



# FCC Test Report

**Product Name: Wireless Gateway**

**Model Number: HUAWEI B970**

**Report No: SYBH(E)015122007EB -2**
**FCC ID:** QISB970

**Reliability Laboratory of Huawei Technologies Co., Ltd.**

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| | |
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**REPORT ON** **FCC Test of HUAWEI B970 Wireless Gateway**
**M/N: B970**

**Report No: SYBH(E) 015122007EB-2**

**REGULATION** **FCC CFR47 Part 2: Subpart J;**

**FCC CFR47 Part 24: Subpart E;**

**Final Judgement: Pass**

| | | | |
|---|---|---|---|
| **General Manager** | **2008.05.09** | **张兴海** | |
| | Date | Name | signature |
| **Technical Responsibility For Area of Testing** | **2007.05.07** | **余　辉** | |
| | Date | Name | signature |
| **Test Lab Engineer** | **2007.05.05** | **胡　俊** | |
| | Date | Name | signature |

# Contents

# 1 Summary

The table below summarizes the measurements and results for the HUAWEI B970 Wireless Gateway. Detailed results and descriptions are shown in the following pages.

Table 1 Summary of results

| FCC Measurement Specification | FCC Limits Part(s) | Description | Result |
|---|---|---|---|
| 2.1046 | 24.232 | Effective Radiated Power of Transmitter | PASS |
| 2.1046 | 24.232 | Conducted Power of Transmitter | PASS |
| 2.1047 | | Modulation Characteristics | PASS |
| 2.1049 | | Occupied Bandwidth | PASS |
| 2.1051 | 24.238 | Band Edges Compliance | PASS |
| 2.1051 | 24.238 | Spurious Emission at Antenna Terminal | PASS |
| 2.1055 | 24.235 | Frequency Stability | PASS |
| 2.1053 | 22.917 | Radiated Spurious Emissions | PASS |

Note： The Radiated Spurious Emissions' test results are shown in the EMC report.

# 2 Product Description

## 2.1 Production Information

### 2.1.1 General Description

HUAWEI B970 Wireless Gateway is subscriber equipment in the GSM system, also supports wireless Internet accessing function, routing function, and network address translation (NAT) function. The GSM/GPRS/EDGE frequency band includes 850M, EGSM900, DCS1800 and PCS1900, but only 1900MHz band are included in this report, the WLAN frequency is 2.4G. B970 implements such functions as RF signal receiving/transmitting, EDGE/GPRS/GSM protocol processing, data service, etc. Externally it provides USB interface (to connect to the laptop etc.), USIM card interface, RJ11 interface (to connect to fixed telephone), RJ45 interface (to connect to pc). It has four internal antennas as default.

### 2.1.2 Support function and Service

The HUAWEI B970 Wireless Gateway support the function and service as follows:

Table 2 Service and Test mode List

| Service Name | Characteristic | Corresponding Test Mode | Note |
|---|---|---|---|
| Voice and data | Modulation: GMSK | TM1 | GPRS/GSM |
| Data | Modulation: 8PSK | TM2 | EDGE |

Note: * The specified GPRS test conditions & settings are defined in 3GPP TS51.010 V5.4.0, the EDGE test conditions & settings are defined in 3GPP TS51.010 V5.4.0

## 2.2 Modification Information

For original equipment, following table is not application.

Table 3 Modification Information

| Model Number | Board/Module | Original Version | New Version | Modify Information |
|---|---|---|---|---|
| Not applicable | | | | |
| | | | | |
| | | | | |
| | | | | |

# 3 Test Site Description

The test site of:

***Huawei Technologies Co. Ltd.***
***P.O. Box 518129***
***Huawei base, bantian,***
***Longgang District, Shenzhen, China***

The test site description has been submitted to FCC and registration granted under the registration number **97456** on Aug 20. 2006. The test site has been accredited by  and the accredited number is **2714.01** in Jan of 2006.

## 3.1 Testing Period

The test have been performed during the period of

**Apr. 20, 2008 – Apr. 30, 2008**

## 3.2 General Set up Description

HUAWEI B970 Wireless Gateway is subscriber equipment in the GSM system, also supports wireless Internet accessing function, routing function, and network address translation (NAT) function. The GSM/GPRS/EDGE frequency band includes 850M, EGSM900, DCS1800 and PCS1900, but only 850MHz band are included in this report, the WLAN frequency is 2.4G. B970 implements such functions as RF signal receiving/transmitting, EDGE/GPRS/GSM protocol processing, data service, etc. Externally it provides USB interface (to connect to the laptop etc.), USIM card interface, RJ11 interface (to connect to fixed telephone), RJ45 interface (to connect to pc). It has four internal antennas as default.

**TM1:** GPRS/GSM Mode with GMSK Modulation，the multi slot class of GPRS is class 10
**TM2:** EDGE Mode with 8PSK Modulation

# 4 Product Description

## 4.1 Technical Characteristics

### 4.1.1 Frequency Range

Table 4 Frequency Range

| | |
|---|---|
| Uplink band: | 1850 to 1910 MHz |
| Downlink band: | 1930 to 1990 MHz |

### 4.1.2 Channel Spacing / Separation

Table 5 Channel Spacing / Separation

| | EDGE/GPRS/GSM |
|---|---|
| Channel spacing | 200k Hz |
| Channel separation: | 200k Hz |

### 4.1.3 Type of Emission

Table 6 Type of Emission

| | EDGE/GPRS/GSM |
|---|---|
| Emission Designation: | 300kGXW |

According to CFR 47 (FCC) part 2, subpart C, section 2.201 and 2.202

### 4.1.4 Environmental Requirements

Table 7 Environmental Requirements

| | |
|---|---|
| Minimum temperature: | - 10 °C |
| Maximum temperature: | + 45 °C |
| Relative Humidity: | 5%-95%RH |

### 4.1.5 Power Source

Table 8 Power Source

| | |
|---|---|
| AC voltage nominal: | ~120V |
| AC voltage range | ~100V-240V |
| AC current maximal: | 0.5A |

### 4.1.6 Tune-up Procedure

According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (9).

