**JQA File No.** : KL80090273

**Issue Date** : September 25, 2009

# TEST REPORT

| | | |
|---|---|---|
| **APPLICANT** | : | Sharp Corporation |
| **ADDRESS** | : | 2-13-1, Iida Hachihonmatsu, Higashi-Hiroshima City, Hiroshima, 739-0192, JAPAN |
| **PRODUCTS** | : | Cellular Phone |
| **MODEL NO.** | : | 940SH |
| **SERIAL NO.** | : | 004401/11/208605/9 |
| **FCC ID** | : | APYHRO00108 |
| **TEST STANDARD** | : | CFR 47 FCC Rules and Regulations Part 24 |
| **TESTING LOCATION** | : | Japan Quality Assurance Organization<br>KITA-KANSAI Testing Center<br>1-7-7, Ishimaru, Minoh-shi, Osaka 562-0027, Japan |
| **TEST RESULTS** | : | **Passed** |
| **DATE OF TEST** | : | August 31, 2009 - September 16, 2009 |

This report must not used by the client to claim product endorsement by NVLAP or NIST or any agency of the U.S. Government.

NVLAP LAB CODE 200191-0

Junichi Wakamatsu
Manager
Japan Quality Assurance Organization
KITA-KANSAI Testing Center
Testing Dept. EMC Division
1-7-7, Ishimaru, Minoh-shi, Osaka 562-0027, Japan

- The measurement values stated in Test Report was made with traceable to National Institute of Advanced Industrial Science and Technology (AIST) of Japan and National Institute of Information and Communications Technology (NICT) of Japan.
- The applicable standard, testing condition and testing method which were used for the tests are based on the request of the applicant.
- The test results presented in this report relate only to the offered test sample.
- The contents of this test report cannot be used for the purposes, such as advertisement for consumers.
- This test report shall not be reproduced except in full without the written approval of JQA.

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## DEFINITIONS FOR ABBREVIATION AND SYMBOLS USED IN THIS TEST REPORT

**EUT** : Equipment Under Test
**AE** : Associated Equipment
**N/A** : Not Applicable
**N/T** : Not Tested
**EMC** : Electromagnetic Compatibility
**EMI** : Electromagnetic Interference
**EMS** : Electromagnetic Susceptibility

☒ - indicates that the listed condition, standard or equipment is applicable for this report.
☐ - indicates that the listed condition, standard or equipment is not applicable for this report.

## Documentation

### 1 Test Regulation

Applied Standard : CFR 47 FCC Rules and Regulations Part 24
Subpart E - Broadband PCS

Test Requirements : CFR 47 FCC Rules and Regulations Part 2
§2.1046, §2.1047, §2.1049, §2.1051, §2.1053, §2.1055 and §2.1057

Test Procedure : ANSI C63.4–2003, TIA/EIA–603-C-2004

### 2 Test Location

KITA-KANSAI Testing Center
1-7-7, Ishimaru, Minoh-shi, Osaka 562-0027, Japan
KAMEOKA EMC Branch
9-1, Ozaki, Inukanno, Nishibetsuin-cho, Kameoka-shi, Kyoto 621-0126, Japan

### 3 Recognition of Test Laboratory

JQA KITA-KANSAI Testing Center Testing Department EMC Division is accredited under ISO/IEC 17025 by following accreditation bodies and the test facility of Testing Division is registered by the following bodies.

VLAC Code : VLAC-001-2 (Effective through : April 3, 2010)
NVLAP Lab Code : 200191-0 (Effective through : June 30, 2010)
BSMI Recognition No. : SL2-IS-E-6006, SL2-IN-E-6006, SL2-AI-E-6006
(Effective through : September 14, 2010)

VCCI Registration No. : R-008, R-1117, C-006, C-007, C-1674, C-2143, T-1418, T-1419
(Effective through : April 3, 2010)
IC Registration No. : 2079E-1, 2079E-2 (Effective through : January 6, 2011)

Accredited as conformity assessment body for Japan electrical appliances and material law by METI.
(Effective through : February 22, 2010)

# 4 Description of the Equipment Under Test

## 4.1 General Information

| | | | |
|---|---|---|---|
| 1. | Manufacturer | : | Sharp Corporation<br>2-13-1, Iida Hachihonmatsu, Higashi-Hiroshima City, Hiroshima, 739-0192, JAPAN |
| 2. | Products | : | Cellular Phone |
| 3. | Model No. | : | 940SH |
| 4. | Serial No. | : | 004401/11/208605/9 |
| 5. | Product Type | : | Pre-production |
| 6. | Date of Manufacture | : | July, 2009 |
| 7. | Transmitting Frequency | : | 1850.2 MHz(512CH) – 1909.8MHz(810CH) |
| 8. | Receiving Frequency | : | 1930.2 MHz(512CH) – 1989.8MHz(810CH) |
| 9. | Emission Designations | : | 243KGXW |
| 10. | Max. RF Output Power | : | 1.318W (EIRP) |
| 11. | Power Rating | : | 4.0VDC (Lithium-ion Battery Pack SHBCR1 770mAh) |
| 12. | EUT Grounding | : | None |
| 13. | Category | : | Broadband PCS |
| 14. | EUT Authorization | : | Certification |
| 15. | Receive Date of EUT | : | August 31, 2009 |

## 4.2 Channel Plan

The carrier spacing is 200 kHz.
The carrier frequency is designated by the absolute frequency channel number (ARFCN).
The carrier frequency is expressed in the equation shown as follows:

Transmitting Frequency (in MHz) = $1850.2 + 0.2 \times (n - 512)$
Receiving Frequency (in MHz) = $1930.2 + 0.2 \times (n - 512)$
where, n : channel number ($512 \leq n \leq 810$)

# 5 Test Condition

## 5.1 RF Power Output (§2.1046)

### 5.1.1 Conducted RF Power Output

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

Test site : KITA-KANSAI ☒ - Shielded room ☐ - 2nd Shielded room
KAMEOKA ☐ - Shielded room ☐ - Conducted emission facility

Test instruments : Refer to Appendix C.

### 5.1.2 ERP / EIRP RF Power Output

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

Test site : ☒ - KAMEOKA 1st open site ☒ - 3 m ☐ - 10 m
☐ - KAMEOKA 2nd open site ☐ - 3 m ☐ - 10 m

Test instruments : Refer to Appendix C.

## 5.2 Modulation Characteristics (§2.1047)

The requirements are ☐ - Applicable [☐ - Tested. ☐ - Not tested by applicant request.]
☒ - Not Applicable

Test site : KITA-KANSAI ☐ - Shielded room ☐ - Anechoic chamber
KAMEOKA ☐ - Shielded room

Test instruments : Refer to Appendix C.

## 5.3 Occupied Bandwidth (§2.1049)

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

Test site : KITA-KANSAI ☒ - Shielded room ☐ - 2nd Shielded room
KAMEOKA ☐ - Shielded room ☐ - Conducted emission facility

Test instruments : Refer to Appendix C.

### 5.4 Spurious Emissions at Antenna Terminals (§2.1051)

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

Test site : KITA-KANSAI ☒ - Shielded room ☐ - 2nd Shielded room
KAMEOKA ☐ - Shielded room ☐ - Conducted emission facility

Test instruments : Refer to Appendix C.

### 5.5 Band-Edge Emission (§2.1051)

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

Test site : KITA-KANSAI ☒ - Shielded room ☐ - 2nd Shielded room
KAMEOKA ☐ - Shielded room ☐ - Conducted emission facility

Test instruments : Refer to Appendix C.

### 5.6 Field Strength of Spurious Radiation (§2.1053)

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

Test site : ☒ - KAMEOKA 1st open site ☒ - 3 m ☐ - 10 m
☐ - KAMEOKA 2nd open site ☐ - 3 m ☐ - 10 m

Test instruments : Refer to Appendix C.

### 5.7 Frequency Stability (§2.1055)

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

Test site : KITA-KANSAI Environment Testing Room

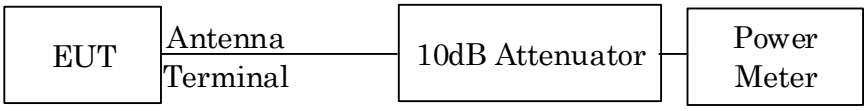
Test instruments : Refer to Appendix C.

# 6 Preliminary Test and Test Setup

## 6.1 RF Power Output (§2.1046)

### 6.1.1 Conducted RF Power Output

The Conducted RF Power Output was measured with a power meter, one 10dB attenuator and a short, low loss cable.




### 6.1.2 ERP / EIRP RF Power Output

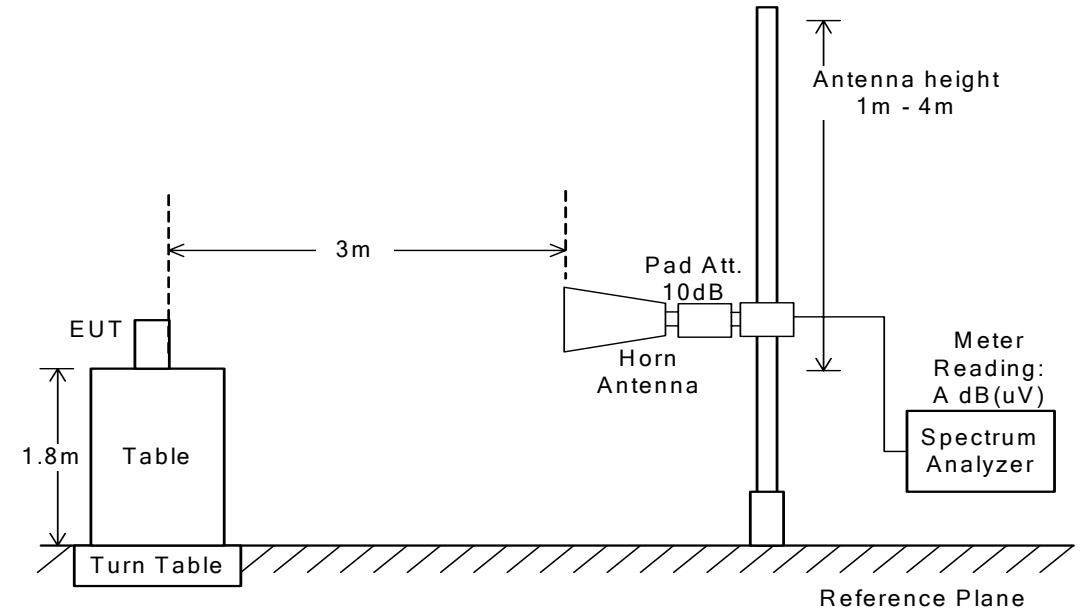
Step 1:
In order to obtain the maximum emission, the EUT was placed at the height 1.8 m on the non-conducted support and was varying at three orthogonal axes (Refer to clause 15), at the distance 3 m from the receiving antenna and rotated around 360 degrees.
The receiving antenna height was varied from 1 m to 4 m.
The EUT on the table was placed to be maximum emission against at 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 EUT was replaced to substitution antenna at the same polarized under the same condition as step 1.
The RF power was fed to the transmitting antenna through the RF amplifier from the signal generator.
In order to obtain the maximum emission level, the height of the receiving antenna was varied from 1 m to 4 m.
The level of maximum emission was A dB(μV), same as the recorded level in the step 1.
Then the RF power into the substitution horn antenna was P (dBm).

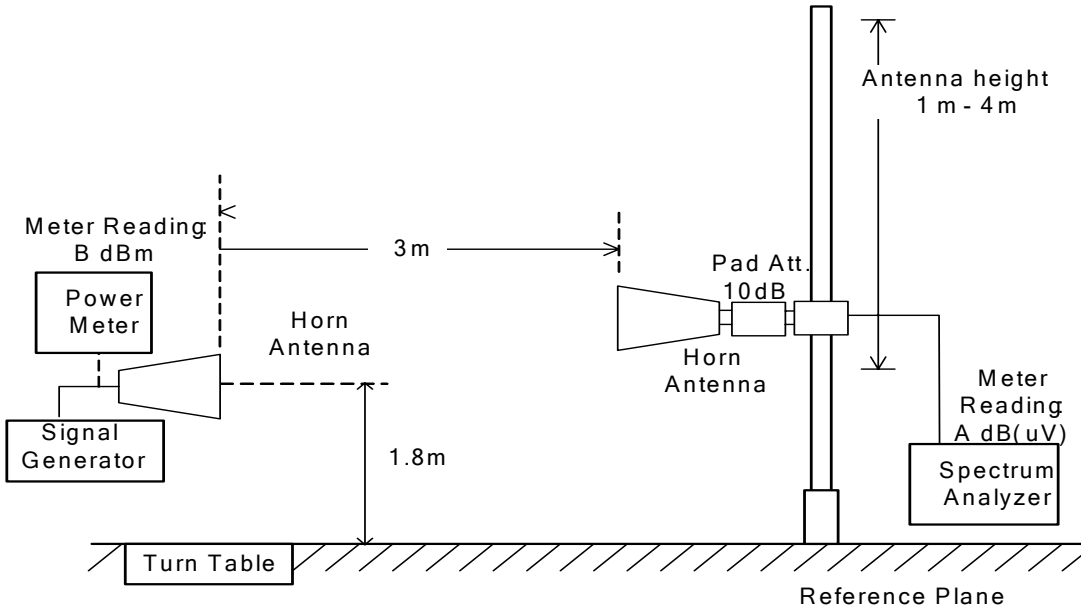
The ERP/EIRP output power was calculated in the following equation.

