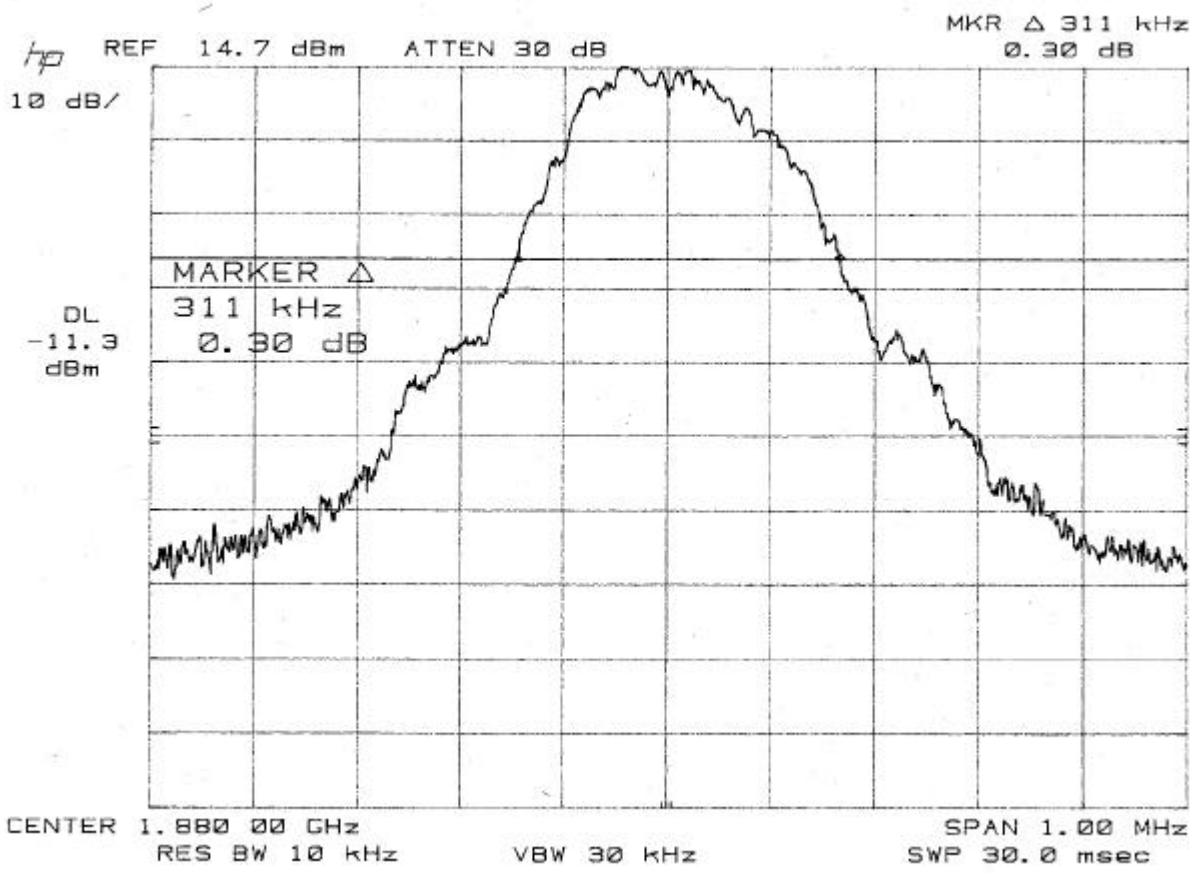
CH No.	Transmitting Frequency(MHz)	26dB Bandwidth	Data Page
512	1850.200	310 kHz	Page 39
661	1880.000	311 kHz	Page 40
910	1909.800	311 kHz	Page 41