Please reference the document Tune-up Procedure in TCF.

### 4.1.7 Applied DC Voltages and Currents

According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (8).

The voltage and current of RF IC in the final stage is:

Table 9 Applied RF module DC Voltages and Currents

| | |
|---|---|
| Voltage: | ⎓ 2.85V |
| Current: | 2A According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (8) |

## 4.2 EUT Identification List

### 4.2.1 Board Information

Table 10 Board Information

| B970 Wireless Gateway | | | |
|---|---|---|---|
| B970 | | | |
| Board and Module | | | |
| Equipment Designation / Description | Hardware Version | Serial Number | Remarks |
| Main board | WLA1GCYU<br>WLA1TIZU | 020HMF107C000261<br>020JFH07C8100090 | B970 |

### 4.2.2 Adapter Technical Data

| | |
|---|---|
| AC/DCAdapter Model | UE15W1-050200SPAV |
| Manufacturer | Huawei Technologies CO.,LTD |
| Input Voltage | 100-240V ~50/60Hz 0.5 A |
| Output Voltage | 5V ⎓ 2A |
| Rated Power | <9W |
| S/N | UEP7328002672 |

### 4.2.3 FCC Identification

**Grantee Code:** **QIS**
**Product Code:** **B970**
**FCC Identification:** **QISB970**

# 5 Main Test Instruments

Table 11 Main Test Equipments

| Equipment Description | Manufacturer | Model | Serial Number | Calibrated until (MM.DD.YYYY) |
|---|---|---|---|---|
| Test Receiver Display Unit | R&S | ESMI 804.8932.52 | 829214/011 | 08.23.2008 |
| Test Receiver RF Unit | R&S | ESMI 1032.5640.53 | 829550/008 | 08.23.2008 |
| Receiver | R&S | ESIB 26 | 100318 | 05.29.2008 |
| Receiver | R&S | ESCS30 | 830245/018 | 05.29.2008 |
| Pre-Amplifier | Agilent | 8447D | 2944A10146 | 05.21.2008 |
| Pre-Amplifier | Agilent | 83017A | 3950M00246 | 09.04.2008 |
| Loop Antenna | Schwarzbeck | FMZB1516 | 1516115 | 06.20.2008 |
| BiLog Antenna | Schaffner | CBL 6112B | 2536 | 09.25.2008 |
| Horn Antenna | ETS-Lindgren | 3117 | 00062533 | 06.05.2008 |
| Horn Antenna | ETS-Lindgren | 3116 | 00031541 | 06.20.2008 |
| Dipole | Schwarzbeck | D69250-UHAP/D69250-VHAP | 979/917 | 08.27.2008 |
| Signal Generator | R&S | SMT06 | 830264/009 | 09.29.2008 |
| Signal Generator | R&S | SMU200A | 3605062516 | 10.08.2008 |
| Signal Generator | R&S | SMR 40 | 100325 | 12.09.2008 |
| Power Supply | Keithley | 2306 | 1045337 | 07.20.2008 |
| Climate Chamber | WEISS | ACS-1 | 3604040034 | 08.14.2008 |
| Universal Radio Communication Tester | R&S | CMU200 | 108035 | 07.04.2008 |
| Wireless communication test set | Agilent | 8960 | GB43461081 | 06.15.2008 |
| Power Splitter | Agilent | 11667B | 3586M000159 | 07.20.2008 |
| Spectrum Analyzer | R&S | FSU | SZ0600008267 | 06.21.2008 |
| Spectrum Analyzer | Agilent | E4440A | N/A | 09.26.2008 |

# 6 Transmitter Measurements

## 6.1 Effective Radiated Power of Transmitter (EIRP)

### 6.1.1 Test Conditions

Table 12 Test Conditions

| | |
|---|---|
| Preconditioning: | 0.5 hour |
| Measured at: | enclosure |
| Ambient temperature: | 25°C |
| Relative humidity: | 55% |
| Test Configurations: | TM1/TM2 at frequency Bottom、Middle、Top |

### 6.1.2 Test Specifications and Limits

#### 6.1.2.1 Specification

CFR 47 (FCC) part 2.1046 and part 24.232

#### 6.1.2.2 Supporting Standards

Table 13 Supporting Standards:

| | |
|---|---|
| ANSI/TIA-603-C:2004 | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards |
| 3GPP TS51.010 V6.1.0:2005 | Digital cellular telecommunications system Mobile Station (MS) conformance specification; |

#### 6.1.2.3 Limits

Compliance with part 24.232, mobile/portable stations are limited to 2 watts EIRP peak power.
W(dBm)= 10*log ($W_{In\ mW}$).

Table 14 Limits

| | |
|---|---|
| Maximum Output Power (Watts) | < 2 Watts |
| Maximum Output Power (dBm) | < 33 dBm |