ERP (dBm) = P (dBm) – Balun loss of the half-wave dipole antenna (dB) + Cable loss (dB)
EIRP (dBm) = P (dBm) + Gh (dBi)
where, Gh (dBi) : Gain of the substitution horn antenna.

– Side View –




(a)EUT



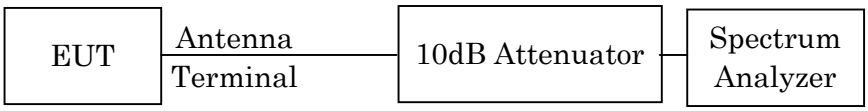

(b) Substitution Horn Antenna

## 6.2 Modulation Characteristics (§2.1047)

Not Applicable

## 6.3 Occupied Bandwidth (§2.1049)

The test system is shown as follows:



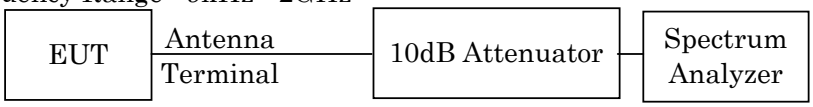

The setting of the spectrum analyzer are shown as follows:

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

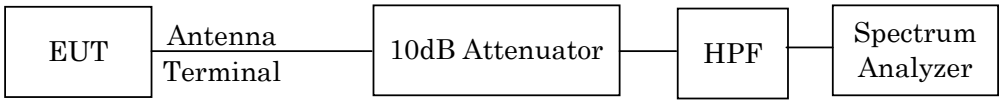
## 6.4 Spurious Emissions at Antenna Terminals (§2.1051)

The Antenna Conducted Emission was with a spectrum analyzer. The test system is shown as follows:

a) Frequency Range : 9kHz - 2GHz




b) Frequency Range : 2GHz - 20GHz

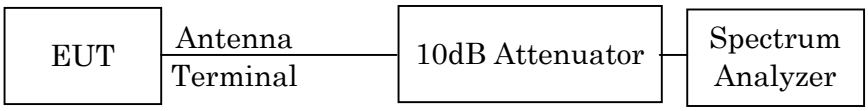



The setting of the spectrum analyzer are shown as follows:

| Frequency Range | 9 kHz - 150 kHz | 150 kHz - 30 MHz | 30 MHz - 20 GHz |
|---|---|---|---|
| Res. Bandwidth | 200 Hz | 10 kHz | 1 MHz |
| Video Bandwidth | 1 kHz | 30 kHz | 3 MHz |
| Sweep Time | AUTO | AUTO | AUTO |
| Trace | Maxhold | Maxhold | Maxhold |

## 6.5 Band-Edge Emission (§2.1051)

The test system is shown as follows:




The setting of the spectrum analyzer are shown as follows:

| | |
|---|---|
| TX Frequency | 1850.20 MHz / 1909.80 MHz |
| Band-Edge Frequency | 1850.00 MHz / 1910.00 MHz |
| Res. Bandwidth | 3 kHz |
| Video Bandwidth | 10 kHz |
| Span | 2 MHz |
| Sweep Time | AUTO |
| Trace | Maxhold |

## 6.6 Field Strength of Spurious Radiation (§2.1053)

Step 1) The spurious radiation for transmitter were measured at the distance 3 m away from the EUT which was placed on a non-conducted support 1.0 m in height and was varying at three orthogonal axes (Refer to clause 15). 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 half-wave dipole antenna for up to 1GHz and using the horn antenna for above 1 GHz.

Step 2) The ERP measurement was carried out with according to Step 2 in page 8. Then the RF power in the substitution antenna half-wave dipole antenna for up to 1 GHz and the substitution horn antenna for above 1 GHz.

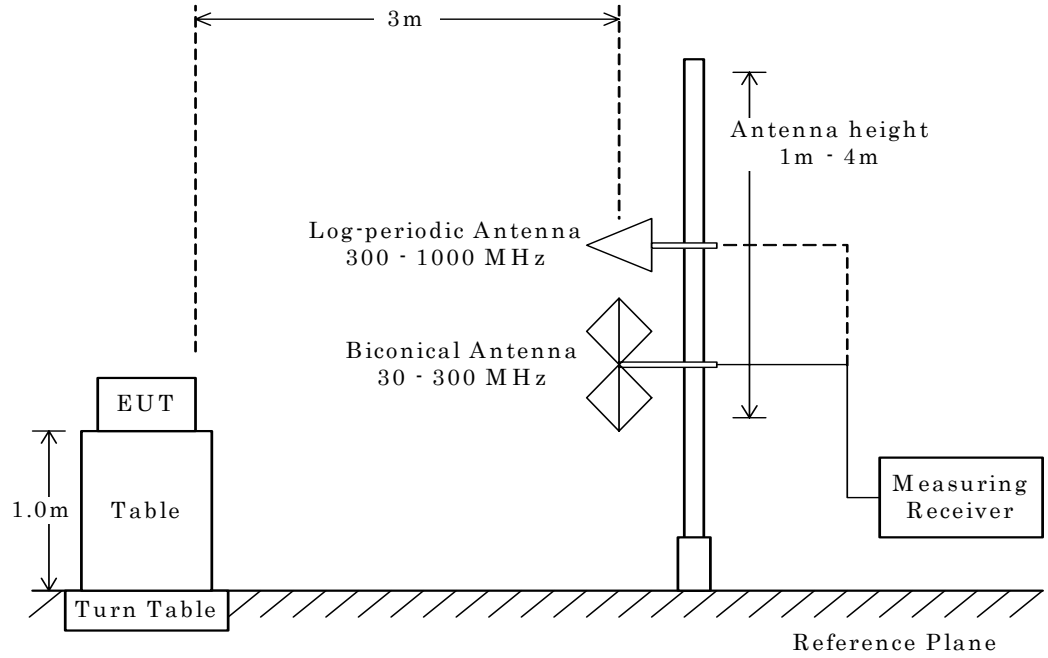
The ERP is calculated in the following equation.

A) Up to 1 GHz
ERP (dBm) = P (dBm) - ( Balun Loss of the half-wave dipole Ant. (dB) ) + Cable Loss (dB)

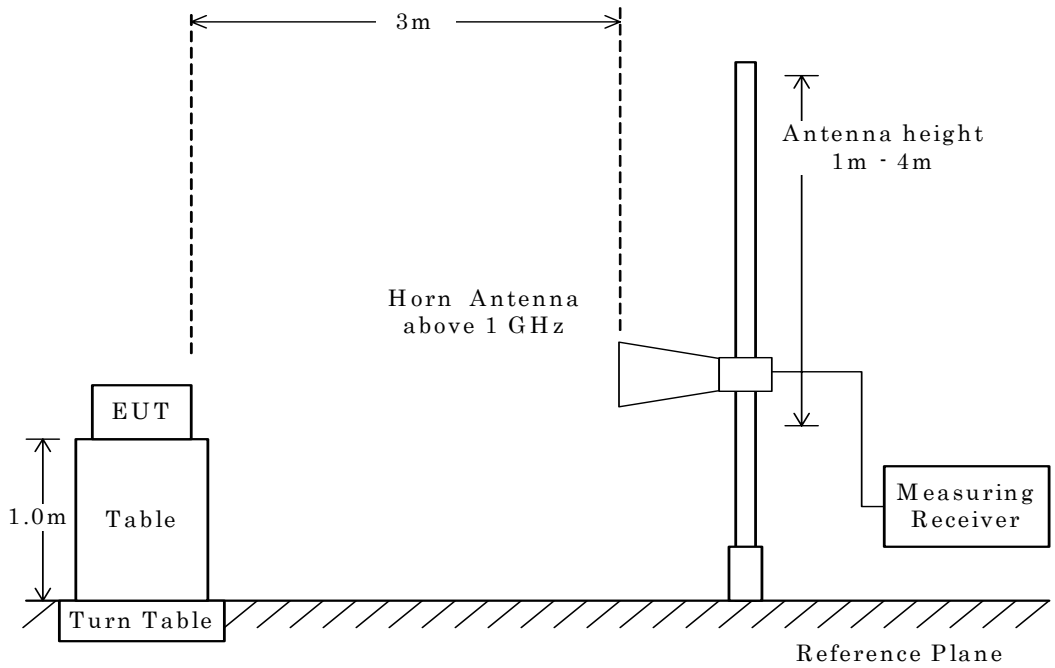
B) Above 1 GHz
ERP (dBm) = P (dBm) + Gh (dBi) - Gd (dBi)
Where, Gh (dBi) : Gain of the substitution horn antenna
Gd (dBi) : Gain of the substitution half-wave dipole antenna

The respective calculated ERP of the spurious and harmonics were compared with the 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 hands free unit used.

Radiated Emission 30 MHz to 1000 MHz

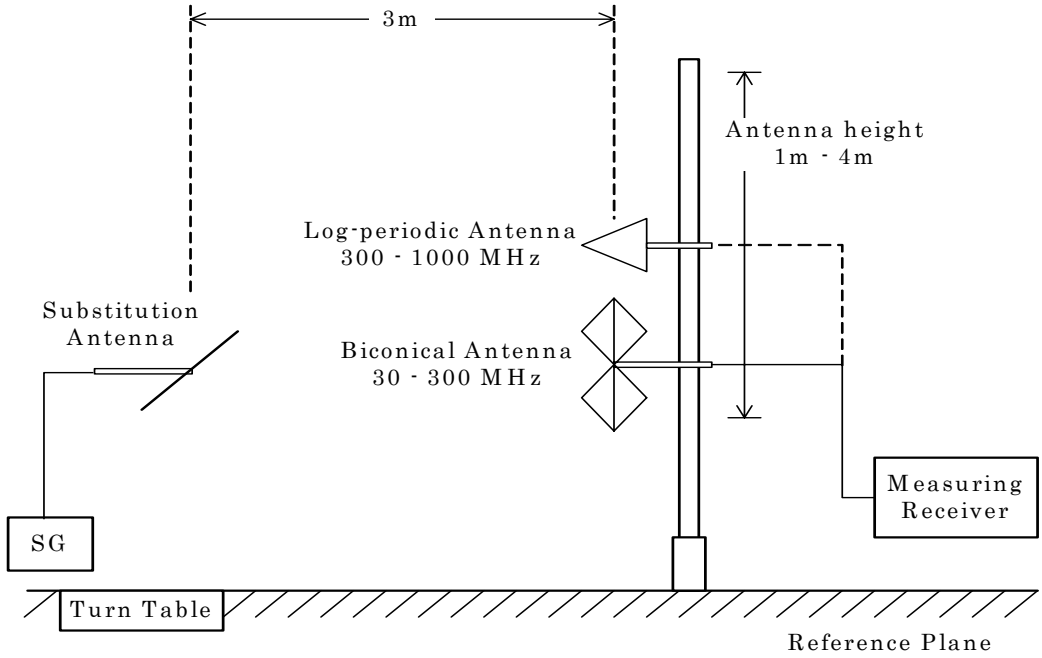



Radiated Emission above 1 GHz

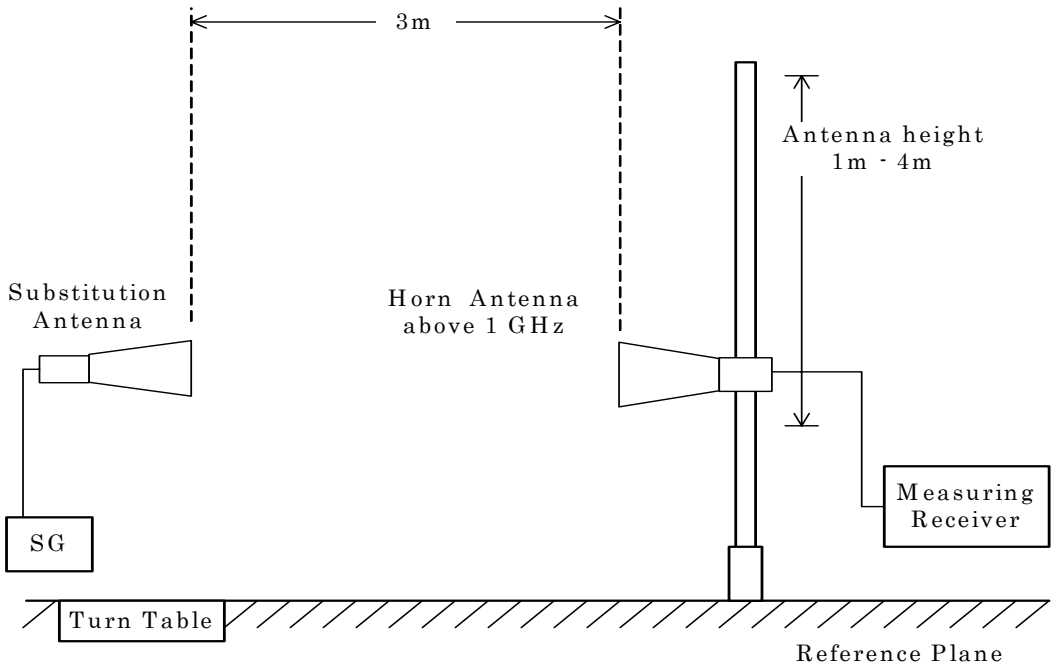



NOTE
The antenna height is scanned depending on the EUT's size and mounting height.