Tester : Shigeru Kinoshita

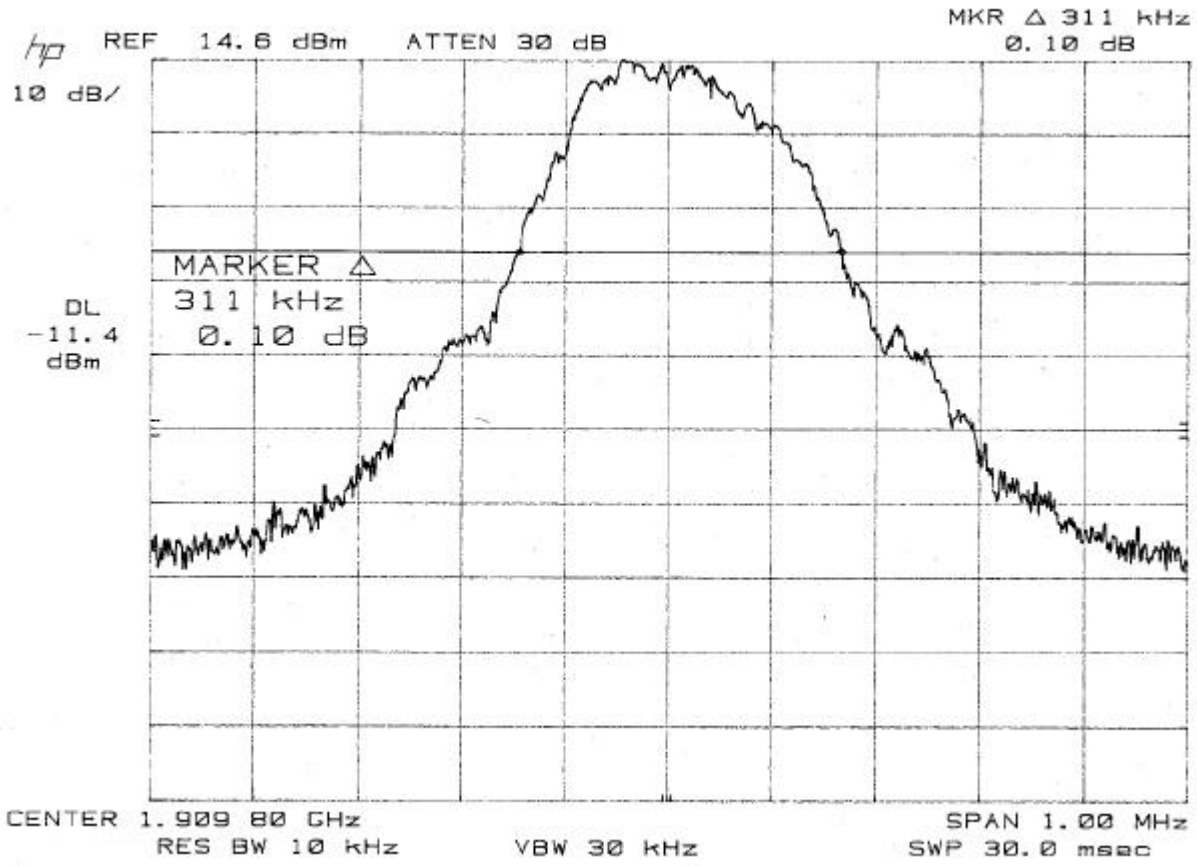
Occupied Bandwidth Measurement
Transmitting Frequency : 1850.200 MHz (512 ch)



Occupied Bandwidth Measurement
Transmitting Frequency : 1880.000 MHz (661 ch)



Occupied Bandwidth Measurement
Transmitting Frequency : 1909.800 MHz (810 ch)