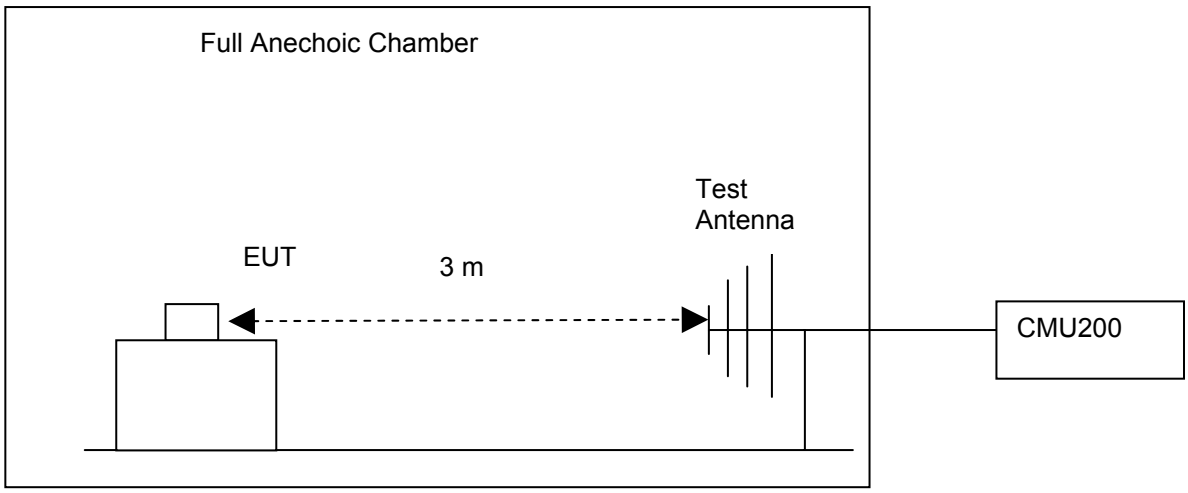
### 6.1.3 Test Method and Setup

(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, ERP shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect the Wireless Gateway to the wireless communication tester R&S CMU200 via the air interface. The band class is set as PCS.
(b) Test the Radiated maximum output power by the CMU200 received from test antenna.
(c) Use substitution method to verify the maximum output power. The EUT is substituted by a dipole antenna. The dipole is connected to a signal generator. And then adjust the output level of the signal generator to get the same received power recorded in step (b) on CMU200, and record the

power level of Signal Generator. Of course, the cable loss at the test frequency should be compensated..

## Test setup

### Step 1: Pre-test




### Step 2: Substitution method to verify the maximum EIRP

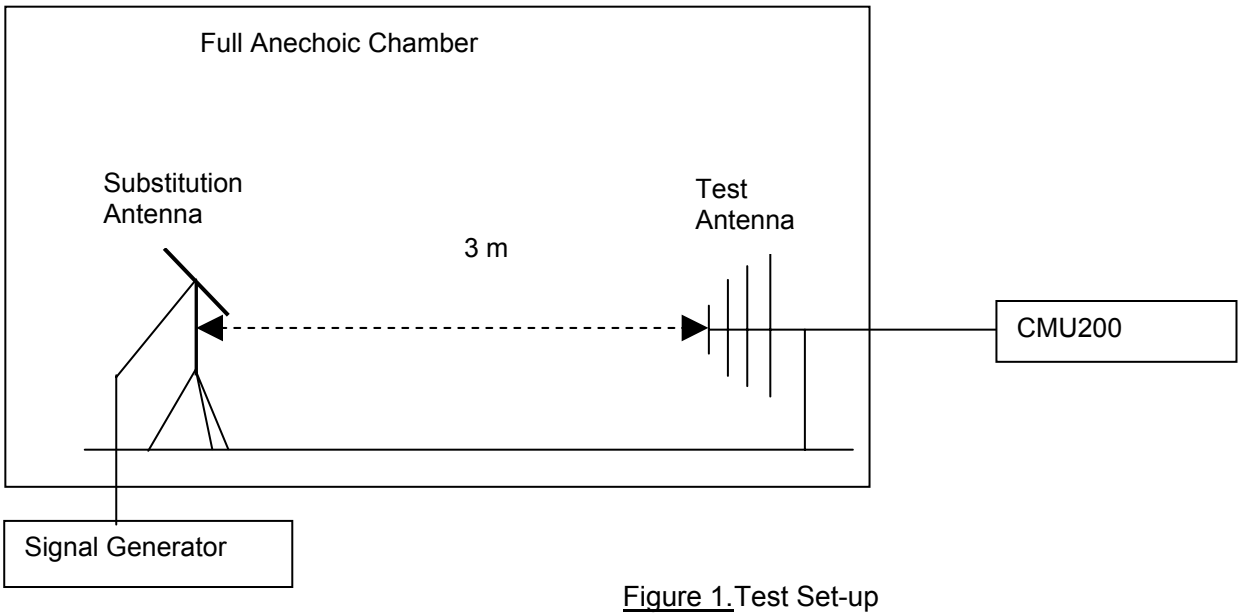



Figure 1.Test Set-up

NOTE: Effective radiated power (ERP) refers to the radiation power output of the EUT, assuming all emissions are radiated from half-wave dipole antennas.
There is a constant difference of 2.15 dB between EIRP and ERP.
EIRP (dBm) = ERP (dBm) + 2.15 (ITU-R Recommendation SM.329-10).

### 6.1.4 Measurement Results

#### 6.1.4.1 Pre-test Results

Table 15 Measurement Results

| | | RF Output Power (EIRP) | | | | | |
|---|---|---|---|---|---|---|---|
| TEST CONDITIONS | | Channel512(B) 1850.2MHz | | Channel661 (M) 1880MHz | | Channel810(T) 1909.8MHz | |
| | | dBm | | dBm | | dBm | |
| | | Measured | Limit | Measured | Limit | Measured | Limit |
| TM1 | $T_{nom}$ (25 °C) $V_{nom}$ (5V) | 29.23 | 33 | 29.45 | 33 | 29.31 | 33 |
| TM2 | $T_{nom}$ (25 °C) $V_{nom}$ (5V) | 25.67 | 33 | 25.65 | 33 | 25.84 | 33 |
| | | | | | | | |