Radiated Emission 30 to 1000 MHz – Substitution Method




Radiated Emission above 1 GHz – Substitution Method



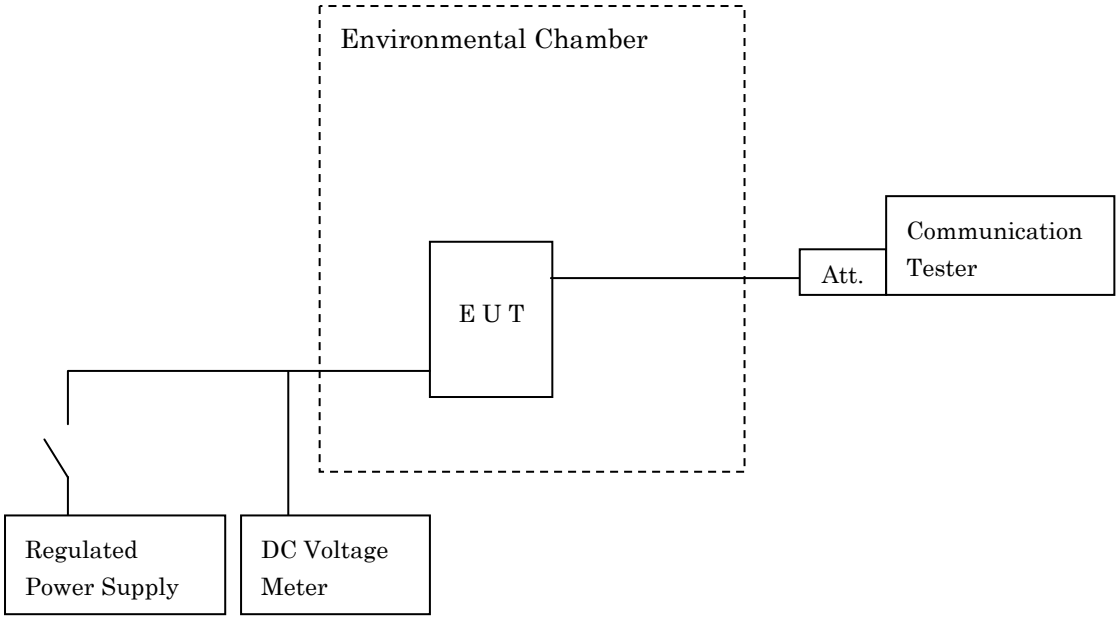
## 6.7 Frequency Stability (§2.1055)

### Frequency Stability 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 (4.0VDC) 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.

### Frequency Stability 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 (4.0VDC) and the power (3.7VDC, the ending voltage) was applied to the EUT allowed to stabilize for 10 minutes. The transmitting frequency was measured at startup and 2 minutes, 5 minutes and 10 minutes after startup.



## 7 Equipment Under Test Modification

☒ - No modifications were conducted by JQA to achieve compliance to the limitations.
☐ - To achieve compliance to the limitations, the following changes were made by JQA during the compliance test.

The modifications will be implemented in all production models of this equipment.

Applicant : Not Applicable
Date : Not Applicable
Typed Name : Not Applicable
Position : Not Applicable Signatory : Not Applicable

## 8 Responsible Party

Responsible Party of Test Item (Product)

Responsible Party :

Contact Person :

Signatory

## 9 Deviation from Standard

☒ - No deviations from the standard described in clause 1.
☐ - The following deviations were employed from the standard described in clause 1.

## 10 Test Results

### 10.1 RF Power Output (§2.1046)

#### 10.1.1 Conducted RF Power Output

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

Transmitter Power is 690.2 mW at 1880.000 MHz

Uncertainty of Measurement Results at Amplitude +/-0.19 dB(2σ)

Remarks : _____

#### 10.1.2 ERP / EIRP RF Power Output

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

☒ - **Passed** ☐ - **Failed** ☐ - **Not judged**

Min. Limit Margin 1.8 dB at 1909.800 MHz

Max. Limit Exceeding _____ dB at _____ MHz

Uncertainty of Measurement Results at Amplitude +/-1.3 dB(2σ)

Remarks : The maximum EIRP is 1.318 W at 1909.800 MHz.

### 10.2 Modulation Characteristics (§2.1047)

The requirements are ☐ - Applicable [☐ - Tested. ☐ - Not tested by applicant request.]
☒ - Not Applicable

☐ - **Passed** ☐ - **Failed** ☐ - **Not judged**

Remarks : _____

### 10.3 Occupied Bandwidth (§2.1049)

The requirements are ☒ - Applicable [☐ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

☒ - **Passed** ☐ - **Failed** ☐ - **Not judged**

| | | | | |
|---|---|---|---|---|
| The 99% Bandwidth is | 242.8 | kHz | at 1880.000 | MHz |
| The 26dB Bandwidth is | 317.2 | kHz | at 1909.800 | MHz |

| | | |
|---|---|---|
| Uncertainty of Measurement Results at Frequency | +/-1.7 | kHz(2σ) |
| Uncertainty of Measurement Results at Amplitude | +/-0.24 | dB(2σ) |

Remarks : _____

### 10.4 Spurious Emissions at Antenna Terminals (§2.1051)

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

☒ - **Passed** ☐ - **Failed** ☐ - **Not judged**

| | | | | |
|---|---|---|---|---|
| Min. Limit Margin | 34.0 | dB | at 2670.00 | MHz |
| Max. Limit Exceeding | _____ | dB | at _____ | MHz |

| | | |
|---|---|---|
| Uncertainty of Measurement Results at Amplitude | +/-0.24 | dB(2σ) |

Remarks : _____

### 10.5 Band-Edge Emission (§2.1051)

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

☒ - **Passed** ☐ - **Failed** ☐ - **Not judged**

The Band-Edge level is -36.4 dBc at 1910.00 MHz

Uncertainty of Measurement Results at Frequency +/-1.7 kHz(2σ)
Uncertainty of Measurement Results at Amplitude +/-0.24 dB(2σ)

Remarks :

### 10.6 Field Strength of Spurious Radiation (§2.1053)

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

☒ - **Passed** ☐ - **Failed** ☐ - **Not judged**

Min. Limit Margin >18.6 dB at 13368.600 MHz

Max. Limit Exceeding _____ dB at _____ MHz

Uncertainty of Measurement Results 30 MHz – 1000 MHz +1.4/-1.3 dB(2σ)
above 1 GHz +/-1.3 dB(2σ)

Remarks :

### 10.7 Frequency Stability(§2.1055)

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

The Frequency Stability level is +0.04 ppm at 1880.000 MHz

Uncertainty of Measurement Results +/-10 Hz(2σ)

Remarks :

## 11 Summary

**General Remarks** :

The EUT was tested according to the requirements of the following standard.
CFR 47 FCC Rules and Regulations Part 24
The test configuration is shown in clause 12 to 14.
The conclusion for the test items of which are required by the applied regulation is indicated under the test results.
Determining compliance with the limits in this report was based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

**Test Results** :

The "as received" sample;

☒ - fulfill the test requirements of the regulation mentioned on clause 1.
☐ - doesn't fulfill the test requirements of the regulation mentioned on clause 1.

Reviewed by:

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

Tested by:

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

## 12 Operating Condition

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

The Radiated Emission test were carried under 3 test configurations shown in clause 14.
In all tests, the fully charged battery is used for the EUT.

Detailed Transmitter portion:
Transmitter frequency : 1850.2 MHz(512CH) – 1909.8 MHz(810CH)
Local frequency : 1850.2 MHz(512CH) – 1909.8 MHz(810CH)

Detailed Transmitter portion:
Receiver frequency : 1930.2 MHz(512CH) – 1989.8 MHz(810CH)
Local frequency : 3860.4 MHz(512CH) – 3979.6 MHz(810CH)

Other Clock Frequency
RTC : 32.768 kHz
Reference : 26.0 MHz
WLAN : 40.0 MHz

## 13 Test Configuration

The equipment under test (EUT) consists of :

| | Item | Manufacturer | Model No. | Serial No. | FCC ID |
|---|---|---|---|---|---|
| A | Cellular Phone | Sharp | 940SH | 004401/11/208605/9 | APYHRO00108 |
| B | Lithium-ion Battery | SANYO | SHBCR1 | -- | N/A |
| C | AC Charger | KYUSHU MITSUMI | ZTDAA1 | -- | N/A |
| D | Stereo Handsfree | HOSIDEN | RPHOHA018AF | -- | N/A |

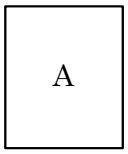
The auxiliary equipment used for testing :
None

Type of Cable:

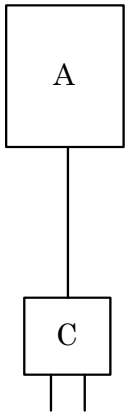
| No. | Description | Identification (Manu. etc.) | Connector Shielded | Cable Shielded | Ferrite Core | Length (m) |
|---|---|---|---|---|---|---|
| 1 | DC Power Cord | -- | NO | -- | NO | 1.5 |
| 2 | Headset Cable | -- | NO | -- | NO | 1.7 |

## 14 Equipment Under Test Arrangement (Drawings)

a) Single Unit

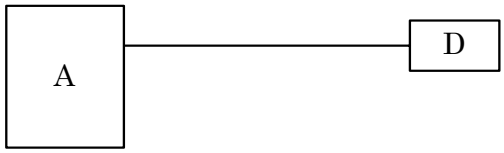



b) AC Charger used




120VAC 60Hz

c) Headset used



# Appendix A: Test Data

## A.1 RF Power Output (§2.1046)

### A.1.1 Conducted RF Power Output

(GSM-PCS1900)

Test Date: September 16, 2009
Temp.: 26 °C, Humi: 42 %

| Transmitting Frequency CH | [MHz] | Correction Factor [dB] | Meter Reading (Peak) [dBm] | Results (Peak) [dBm] | [mW] |
|---|---|---|---|---|---|
| 512 | 1850.200 | 9.90 | 18.44 | 28.34 | 682.3 |
| 661 | 1880.000 | 9.90 | 18.49 | 28.39 | 690.2 |
| 810 | 1909.800 | 9.90 | 18.33 | 28.23 | 665.3 |

Calculated result at 1880.000 MHz, as the maximum level point shown on underline:

| | | | | |
|---|---|---|---|---|
| | Correction Factor | = | 9.90 | dB |
| +) | Meter Reading | = | 18.49 | dBm |
| | Result | = | 28.39 | dBm = 690.2 mW |

NOTE : The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.