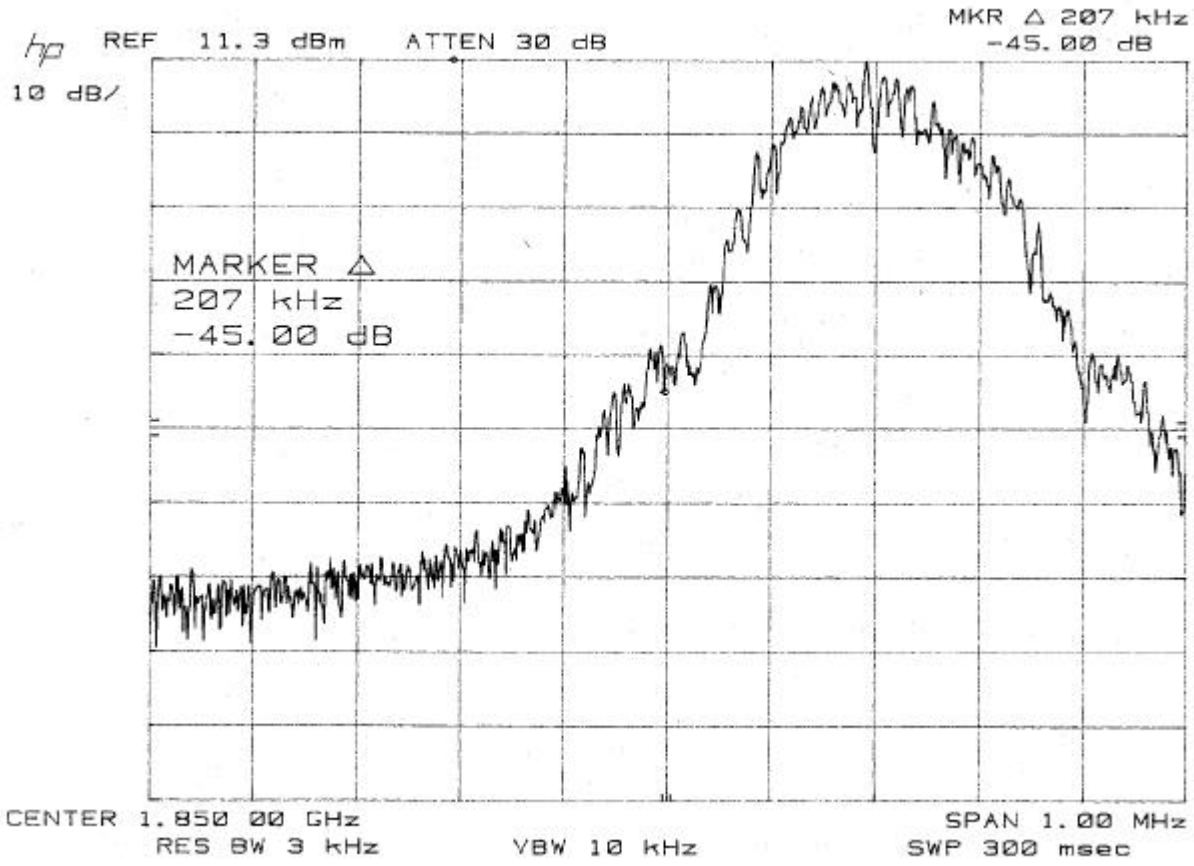
Band-Edge Emission Measurement

Test Date: November 28, 2002
Temp.: 22 °C ; Humi.: 40 %

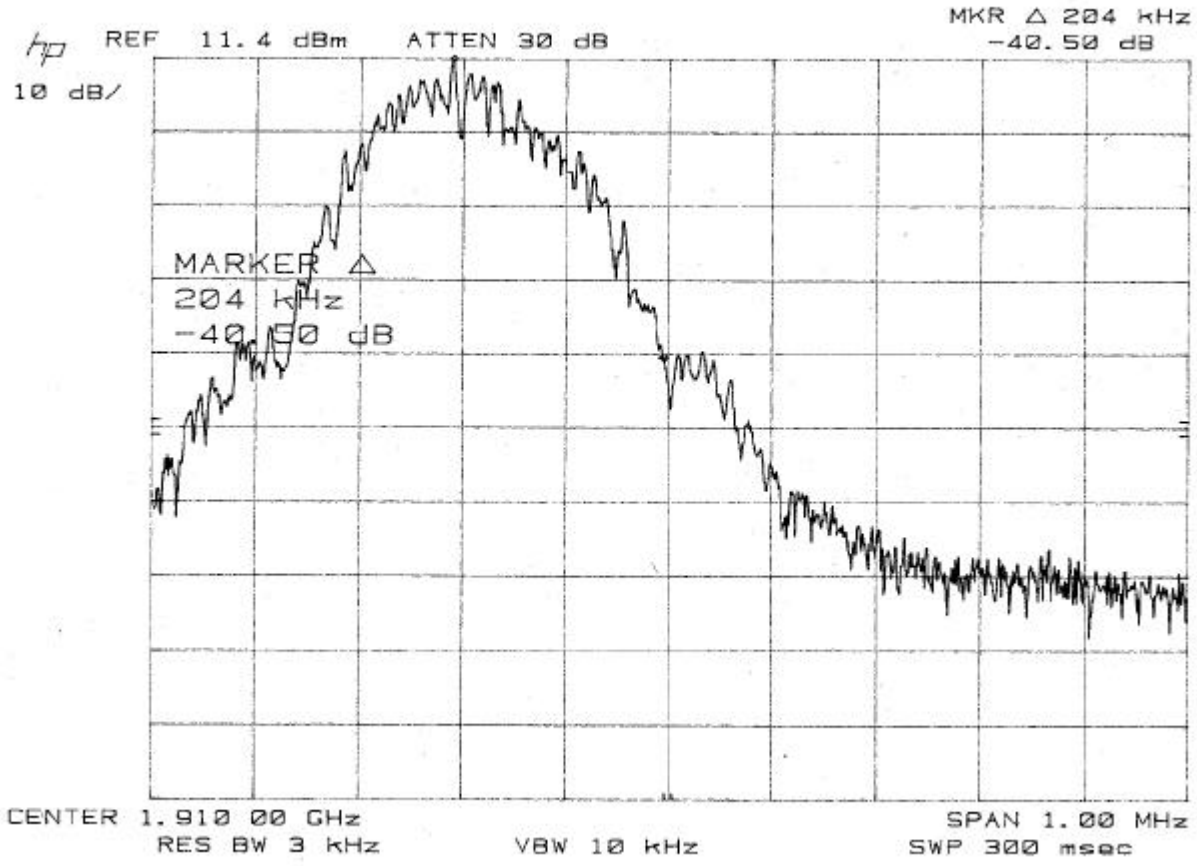
CH No.	Transmitting Frequency(MHz)	Band-Edge Frequency(MHz)	Data Page
512	1850.200	1850.000	Page 43
810	1909.800	1910.000	Page 44

Tester : Shigeru Kinoshita

Band-Edge Emissiom Measurement
Transmitting Frequency : 1850.200 MHz (512 ch)
Band-Edge Frequency : 1850.000 MHz



Band-Edge Emissiom Measurement
Transmitting Frequency : 1909.800 MHz (810 ch)
Band-Edge Frequency : 1910.000 MHz



Frequency Stability Measurement

Measurement Results:

Test Date: November 24-25, 2002

Frequency Stability Measurement versus Temperature

Reference Frequency: 1880.000 MHz (661ch)
DC Supply Voltage : 3.9VDC

Ambient Temperature (℃)	Deviation(Hz) Startup	2 minutes	5 minutites	10 minutites
-30	-66.1	-84.5	-47.3	- 4.3
-20	+ 8.8	- 4.5	-28.5	-40.0
-10	-39.6	-31.7	-31.9	-27.0
0	-19.9	+ 3.6	+34.0	+ 8.2
10	+ 5.1	+ 3.6	- 3.1	-13.2
20	-42.5	-24.4	-26.9	-29.9
30	-47.2	-24.4	-24.5	-23.6
40	-28.0	-22.0	-22.2	-31.0
50	- 6.7	-40.0	-26.9	-27.6

Frequency Stability Measurement versus Temperature

Reference Frequency: 1880.000 MHz (661ch)
Ambient Temperature : 20 ℃

DC Supply Voltage (VDC)	Deviation(Hz) Startup	2 minutes	5 minutites	10 minutites
3.9	-42.5	-24.4	-26.9	-29.9
3.7(Ending)	-13.3	-23.7	-26.9	-29.9

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

Sample Caluculation at 1880.000 MHz ,30°C Startup 3.9VDC) :

$((1879.9999528 - 1880.0000000) \times 10^{6} = -47.2$ (Hz)

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