#### 6.1.4.2 Substitution Results

Table 16 Substitution Results

| Test Mode | Freq. [MHz] | Meas. Level [dBm] | Substitution Antenna Type | SGP [dBm] | Substitution Gain [dBi] | Cable Loss [dB] | Substitution Level (EIRP) [dBm] | Limit [dBm] | Result |
|---|---|---|---|---|---|---|---|---|---|
| TM1 | 1850.2 | 29.23 | Dipole Ant. | 25.6 | 4.6 | 1.0 | 29.20 | 33 | Pass |
| TM1 | 1880.0 | 29.45 | Dipole Ant. | 25.83 | 4.6 | 1.0 | 29.43 | 33 | Pass |
| TM1 | 1909.8 | 29.31 | Dipole Ant. | 25.5 | 4.8 | 1.0 | 29.30 | 33 | Pass |
| TM2 | 1850.2 | 25.67 | Dipole Ant. | 24.04 | 4.6 | 1.0 | 27.64 | 33 | Pass |
| TM2 | 1880.0 | 25.65 | Dipole Ant. | 24.07 | 4.6 | 1.0 | 27.67 | 33 | Pass |
| TM2 | 1909.8 | 25.84 | Dipole Ant. | 24.03 | 4.8 | 1.0 | 27.83 | 33 | Pass |

Note: a, For get the EIRP (Efficient Radiated Power) in substitution method, the following formula should take to calculate it,

EIRP [dBm] = SGP [dBm] – Cable Loss [dB] + Gain [dBi]

NOTE: SGP- Signal Generator Level

b, A GSM/GPRS/EDGE signal with bandwidth of 200kHz are created by the vector generator R&S SMU200A.

c, RBW=10kHz, VBW=300kHz, and integrated by the instrument to 200kHz for TM1/TM2

### 6.1.5 Conclusion

The equipment **PASSED** the requirement of this clause.

## 6.2 Conducted Power of Transmitter

### 6.2.1 Test Conditions

Table 17 Test Conditions

| | |
|---|---|
| Preconditioning: | 0.5 hour |
| Measured at: | Antenna connector |
| Ambient temperature: | 25 °C |
| Relative humidity: | 52 % |
| Test Configurations: | TM1/TM2 at frequency Bottom、Middle、Top |

### 6.2.2 Test Specifications and Limits

#### 6.2.2.1 Specification

CFR 47 (FCC) part 2.1047 and part 24 subpart E

#### 6.2.2.2 Supporting Standards

Table 18 Supporting Standards:

| | |
|---|---|
| ANSI/TIA-603-C: 2004 | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards |
| 3GPP TS51.010 V6.1.0:2005 | Digital cellular telecommunications system Mobile Station (MS) conformance specification; |

#### 6.2.2.3 Limits

Compliance with part 24.232, in no any case may the peak power of a mobile station transmitter exceed 2 W. The calculated longitude EIRP by following formula:

EIRP(dBm)= 10*log ($EIRP_{in\ mW}$).

And for conducted power, we can use Antenna Gain to calculate the limit. So the conducted power:

$P_{cod}$.(dBm)=EIRP(dBm)- Gain(dBi).
and Gain (dBi)= Gain(dBd)+ 2.15dB

Table 19 Limits

| | |
|---|---|
| Maximum Output Power (Watts) | < 2 Watts（33dBm） |
| Antenna Gain(dBi): | 2.5 |
| Maximum Conducted Output Power (dBm) | < 30.5 |

### 6.2.3 Test Method and Setup

(a)For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, Conducted maximum power shall be measured when the transmitter is adjusted in

accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect the Wireless Gateway to the wireless communication tester CMU200 via the antenna connector. The band class is set as US Cellular.
(b)Test the Conducted maximum output power by the CMU200.

## Test setup

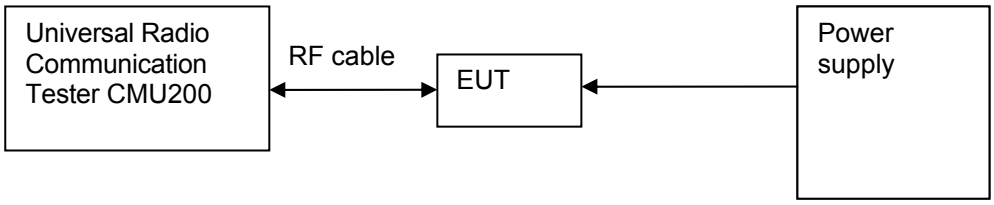



Figure 2. Test Set-up

### 6.2.4 Measurement Results

Table 20 Measurement Results

| | | RF Output Power(Conducted) | | | | | |
|---|---|---|---|---|---|---|---|
| TEST CONDITIONS | | Channel512(B) 1850.2MHz | | Channel661 (M) 1880MHz | | Channel810(T) 1909.8MHz | |
| | | dBm | | dBm | | dBm | |
| | | Measured | Limit | Measured | Limit | Measured | Limit |
| TM1 | $T_{nom}$ (25 °C) $V_{nom}$ (5V) | 29.70 | 30.5 | 29.93 | 30.5 | 29.80 | 30.5 |
| TM2 | $T_{nom}$ (25 °C) $V_{nom}$ (5V) | 25.14 | 30.5 | 25.17 | 30.5 | 25.33 | 30.5 |
| | | | | | | | |

### 6.2.5 Conclusion

The equipment **PASSED** the requirement of this clause.

## 6.3 Modulation Characteristics

### 6.3.1 Test Conditions

Table 21 Test Conditions

| | |
|---|---|
| Preconditioning: | 0.5 hour |
| Measured at: | Antenna connector |
| Ambient temperature: | 25 °C |
| Relative humidity: | 52 % |
| Test Configurations: | TM1/TM2 at frequency Middle |

### 6.3.2 Test Specifications and Limits

#### 6.3.2.1 Specification

CFR 47 (FCC) part 2.1047 and part 24 subpart E

#### 6.3.2.2 Supporting Standards

Table 22 Supporting Standards:

| | |
|---|---|
| ANSI/TIA-603-C: 2004 | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards |
| 3GPP TS51.010 V6.1.0:2005 | Digital cellular telecommunications system Mobile Station (MS) conformance specification; |

#### 6.3.2.3 Limits

No specific modulation characteristics requirement limits in part 2.1047 and part 24 subpart E.