## A.1.2 ERP /EIRP Power Output

(GSM-PCS1900)

Test Date: September 9, 2009
Temp.: 26 °C, Humi: 50 %

**1. Measurement Results**

| CH | Transmitting Frequency [MHz] | Emission Measurement [dB(uV)] Hori. (Mh) | Emission Measurement [dB(uV)] Vert. (Mv) | Substitution Measurement [dB(uV)] Hori. (Msh) | Substitution Measurement [dB(uV)] Vert. (Msv) | Supplied Power to Substitution Antenna [dBm] | Gain of Substitution Antenna [dB] |
|---|---|---|---|---|---|---|---|
| 512 | 1850.200 | 93.2 | 92.3 | 74.0 | 74.2 | - 3.2 | 14.3 |
| 661 | 1880.000 | 91.3 | 90.6 | 74.3 | 74.5 | - 3.2 | 14.4 |
| 810 | 1909.800 | 94.4 | 90.2 | 74.5 | 74.5 | - 3.2 | 14.5 |

**2. Calculation Results**

| CH | Transmitting Frequency [MHz] | Peak EIRP [dBm] (EIRPh) | Peak EIRP [dBm] Vert. (EIRPv) | Maximum Peak EIRP [W] | Limits [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|
| 512 | 1850.200 | 30.3 | 29.2 | 1.072 | 33.0 | + 2.7 |
| 661 | 1880.000 | 28.2 | 27.3 | 0.661 | 33.0 | + 4.8 |
| 810 | 1909.800 | 31.2 | 27.0 | 1.318 | 33.0 | + 1.8 |

Calculated result at 1909.800 MHz, as the worst point shown on underline:

| | | | | |
|---|---|---|---|---|
| | Emission Measurment (Mh) | = | 94.4 | dB(uV) |
| | Substitution Measurement (Msh) | = | -74.5 | dB(uV) |
| | Supplied Power to Substitution Antenna | = | -3.2 | dBm |
| + ) | Gain of Substitution Antenna | = | 14.5 | dB |
| | Result (ERPh) | = | 31.2 | dBm = 1.318 W |

Minimum Margin: 33.0 - 31.2 = 1.8 (dB)

NOTE : Setting of measuring instrument(s) :

| Detector Function | Resolution B.W. | V.B.W. | Sweep Time |
|---|---|---|---|
| Peak | 1 MHz | 1 MHz | 20 msec. |

## A.2 Modulation Characteristics (§2.1047)

Not Applicable

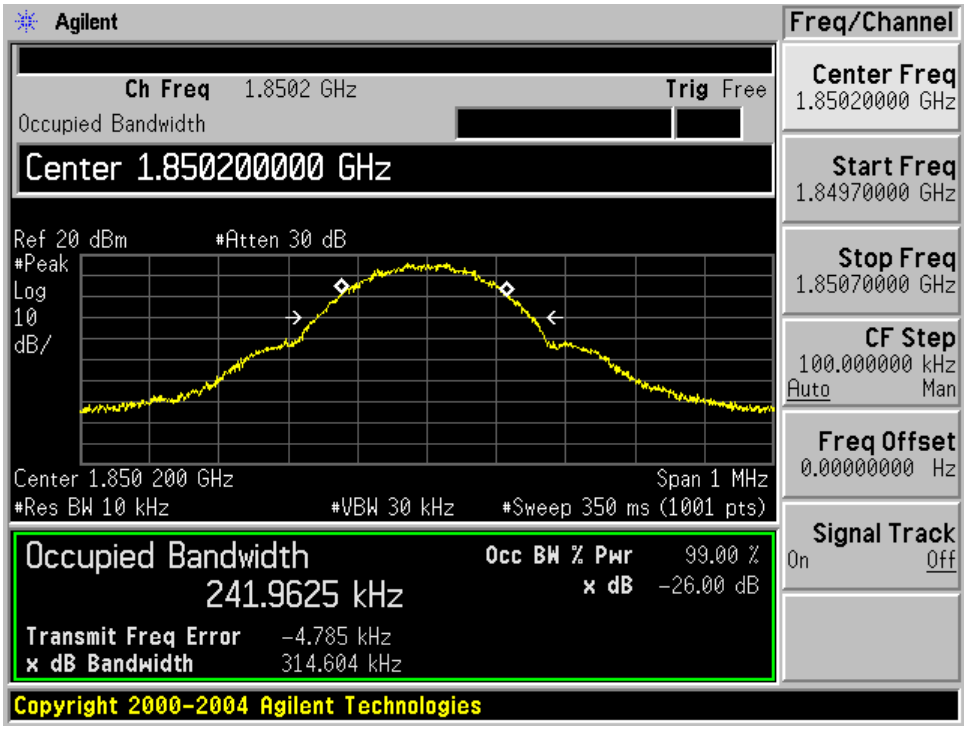
## A.3 Occupied Bandwidth (§2.1049)

The resolution bandwidth was set to about 1% of emission bandwidth, -26dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.

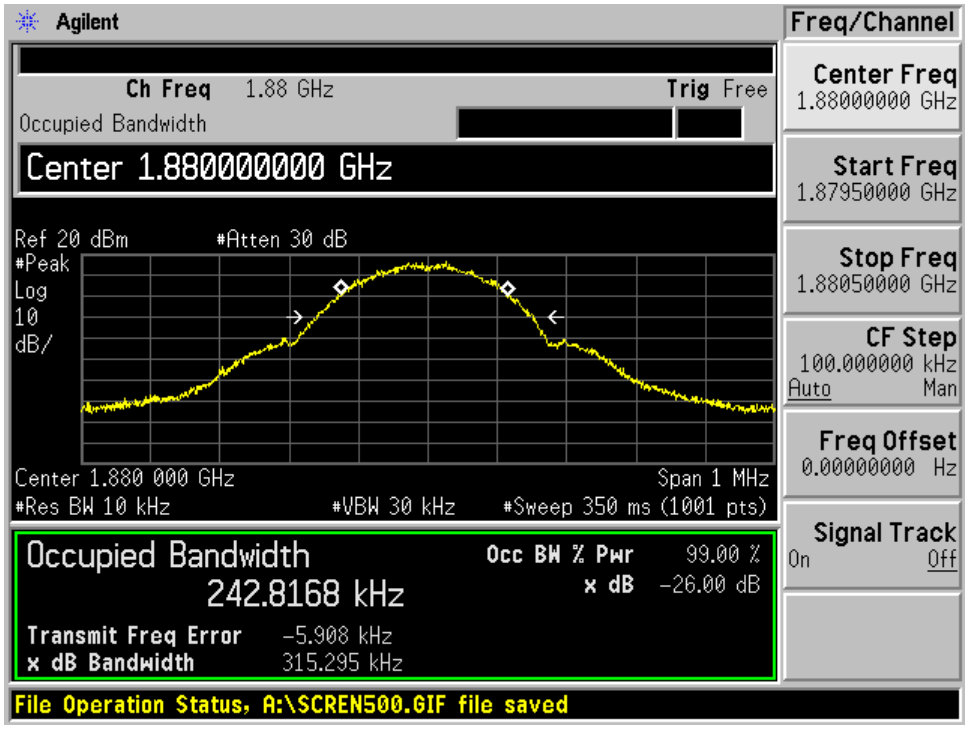
Test Date : September 16, 2009
Temp.:26°C, Humi:42%

| Channel | Frequency (MHz) | 99% Bandwidth (kHz) | -26dBc Bandwidth (kHz) |
|---|---|---|---|
| 512 | 1850.200 | 242.0 | 314.6 |
| 661 | 1880.000 | 242.8 | 315.3 |
| 810 | 1909.800 | 242.4 | 317.2 |

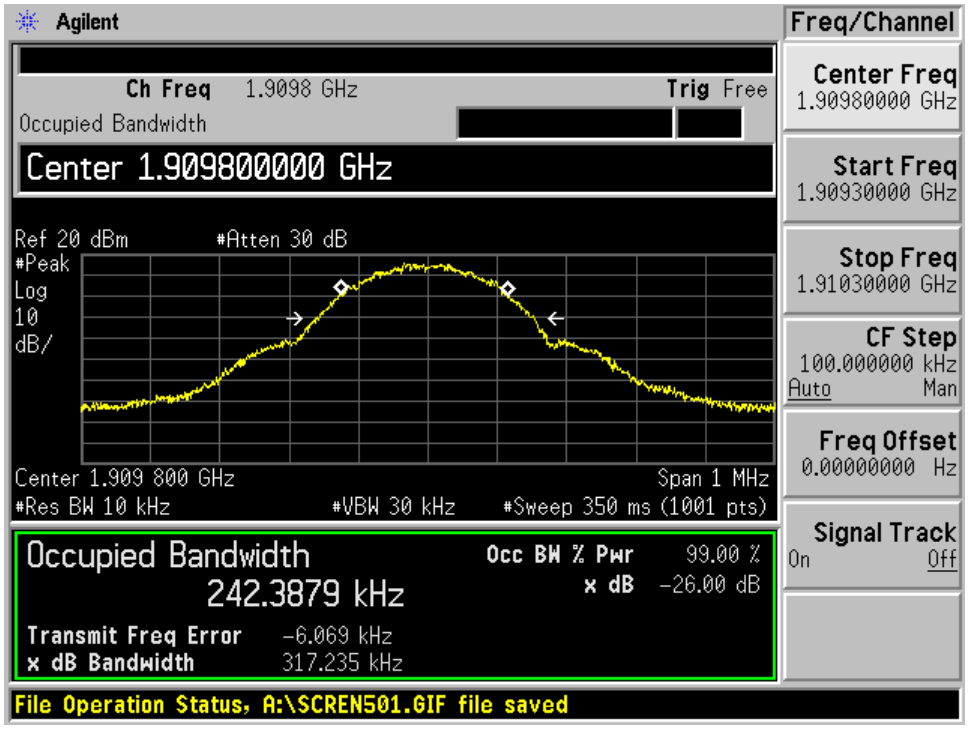
Low Channel



Middle Channel




High Channel



## A.4 Spurious Emissions at Antenna Terminals (§2.1051)

(GSM-PCS1900)

Test Date: September 16, 2009
Temp.: 26 °C, Humi: 42 %

| CH | Transmitting Frequency [MHz] | Measured Frequency [MHz] | Corr. Factor [dB] | Meter Readings [dBm] | Limits [dBm] | Results [dBm] | Margin [dB] | Remarks |
|---|---|---|---|---|---|---|---|---|
| 512 | 1850.200 | 2670.000 | 11.3 | -58.3 | -13.0 | -47.0 | +34.0 | C |
| | | 3700.400 | 11.4 | < -63.0 | -13.0 | < -51.6 | > +38.6 | C |
| | | 5550.600 | 11.3 | < -63.0 | -13.0 | < -51.7 | > +38.7 | C |
| | | 7400.800 | 11.4 | < -63.0 | -13.0 | < -51.6 | > +38.6 | C |
| | | 9251.000 | 11.5 | < -63.0 | -13.0 | < -51.5 | > +38.5 | C |
| | | 11101.200 | 11.6 | < -63.0 | -13.0 | < -51.4 | > +38.4 | C |
| | | 12951.400 | 11.8 | < -63.0 | -13.0 | < -51.2 | > +38.2 | C |
| | | 14801.600 | 11.9 | < -63.0 | -13.0 | < -51.1 | > +38.1 | C |
| | | 16651.800 | 12.4 | < -63.0 | -13.0 | < -50.6 | > +37.6 | C |
| | | 18502.000 | 12.7 | < -63.0 | -13.0 | < -50.3 | > +37.3 | C |
| 661 | 1880.000 | 2670.000 | 11.3 | -58.8 | -13.0 | -47.5 | +34.5 | C |
| | | 3760.000 | 11.4 | < -63.0 | -13.0 | < -51.6 | > +38.6 | C |
| | | 5640.000 | 11.3 | < -63.0 | -13.0 | < -51.7 | > +38.7 | C |
| | | 7520.000 | 11.4 | < -63.0 | -13.0 | < -51.6 | > +38.6 | C |
| | | 9400.000 | 11.5 | < -63.0 | -13.0 | < -51.5 | > +38.5 | C |
| | | 11280.000 | 11.6 | < -63.0 | -13.0 | < -51.4 | > +38.4 | C |
| | | 13160.000 | 11.8 | < -63.0 | -13.0 | < -51.2 | > +38.2 | C |
| | | 15040.000 | 11.9 | < -63.0 | -13.0 | < -51.1 | > +38.1 | C |
| | | 16920.000 | 12.4 | < -63.0 | -13.0 | < -50.6 | > +37.6 | C |
| | | 18800.000 | 12.8 | < -63.0 | -13.0 | < -50.2 | > +37.2 | C |
| 810 | 1909.800 | 2670.000 | 11.3 | -58.3 | -13.0 | -47.0 | +34.0 | C |
| | | 3819.600 | 11.4 | < -63.0 | -13.0 | < -51.6 | > +38.6 | C |
| | | 5729.400 | 11.3 | < -63.0 | -13.0 | < -51.7 | > +38.7 | C |
| | | 7639.200 | 11.4 | < -63.0 | -13.0 | < -51.6 | > +38.6 | C |
| | | 9549.000 | 11.5 | < -63.0 | -13.0 | < -51.5 | > +38.5 | C |
| | | 11458.800 | 11.6 | < -63.0 | -13.0 | < -51.4 | > +38.4 | C |
| | | 13368.600 | 11.8 | < -63.0 | -13.0 | < -51.2 | > +38.2 | C |
| | | 15278.400 | 12.1 | < -63.0 | -13.0 | < -50.9 | > +37.9 | C |
| | | 17188.200 | 12.5 | < -63.0 | -13.0 | < -50.5 | > +37.5 | C |
| | | 19098.000 | 12.8 | < -63.0 | -13.0 | < -50.2 | > +37.2 | C |

Calculated result at 2670.0 MHz, as the worst point shown on underline:

| | | | |
|---|---|---|---|
| | Corr. Factor | = | 11.3 dB |
| +) | Meter Reading | = | -58.3 dBm |
| | Result | = | -47.0 dBm |

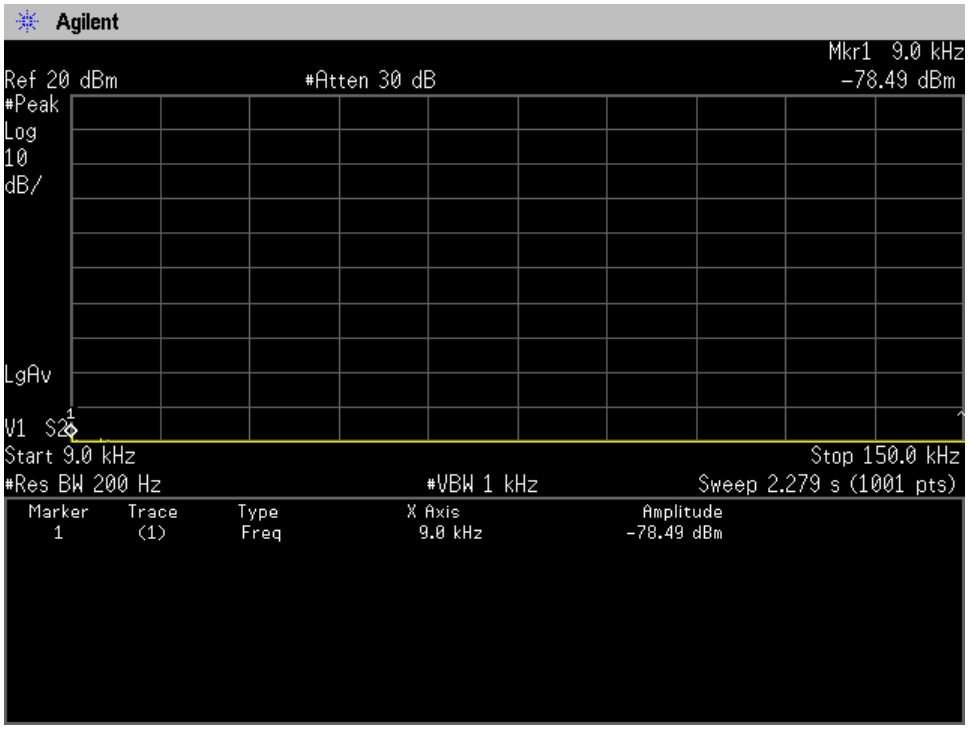
Minimum Margin: -13.0 - (-47.0) = 34.0 (dB)

NOTES

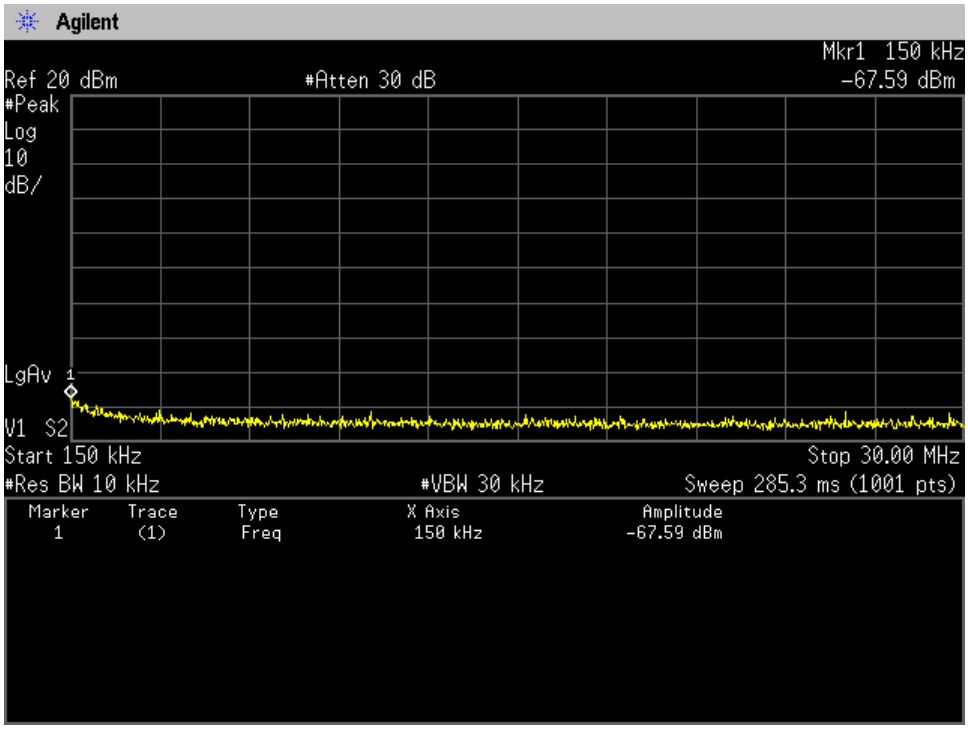
1. The spectrum was checked from 9 kHz to 20 GHz.
2. Applied limits : -13.0 [dBm] = 10log(TP[mW]) - (43 + 10log(tp[W])) = 10log(TP[mW]) - (43 + (10 log(TP[mW]) - 30))
   where, tp[W] = TP[mW] / 1000 : Transmitter power at anttena terminal
3. The correction factor is shown as follows:
   Corr. Factor [dB] = Cable Loss + 10dB Pad Att. [dB] (9 kHz - 2 GHz)
   Corr. Factor [dB] = Cable Loss + 10dB Pad Att. + High Pass Filter Loss (D-96) [dB] (over 2 GHz)
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. Setting of measuring instrument(s) :

| | Detector Function | RES B.W. | V.B.W. | Sweep Time |
|---|---|---|---|---|
| A | Peak | 200 Hz | 1 kHz | AUTO |
| B | Peak | 10 kHz | 30 kHz | AUTO |
| C | Peak | 1 MHz | 3 MHz | AUTO |

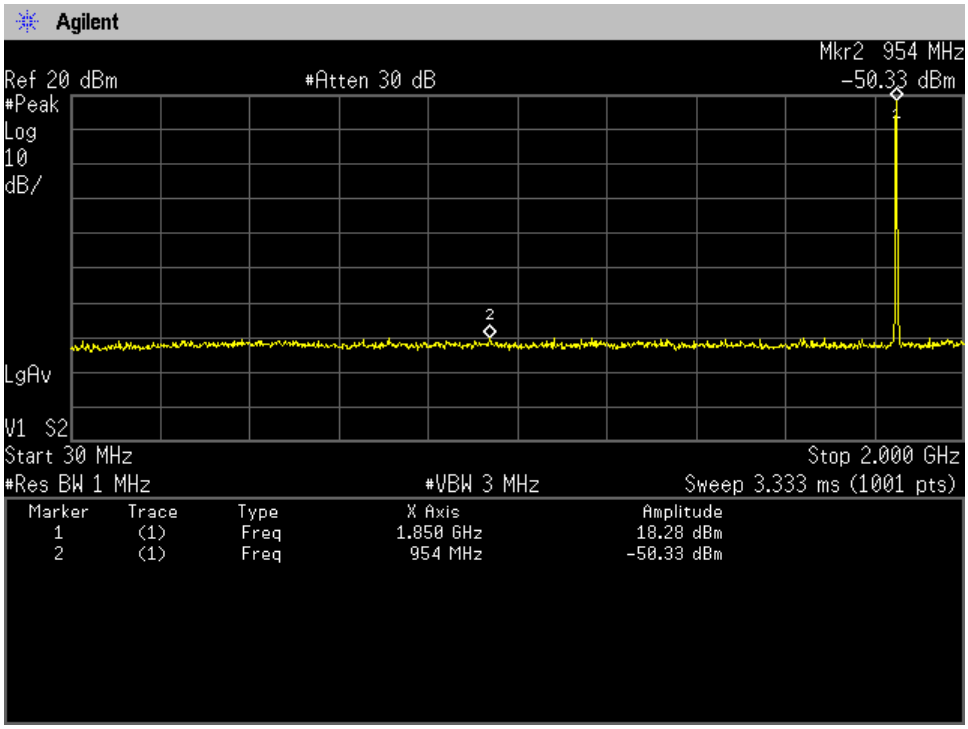
Low Channel, Out-Of-Band Emissions (9 kHz – 150 kHz)



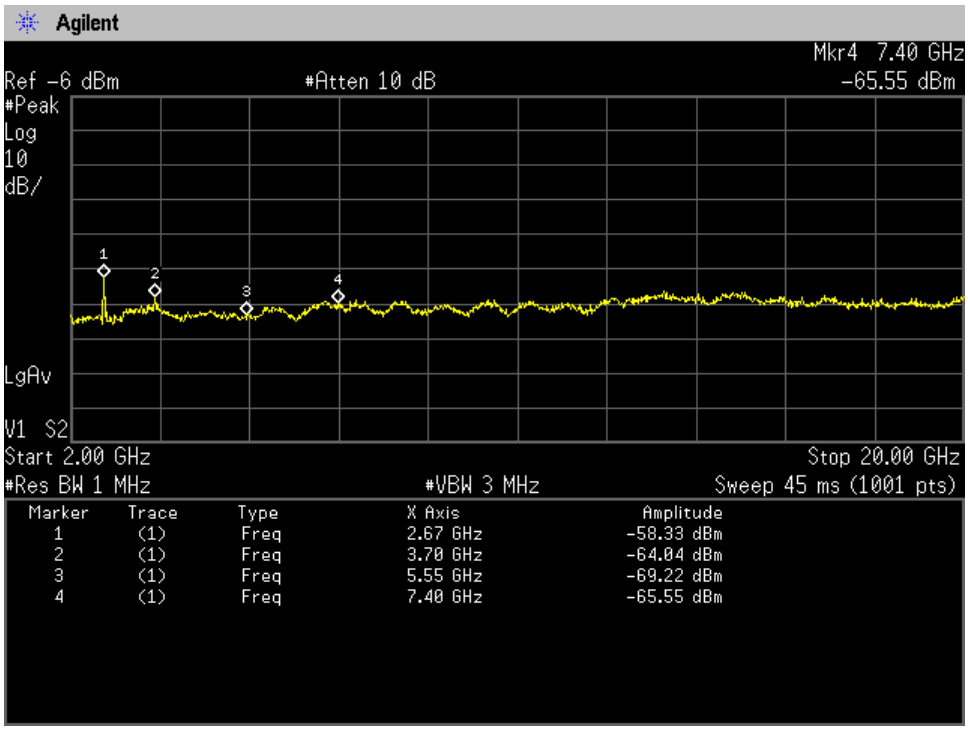

Low Channel, Out-Of-Band Emissions (150 kHz – 30 MHz)