Table 23 Limits

| | |
|---|---|
| Limits | Not applicable |

### 6.3.3 Test Method and Setup

Connect the Wireless Gateway to Universal Radio Communication Tester CMU200 via the antenna connector. The frequency band is set as PCS; the Wireless Gateway's output is matched with 50 Ω load, test method was according to 3GPP TS 51.010. The waveform quality and constellation of the Wireless Gateway was tested.

**Test setup**

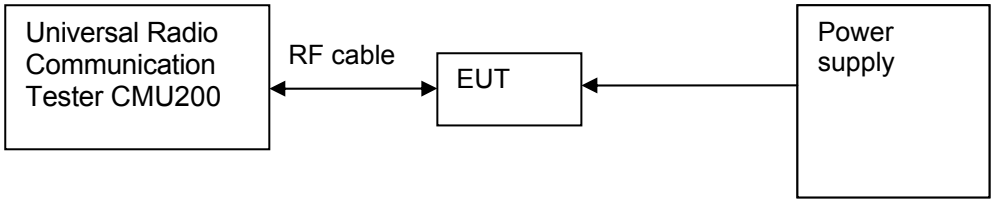



Figure 3.Test Set-up

### 6.3.4 Measurement Results

Table 24 Measurement Results

| | | Modulation Characteristic | |
|---|---|---|---|
| TEST CONDITIONS | | Channel661(M)<br>1880MHz | |
| | | Measured | |
| | | TM1 | TM2 |
| $T_{nom}$ (25 °C) | $V_{nom}$ (5V) | Refer to Appendix A | Refer to Appendix A |
| | | | |

### 6.3.5 Conclusion

The equipment **PASSED** the requirement of this clause.

For the measurement results refer to appendix A.

## 6.4 Occupied Bandwidth

### 6.4.1 Test Conditions

Table 25 Test Conditions

| | |
|---|---|
| Preconditioning: | 0.5 hour |
| Measured at: | Antenna connector |
| Ambient temperature: | 25 °C |
| Relative humidity: | 55 % |
| Test Configurations: | TM1/TM2 at frequency Bottom, Middle, Top |

### 6.4.2 Test Specifications and Limits

#### 6.4.2.1 Specification

CFR 47 (FCC) part 2.1049 and part 24 subpart E

#### 6.4.2.2 Supporting Standards

Table 26 Supporting Standards:

| | |
|---|---|
| ANSI/TIA-603-C: 2004 | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards |
| 3GPP TS51.010 V6.1.0:2005 | Digital cellular telecommunications system Mobile Station (MS) conformance specification; |

#### 6.4.2.3 Limits

No specific occupied bandwidth requirement in part 24 subpart E, but the occupied bandwidth was defined in part 2.1049: the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

Table 27 Limits

| | |
|---|---|
| Upper /lower frequency limits | 0.5% of the mean power |

### 6.4.3 Test Method and Setup

Wireless Gateway was connected to the Spectrum Analyzer AGILENT E4440A via the one RF connector. The band class is set as PCS; The EUT was controlled to transmit maximum power. Measure and record the occupied bandwidth of the EUT by the AGILENT E4440A.

The OBW, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

Refer to 47CFR part2.1049 section (g)&(h).
(g) Transmitter in which the modulating base band comprises not more than three independent channels - when modulated by the full complement of signals for which the transmitter is rated. The level of modulation for each channel should be set to that prescribed in rule parts applicable to the services for which the transmitter is intended. If specific modulation levels are not set forth in the rules, the tests should provide the manufacturer’s maximum rated condition.

(h) Transmitters employing digital modulation techniques - when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudorandom generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at discretion of the user.

For TM1/TM2 following RBW and VBW are employed:
Measurement bandwidth (RBW): 3 kHz (Resolution bandwidth)
Video bandwidth (VBW): 10 kHz

## Test Set-up

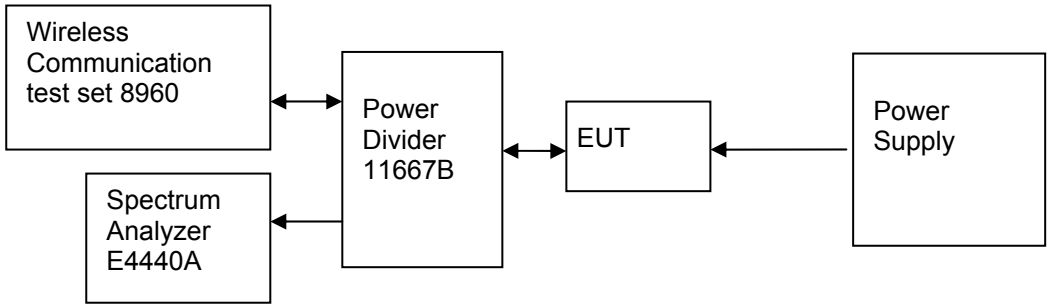



Figure 4.Test Set-up

### 6.4.4 Measurement Results

Table 28 Measurement Results

| | | Occupied Bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| TEST CONDITIONS | | Channel512 (B) 1850.2MHz | | Channel661 (M) 1880MHz | | Channel810 (T) 1909.8MHz | |
| | | Measured (kHz) | | Measured (kHz) | | Measured (kHz) | |
| | | TM1 | TM2 | TM1 | TM2 | TM1 | TM2 |
| $T_{nom}$ (25 °C) $V_{nom}$ (5V) | 99% | 246.42 | 242.41 | 246.18 | 248.49 | 243.20 | 244.37 |

### 6.4.5 Conclusion

The equipment **PASSED** the requirement of this clause.
For the measurement results refer to appendix B.