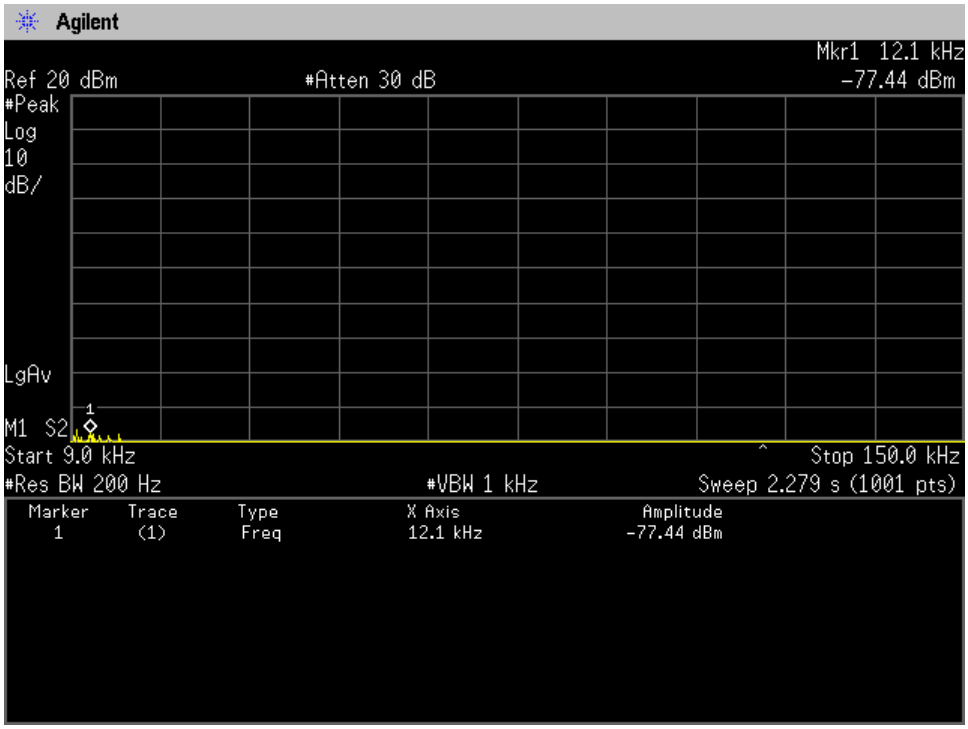
Low Channel, Out-Of-Band Emissions (30 MHz – 2 GHz)



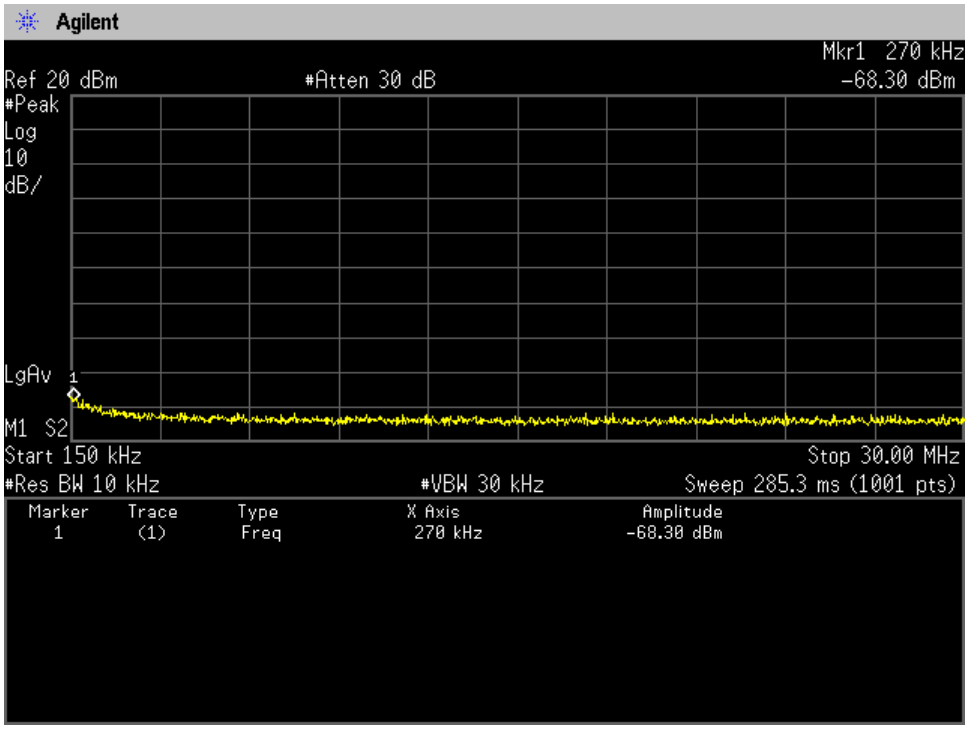

Low Channel, Out-Of-Band Emissions (2 GHz – 20 GHz)



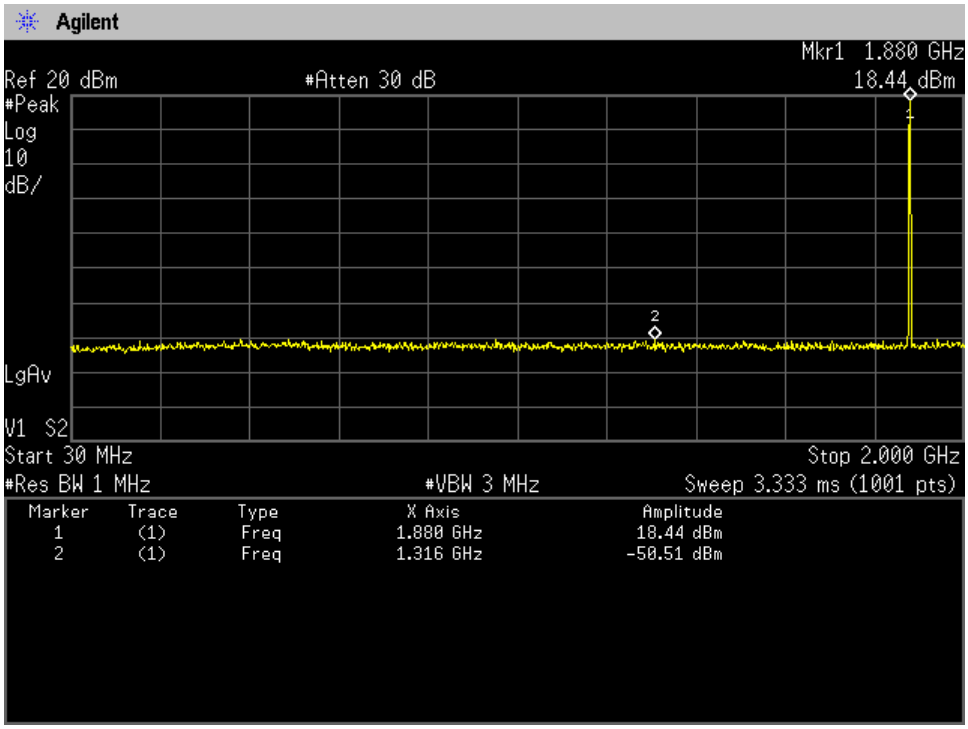
Middle Channel, Out-Of-Band Emissions (9 kHz – 150 kHz)



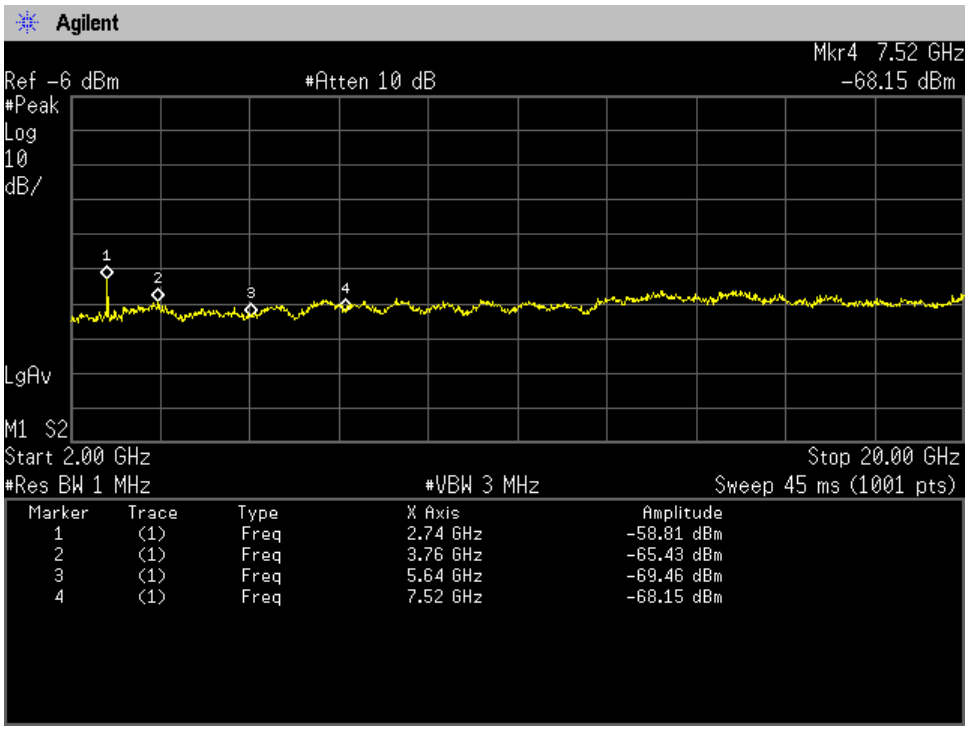

Middle Channel, Out-Of-Band Emissions (150 kHz – 30 MHz)



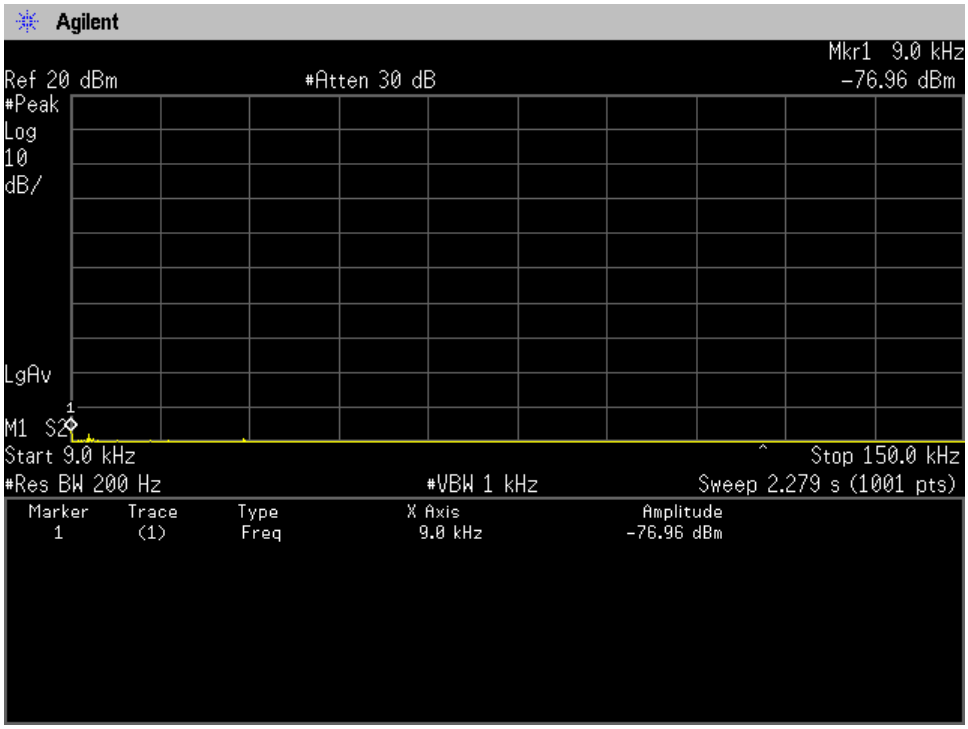
Middle Channel, Out-Of-Band Emissions (30 MHz – 2 GHz)



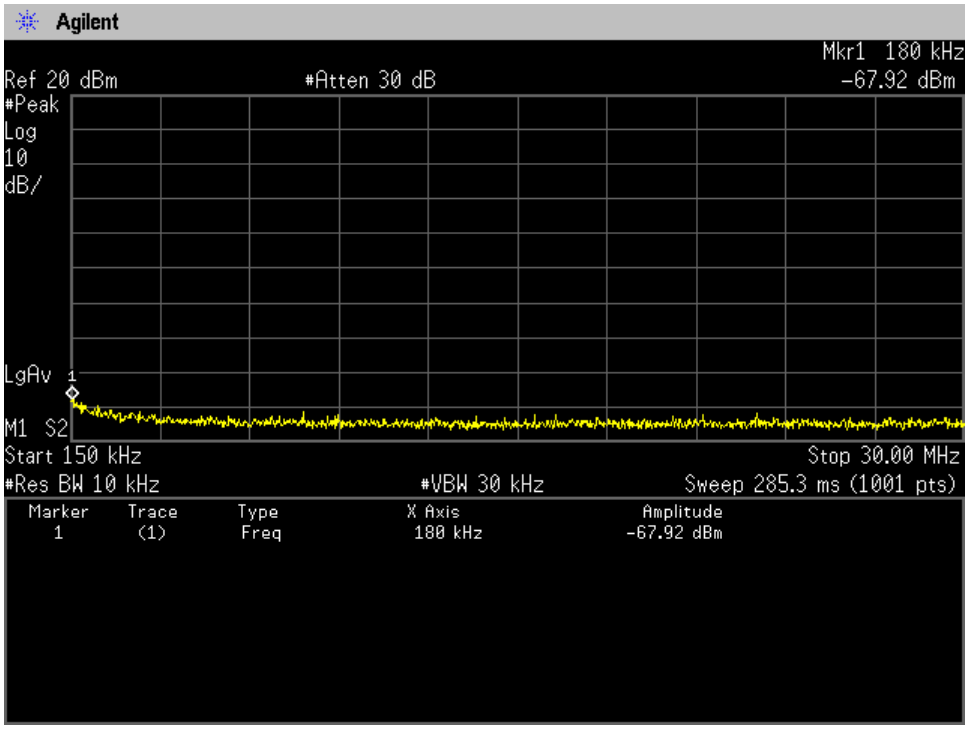

Middle Channel, Out-Of-Band Emissions (2 GHz – 20 GHz)