## 6.5 Band Edges Compliance

### 6.5.1 Test Conditions

Table 29 Test Conditions

| | |
|---|---|
| Preconditioning: | 0.5 hour |
| Measured at: | Antenna connector |
| Ambient temperature: | 25°C |
| Relative humidity: | 55 % |
| Test Configurations: | TM1/TM2 at frequency Bottom、Top |

### 6.5.2 Test Specifications and Limits

#### 6.5.2.1 Specification

CFR 47 (FCC) part 2.1051 and part 24.238

#### 6.5.2.2 Supporting Standards

Table 30 Supporting Standards:

| | |
|---|---|
| ANSI/TIA-603-C: 2004 | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards |
| 3GPP TS51.010 V6.1.0:2005 | Digital cellular telecommunications system Mobile Station (MS) conformance specification; |

#### 6.5.2.3 Limits

Compliance with part 24.238, all spurious emission must be attenuated below the transmitter power by at least 43 +10 $\log_{10}$ P（W）. (Whereas P is the rated power of the EUT).

Table 31 Limits for GPRS

| | TM1 | TM2 |
|---|---|---|
| Rated Power: | 30 dBm | 26 dBm |
| Required attenuation: | 43+10log (1) = 43 , 30 dBm - 43 dB | 43+10log (0.4) = 39 , 26 dBm - 39 dB |
| Absolute level | - 13 dBm | - 13 dBm |

### 6.5.3 Test Method and Setup

The EUT was connected to the Spectrum Analyzer AGILENT E4440A via the one RF connector, the band class is set as PCS. The EUT was controlled to transmit maximum power. Measure and record band edges compliance of the EUT by the AGILENT E4440A.

The limit is -13dBm.

For TM1/TM2 following RBW and VBW are employed:

Measurement bandwidth (RBW): 3 kHz (Resolution bandwidth)
Video bandwidth (VBW): 10 kHz

## Test Set-up

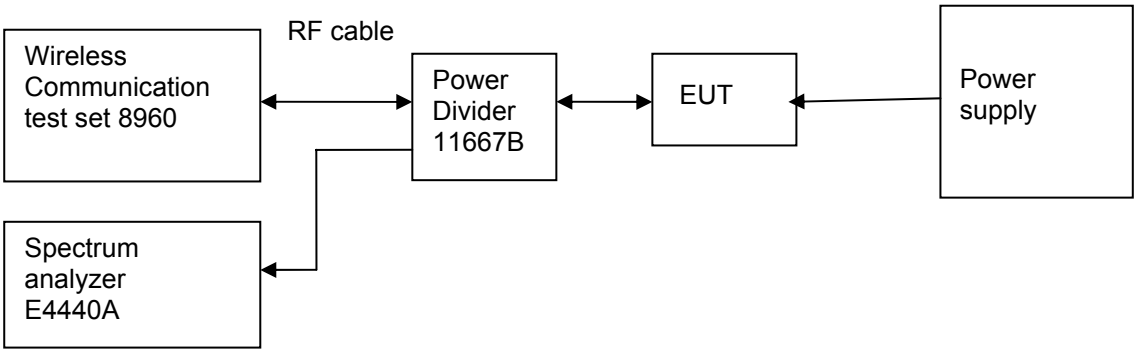



Figure 5. Test Set-up

### 6.5.4 Measurement Results

Table 32 Measurement Results outside Band Edges-- Single Carrier

| Band | Frequency of Band edges [MHz] | Channel Number | Test Mode | Spurious Level measured [dBm] | FCC limit | Result |
|---|---|---|---|---|---|---|
| PCS | $T_{nom}$ (25 °C), $V_{nom}$ (5V) | | | | | |
| | 1850.2 | 512 | TM1 | <-13(See appendix C) | - 13 dBm | Pass |
| | 1909.8 | 810 | TM1 | <-13(See appendix C) | - 13 dBm | Pass |
| | 1850.2 | 512 | TM2 | <-13(See appendix C) | - 13 dBm | Pass |
| | 1909.8 | 810 | TM2 | <-13(See appendix C) | - 13 dBm | Pass |

### 6.5.5 Conclusion

The equipment **PASSED** the requirement of this clause.
For the measurement results refer to appendix C.

## 6.6 Spurious Emission at Antenna Terminal

### 6.6.1 Test Conditions

Table 33 Test Conditions

| | |
|---|---|
| Preconditioning: | 0.5 hour |
| Measured at: | Antenna connector |
| Ambient temperature: | 25°C |
| Relative humidity: | 50 % |
| Test Configurations: | TM1/TM2 at frequency Bottom, Middle ,Top |

### 6.6.2 Test Specifications and Limits

#### 6.6.2.1 Specification

CFR 47 (FCC) part 2.1051 and part 24.238

#### 6.6.2.2 Supporting Standards

Table 34 Supporting Standards:

| | |
|---|---|
| ANSI/TIA-603-C: 2004 | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards |
| 3GPP TS51.010 V6.1.0:2005 | Recommended GSM/EDGE MS conformance specification |

#### 6.6.2.3 Limits

Compliance with part 24.238, all spurious emission must be attenuated below the transmitter power by at least 43 +10 $\log_{10}$ P. (Whereas P is the rated power of the EUT).

Table 35 Limits for GPRS Mode

| | TM1 | TM2 |
|---|---|---|
| Rated Power: | 30 dBm | 26 dBm |
| Required attenuation: | 43+10log (1) = 43 , 30 dBm - 43 dB | 43+10log (0.4) = 39 , 26 dBm - 39 dB |
| Absolute level | - 13 dBm | - 13 dBm |

### 6.6.3 Test Method and Setup

The EUT was connected to the Spectrum analyzer R&S FSU via the one RF connector, the band class is set as PCS. The EUT was controlled to transmit maximum power. Measure and record the Conducted Spurious Emission of the EUT by the R&S FSU.

According to part 24.238, the defined measurement bandwidth as following:

24.238 (b) Measurement procedure: Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater.

Measurement bandwidth (RBW) for 9 kHz up to 150 kHz: 1 kHz;
Measurement bandwidth (RBW) for 150 kHz up to 30MHz: 10 kHz;
Measurement bandwidth (RBW) for 30MHz up to 1GHz: 100 kHz;
Measurement bandwidth (RBW) for 1GHz up to 26GHz: 1MHz;

## Test Set-up

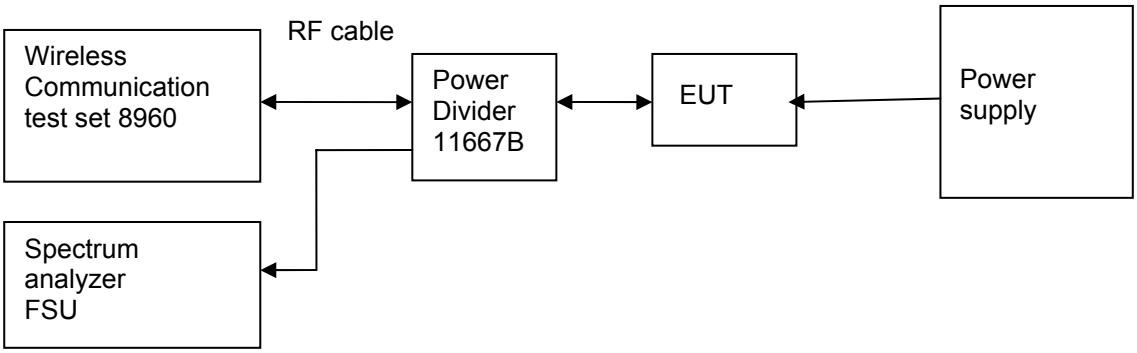



Figure 6. Test Set-up

### 6.6.4 Measurement Results

Table 36 Measurement Results

| Channel Number | Test Mode | Test Range (Frequency) | Output Power [dBm] | Spurious Level measured [dBm] | FCC limit | Result |
|---|---|---|---|---|---|---|
| Channel 512(B) | TM1 | 9 kHz~26GHz | 30 | <- 13 dBm (See appendix D) | - 13 dBm | Pass |
| | TM2 | 9 kHz~26GHz | 26 | <- 13 dBm (See appendix D) | - 13 dBm | Pass |
| Channel 661(M) | TM1 | 9 kHz~26GHz | 30 | <- 13 dBm (See appendix D) | - 13 dBm | Pass |
| | TM2 | 9 kHz~26GHz | 26 | <- 13 dBm (See appendix D) | - 13 dBm | Pass |
| Channel 810(T) | TM1 | 9 kHz~26GHz | 30 | <- 13 dBm (See appendix D) | - 13 dBm | Pass |
| | TM2 | 9 kHz~26GHz | 26 | <- 13 dBm (See appendix D) | - 13 dBm | Pass |

### 6.6.5 Conclusion

The equipment **PASSED** the requirement of this clause.
For the measurement results refer to appendix D.

## 6.7 Frequency Stability

### 6.7.1 Test Conditions

Table 37 Test Conditions

| | |
|---|---|
| Preconditioning: | 0.5 hour |
| Measured at: | Antenna connector |
| Ambient temperature: | See below |
| Relative humidity: | 55 % at 25 °C |
| Test Configurations: | TM1/TM2 at frequency M |

### 6.7.2 Test Specifications and Limits

#### 6.7.2.1 Specification

CFR 47 (FCC) part 2.1055 and part 24.235

#### 6.7.2.2 Supporting Standards

Table 38 Supporting Standards:

| | |
|---|---|
| ANSI/TIA-603-C: 2004 | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards |
| 3GPP TS51.010 V6.1.0:2005 | Digital cellular telecommunications system Mobile Station (MS) conformance specification; |

#### 6.7.2.3 Limits

No specific frequency stability requirement in part 2.1055 and part 24.235.

### 6.7.3 Test Method and Setup

The frequency stability shall be measured with variation of ambient temperature as follows:
(1) From -30 ° to +50 ° centigrade for all equipment except that specified in subparagraphs
(2) and (3) of paragraph 2.1055

(b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than $10^{o}$ centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short-term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

(d) The frequency stability shall be measured with variation of primary supply voltage as follows:
(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point, which shall be specified by the manufacturer.
(3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.
(e) When deemed necessary, the Commission may require tests of frequency stability under conditions in addition to those specifically set out in paragraphs (a), (b), (c) and (d) of this section. (For example, measurements showing the effect of proximity to large metal objects, or of various types of antennas,

may be required for portable equipment.)
The EUT can only work in such extreme voltage 4.75V and 5.6V，so here the EUT is tested in the 4.75V and 5.6V

## Test Set up

Connect the EUT to the Wireless Communication test set 8960 via the connector. Then measure the frequency error by the Wireless Communication test set 8960. The EUT's output is matched with a 50 Ω load.

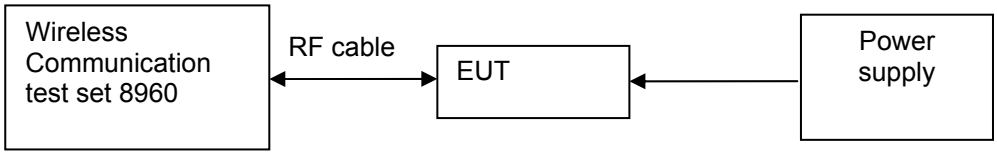



Figure 7. Test Set up

### 6.7.4 Measurement Results

#### 6.7.4.1 Measurement Results vs. Variation of Temperature

- **TM1, 5V DC Channel No.661(1880.0MHz)**

Table 39 Measurement Results vs. Variation of Temperature

| Temperature | Power (dBm) | Nominal Frequency (MHz) | Measured Frequency Error(Hz) | Result |
|---|---|---|---|---|
| -30 °C | 30 | 1880.0 | 11 | Pass |
| -20 °C | 30 | 1880.0 | 14 | Pass |
| -10 °C | 30 | 1880.0 | 8 | Pass |
| 0 °C | 30 | 1880.0 | 5 | Pass |
| +10 °C | 30 | 1880.0 | -10 | Pass |
| +20 °C | 30 | 1880.0 | 15 | Pass |
| +30 °C | 30 | 1880.0 | -11 | Pass |
| +40 °C | 30 | 1880.0 | -7 | Pass |
| +50 °C | 30 | 1880.0 | -9 | Pass |