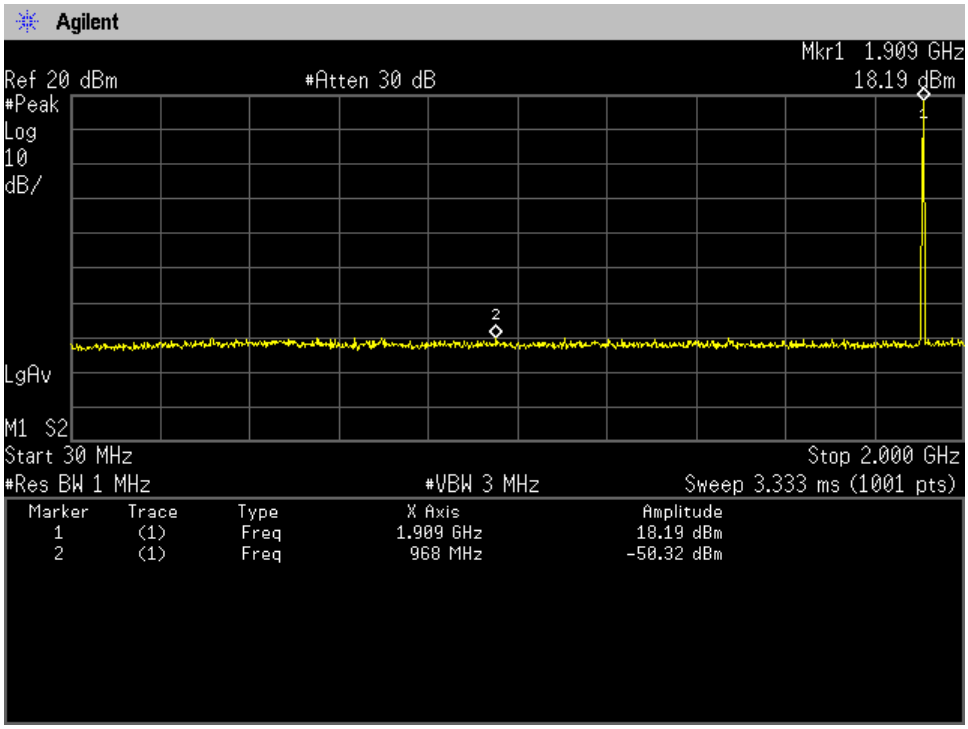
High Channel, Out-Of-Band Emissions (9 kHz – 150 kHz)



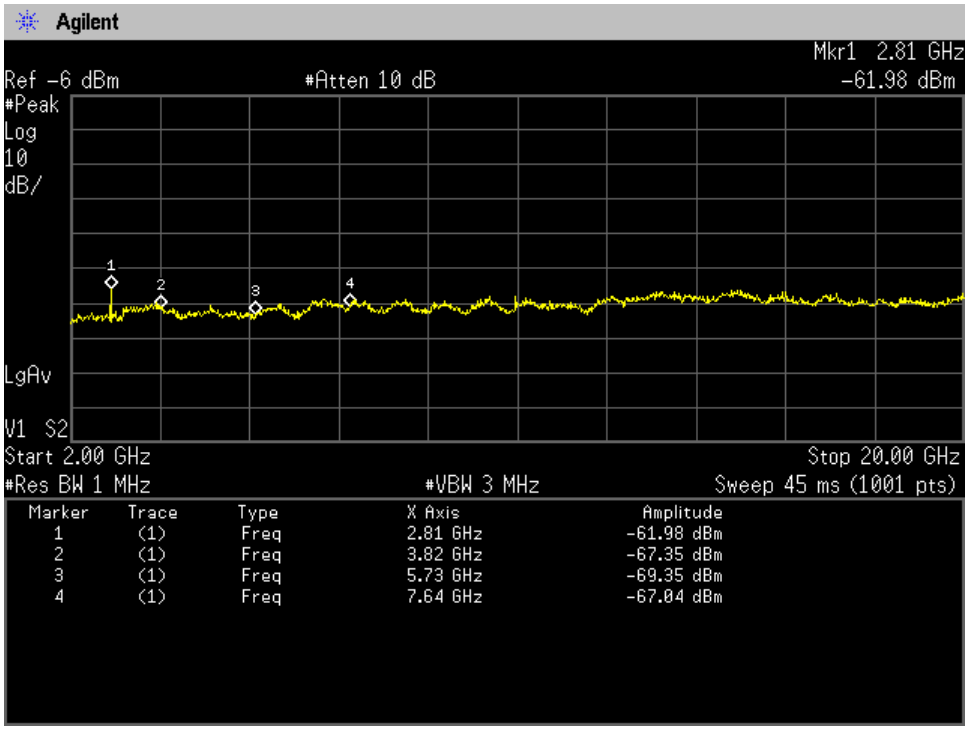

High Channel, Out-Of-Band Emissions (150 kHz – 30 MHz)



High Channel, Out-Of-Band Emissions (30 MHz – 2 GHz)




High Channel, Out-Of-Band Emissions (2 GHz – 20 GHz)



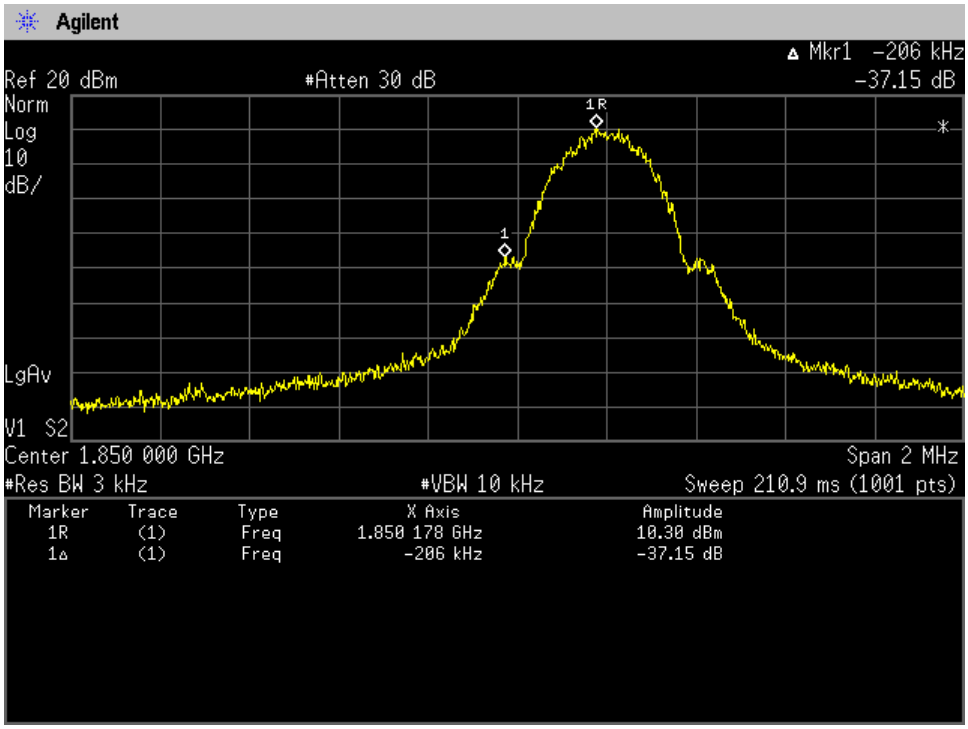
## A.5 Band-Edge Emission(§2.1051)

Test Date : September 16, 2009
Temp.:26°C, Humi:42%

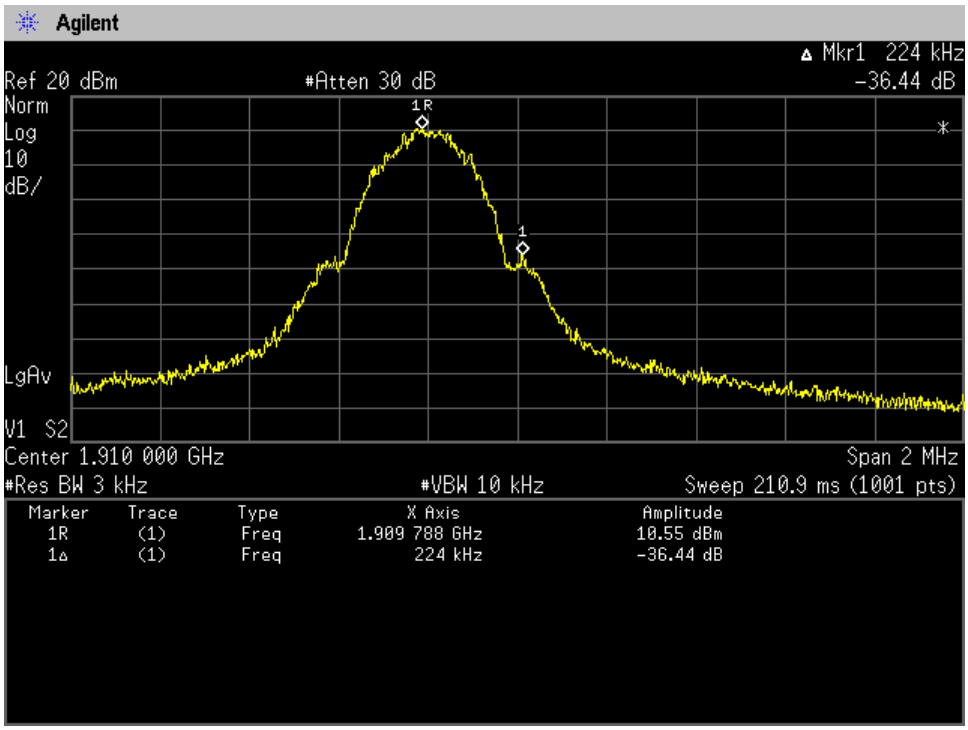
(GSM-PCS1900)

| Channel | Frequency (MHz) | Band-Edge Frequency (MHz) | Band-Edge Level (dBc) |
|---|---|---|---|
| 512 | 1850.200 | 1850.00 | -37.2 |
| 810 | 1909.800 | 1910.00 | -36.4 |

Low Channel, Band-Edge Emission




High Channel, Band-Edge Emission



## A.6 Field Strength of Spurious Radiation (§2.1053)

(GSM-PCS1900)