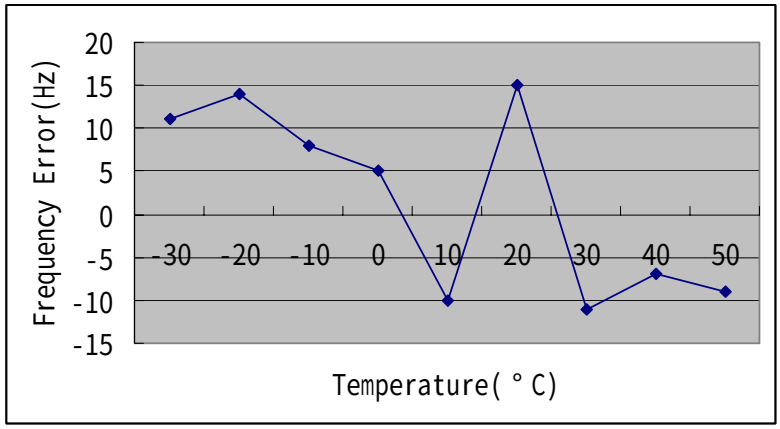



Figure 8. TM1 Test Graph

- **TM2, 5V DC Channel No.661(1880.0MHz)**

Table 40 Measurement Results vs. Variation of Temperature

| Temperature | Power (dBm) | Nominal Frequency (MHz) | Measured Frequency Error(Hz) | Result |
|---|---|---|---|---|
| -30 °C | 26 | 1880.0 | -5 | Pass |
| -20 °C | 26 | 1880.0 | 11 | Pass |
| -10 °C | 26 | 1880.0 | 7 | Pass |
| 0 °C | 26 | 1880.0 | 8 | Pass |
| +10 °C | 26 | 1880.0 | -3 | Pass |
| +20 °C | 26 | 1880.0 | 10 | Pass |
| +30 °C | 26 | 1880.0 | 8 | Pass |
| +40 °C | 26 | 1880.0 | -7 | Pass |
| +50 °C | 26 | 1880.0 | 10 | Pass |

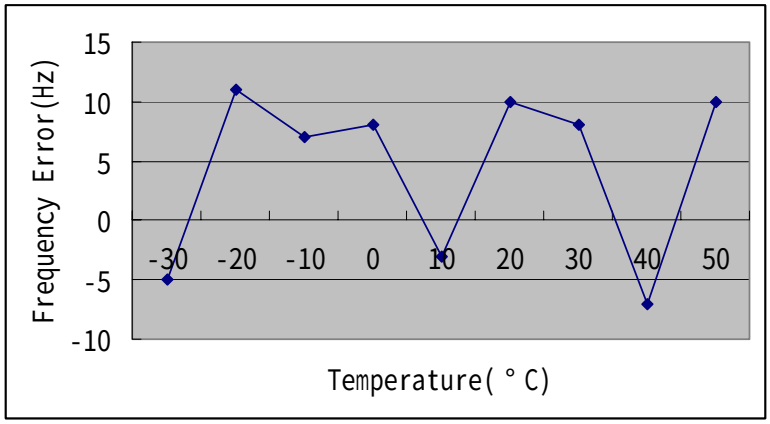



Figure 9. TM2 Test Graph

### 6.7.4.2 Measurement Results vs. Variation of Voltage

- **TM1, 25 °C ,Channel No. 661(1880.0MHz)**

Table 41 Measurement Results vs. Variation of Voltage

| Voltage | Power (dBm) | Nominal Frequency (MHz) | Measured Frequency Error(Hz) | Result |
|---|---|---|---|---|
| 4.75 | 30 | 1880.0 | 8 | Pass |
| 5 | 30 | 1880.0 | 10 | Pass |
| 5.6 | 30 | 1880.0 | 9 | Pass |

- **TM2, 25 °C ,Channel No. 661(1880.0MHz)**

Table 42 Measurement Results vs. Variation of Voltage

| Voltage | Power (dBm) | Nominal Frequency (MHz) | Measured Frequency Error(Hz) | Result |
|---|---|---|---|---|
| 4.75 | 26 | 1880.0 | 8 | Pass |
| 5 | 26 | 1880.0 | 9 | Pass |
| 5.6 | 26 | 1880.0 | 8 | Pass |

### 6.7.5 Conclusion

The equipment **PASSED** the requirement of this clause.

# 7 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Table 43 System Measurement Uncertainty

| Items | | Extended Uncertainty |
|---|---|---|
| Effective Radiated Power of Transmitter | EIRP (dBm) | U=3dB; k=2 |
| Band Width | Magnitude (%) | U＝0.2%; k=2 |
| Band Edge Compliance | Disturbance Power（dBm） | U＝2.0dB; k=2 |
| Conducted Spurious Emission at Antenna Terminal | Disturbance Power（dBm） | U＝2.0dB; k=2 |
| Frequency Stability | Frequency Accuracy(ppm) | U＝0.21ppm; k=2 |

# 8 Appendices

| | | |
|---|---|---|
| Appendix A | Measurement Results Modulation Characteristics | 3 pages |
| Appendix B | Measurement Results Occupied Bandwidth | 7 pages |
| Appendix C | Measurement Results Band Edges Compliance | 5 pages |
| Appendix D | Measurement Results Spurious Emission at Antenna Terminal | 31 pages |