Test Date: September 9, 2009
Temp.: 26 °C, Humi: 50 %

**Test Configuration : Single Unit**

| CH | Transmitting Frequency [MHz] | Measured Frequency [MHz] | ERP [dBm] Hori. | ERP [dBm] Vert. | Limits [dBm] | Margin [dB] | Remarks |
|---|---|---|---|---|---|---|---|
| 512 | 1850.200 | 3700.400 | < -37.7 | < -37.7 | -13.0 | > +24.7 | C |
| | | 5550.600 | < -34.6 | < -34.6 | -13.0 | > +21.6 | C |
| | | 7400.800 | < -33.8 | < -33.8 | -13.0 | > +20.8 | C |
| | | 9251.000 | < -38.1 | < -38.1 | -13.0 | > +25.1 | C |
| | | 11101.200 | < -37.6 | < -37.6 | -13.0 | > +24.6 | C |
| | | 12951.400 | < -32.1 | < -32.1 | -13.0 | > +19.1 | C |
| | | 14801.600 | < -31.8 | < -31.8 | -13.0 | > +18.8 | C |
| | | 16651.800 | < -33.2 | < -33.2 | -13.0 | > +20.2 | C |
| | | 18502.000 | < -38.4 | < -38.4 | -13.0 | > +25.4 | C |
| 661 | 1880.000 | 3760.000 | < -37.8 | < -37.8 | -13.0 | > +24.8 | C |
| | | 5640.000 | < -34.6 | < -34.6 | -13.0 | > +21.6 | C |
| | | 7520.000 | < -33.2 | < -33.2 | -13.0 | > +20.2 | C |
| | | 9400.000 | < -38.2 | < -38.2 | -13.0 | > +25.2 | C |
| | | 11280.000 | < -37.7 | < -37.7 | -13.0 | > +24.7 | C |
| | | 13160.000 | < -32.0 | < -32.0 | -13.0 | > +19.0 | C |
| | | 15040.000 | < -32.2 | < -32.2 | -13.0 | > +19.2 | C |
| | | 16920.000 | < -32.7 | < -32.7 | -13.0 | > +19.7 | C |
| | | 18800.000 | < -38.4 | < -38.4 | -13.0 | > +25.4 | C |
| 810 | 1909.800 | 3819.600 | < -37.6 | < -37.6 | -13.0 | > +24.6 | C |
| | | 5729.400 | < -34.8 | < -34.8 | -13.0 | > +21.8 | C |
| | | 7639.200 | < -37.7 | < -37.7 | -13.0 | > +24.7 | C |
| | | 9549.000 | < -38.3 | < -38.3 | -13.0 | > +25.3 | C |
| | | 11458.800 | < -37.7 | < -37.7 | -13.0 | > +24.7 | C |
| | | 13368.600 | < -31.6 | < -31.6 | -13.0 | > +18.6 | C |
| | | 15278.400 | < -32.6 | < -32.6 | -13.0 | > +19.6 | C |
| | | 17188.200 | < -32.9 | < -32.9 | -13.0 | > +19.9 | C |
| | | 19098.000 | < -38.5 | < -38.5 | -13.0 | > +25.5 | C |

Calculated result at 13368.6 MHz, as the worst point shown on underline:
Minimum Margin: -13.0 - (<-31.6) = >18.6 (dB)

NOTES
1. Test Distance : 3 m
2. The spectrum was checked from 30 MHz to 20 GHz.
3. All emissions not reported were more than 20 dB below the applied limits.
4. Applied limits : -13.0 [dBm] = 10log(TP[mW]) - (43 + 10log(tp[W])) = 10log(TP[mW]) - (43 + (10 log(TP[mW]) - 30))
   where, tp[W] = TP[mW] / 1000 : Transmitter power at anttena terminal
5. The symbol of "<" means "or less".
6. The symbol of ">" means "more than".
7. Setting of measuring instrument(s) :

| | Detector Function | RES B.W. | V.B.W. | Sweep Time |
|---|---|---|---|---|
| A | Peak | 10 kHz | 30 kHz | 20 msec. |
| B | Peak | 100 kHz | 300 kHz | 20 msec. |
| C | Peak | 1 MHz | 3 MHz | 20 msec. |

## A.7 Frequency Stability (§2.1055)

(GSM-PCS1900)

Test Date: September 1, 2009

**1. Frequency Stability Measurement versus Temperature**

**Transmitting Frequency : 1880.000 MHz (661 ch)**
**DC Supply Voltage : 4.0 VDC**

| Ambient Temperature [°C] | Deviation [ppm] Startup | 2 minutes | 5 minutes | 10 minutes | Limits [ppm] | Margin [ppm] |
|---|---|---|---|---|---|---|
| -30 | **+ 0.04** | + 0.01 | - 0.01 | + 0.02 | N/A | N/A |
| -20 | + 0.03 | + 0.02 | + 0.01 | + 0.02 | N/A | N/A |
| -10 | + 0.01 | + 0.01 | + 0.00 | + 0.01 | N/A | N/A |
| 0 | + 0.02 | + 0.00 | + 0.00 | + 0.01 | N/A | N/A |
| 10 | + 0.00 | + 0.02 | - 0.01 | + 0.01 | N/A | N/A |
| 20 | - 0.02 | - 0.02 | - 0.02 | - 0.01 | N/A | N/A |
| 30 | - 0.02 | - 0.02 | - 0.01 | + 0.01 | N/A | N/A |
| 40 | + 0.00 | + 0.01 | + 0.00 | + 0.00 | N/A | N/A |
| 50 | + 0.01 | - 0.02 | - 0.02 | + 0.01 | N/A | N/A |

**2. Frequency Stability Measurement versus Power Supply Voltage**

**Transmitting Frequency : 1880.000 MHz (661 ch)**
**DC Supply Voltage : 20 °C**

| Ambient Temperature [°C] | Deviation [ppm] Startup | 2 minutes | 5 minutes | 10 minutes | Limits [ppm] | Margin [ppm] |
|---|---|---|---|---|---|---|
| 4.0 | - 0.02 | + 0.00 | - 0.01 | - 0.01 | N/A | N/A |
| 3.7(Ending) | - 0.03 | - 0.01 | + 0.01 | - 0.02 | N/A | N/A |

Test condition example as the maximum deviation point shown on underline:
Ambient Temperature : -30 °C / Startup
DC Supply Voltage : 4 VDC

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

## Appendix B: Test Arrangement (Photographs)

### Radiated Emission

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*This page is CONFIDENTIAL.*

## Appendix C: Test Instruments

### C.1 RF Power Output

#### C.1.1 Conducted RF Power Output

| Type | Model | Manufacturer | ID No. | Last Cal. | Interval |
|---|---|---|---|---|---|
| Power Meter | E4417A | Agilent | B-51 | 2009/6 | 1 Year |
| Power Sensor | E9323A | Agilent | B-59 | 2009/6 | 1 Year |
| Attenuator | 54-10 | Weinschel | D-82 | 2009/6 | 1 Year |

#### C.1.2 ERP /EIRP Power Output

| Type | Model | Manufacturer | ID No. | Last Cal. | Interval |
|---|---|---|---|---|---|
| Spectrum Analyzer | E4446A | Agilent | A-39 | 2008/12 | 1 Year |
| Signal Generator | E8257D | Agilent | B-39 | 2009/8 | 1 Year |
| Power Meter | N1911A | Agilent | B-63 | 2009/6 | 1 Year |
| Power Sensor | N1921A | Agilent | B-64 | 2009/6 | 1 Year |
| Attenuator(RX) | 2-10 | Weinschel | D-79 | 2009/9 | 1 Year |
| Attenuator(TX) | 2-10 | Weinschel | D-80 | 2009/9 | 1 Year |
| RF Cable(RX) | SUCOFLEX104 | SUHNER | C-40-11 | 2008/12 | 1 Year |
| RF Cable(TX) | SUCOFLEX 102/E | SUHNER | C-70 | 2009/3 | 1 Year |
| Horn Antenna(RX) | 91889-2 | EATON | C-40-2 | 2009/6 | 1 Year |
| Horn Antenna(TX) | 91889-2 | EATON | C-41-2 | 2009/6 | 1 Year |

### B.2 Modulation Characteristics

Not Applicable

### C.3 Occupied Bandwidth

| Type | Model | Manufacturer | ID No. | Last Cal. | Interval |
|---|---|---|---|---|---|
| Spectrum Analyzer | E4446A | Agilent | A-39 | 2008/12 | 1 Year |
| Attenuator | 54-10 | Weinschel | D-82 | 2009/6 | 1 Year |
| RF Cable | SUCOFLEX102 | SUHNER | C-52 | 2009/6 | 1 Year |

## C.4 Spurious Emissions at Antenna Terminals

| Type | Model | Manufacturer | ID No. | Last Cal. | Interval |
|---|---|---|---|---|---|
| Spectrum Analyzer | E4446A | Agilent | A-39 | 2008/12 | 1 Year |
| Attenuator | 54-10 | Weinschel | D-82 | 2009/6 | 1 Year |
| HPF | HPM13899 | MICRO-TRONICS | D-96 | 2009/2 | 1 Year |
| RF Cable | SUCOFLEX102 | SUHNER | C-52 | 2009/6 | 1 Year |

## C.5 Band-Edge Emission

| Type | Model | Manufacturer | ID No. | Last Cal. | Interval |
|---|---|---|---|---|---|
| Spectrum Analyzer | E4446A | Agilent | A-39 | 2008/12 | 1 Year |
| Attenuator | 54-10 | Weinschel | D-82 | 2009/6 | 1 Year |
| RF Cable | SUCOFLEX102 | SUHNER | C-52 | 2009/6 | 1 Year |

## C.6 Field Strength of Spurious Radiation

| Type | Model | Manufacturer | ID No. | Last Cal. | Interval |
|---|---|---|---|---|---|
| Test Receiver | ESCI | Rohde & Schwarz | A-42 | 2008/11 | 1 Year |
| Biconical Antenna | VHA9103/BBA9106 | Schwarzbeck | C-30 | 2009/5 | 1 Year |
| Log-periodic Antenna | UHALP 9108A1 | Schwarzbeck | C-31 | 2009/5 | 1 Year |
| RF Cable | -- | ---- | H-5 | 2009/5 | 1 Year |
| Site Attenuation | -- | ---- | H-17 | 2008/11 | 1 Year |
| Spectrum Analyzer | E4446A | Agilent | A-39 | 200812 | 1 Year |
| Signal Generator | E8257D | Agilent | B-39 | 2009/8 | 1 Year |
| Power Meter | N1911A | Agilent | B-63 | 2009/6 | 1 Year |
| Power Sensor | N1921A | Agilent | B-64 | 2009/6 | 1 Year |
| Attenuator | 2-10 | Weinschel | D-79 | 2008/9 | 1 Year |
| Attenuator | 2-10 | Weinschel | D-80 | 2008/9 | 1 Year |
| Attenuator | 54-10 | Weinschel | D-82 | 2008/12 | 1 Year |
| Attenuator | 2-10 | Weinschel | D-40 | 2008/12 | 1 Year |
| Pre-Amplifier | WJ-6611-513 | Watkins Johnson | A-23 | 2008/12 | 1 Year |
| Pre-Amplifier | WJ-6882-824 | Watkins Johnson | A-21 | 2008/12 | 1 Year |
| Pre-Amplifier | DBL-0618N515 | DBS Microwave | A-33 | 2008/12 | 1 Year |
| RF Cable | SUCOFLEX104 | SUHNER | C-40-11 | 2008/12 | 1 Year |
| RF Cable | SUCOFLEX104 | SUHNER | C-40-14 | 2008/12 | 1 Year |
| RF Cable | SUCOFLEX 102/E | SUHNER | C-70 | 2009/3 | 1 Year |
| RF Cable | SUCOFLEX102 | SUHNER | C-54 | 2009/3 | 1 Year |
| RF Cable | 102EA-40 11K-252 x2 2m | SUHNER | C-69 | 2009/3 | 1 Year |
| Horn Antenna | 91888-2 | EATON | C-40-1 | 2009/6 | 1 Year |
| Horn Antenna | 91888-2 | EATON | C-41-1 | 2009/6 | 1 Year |
| Horn Antenna | 91889-2 | EATON | C-40-2 | 2009/6 | 1 Year |
| Horn Antenna | 91889-2 | EATON | C-41-2 | 2009/6 | 1 Year |
| Horn Antenna | 94613-1 | EATON | C-40-3 | 2009/6 | 1 Year |
| Horn Antenna | 94613-1 | EATON | C-41-3 | 2009/6 | 1 Year |
| Horn Antenna | 91891-2 | EATON | C-40-4 | 2009/6 | 1 Year |
| Horn Antenna | 91891-2 | EATON | C-41-4 | 2009/6 | 1 Year |
| Horn Antenna | 94614-1 | EATON | C-40-5 | 2009/6 | 1 Year |
| Horn Antenna | CL-107-43 | ARNELLAB | C-41-5 | 2009/6 | 1 Year |
| Horn Antenna | 3160-09 | EMCO | C-48 | 2009/6 | 2 Years |

## C.7 Frequency Stability

| Type | Model | Manufacturer | ID No. | Last Cal. | Interval |
|---|---|---|---|---|---|
| Universal Telecommunication Tester | CMU200 | Rohde&Schwarz | B-21 | 2009/4 | 1 Year |
| DC Voltage Meter | 2011-39 | YEW | B-33 | 2009/4 | 1 Year |
| Environmental Chamber | PL-4KPH (S/N:14019933) | TABAI ESPEC | -- | N/A | N/A |
| Temperature Recorder | SRF106AS00000M11 (S/N: 08242304) | TABAI ESPEC | -- | 2009/8 | 1 Year |
| DC Power Supply | NL035-10 | TAKASAGO | F-4 | N/A | N/A |