



# **FCC&IC RF Test Report**

**ProductName:SONIC;Sonic;HSDPA/UMTS/GPRS/GSM/EDGE  
Mobile Phone with Bluetooth; Sapphire**

**Model Number: HUAWEI U8652/U8652/Huawei U8652/U8652-51**

**Report No: SYBH(Z-RF)019052011-2001**

**FCC ID: QISU8652  
IC ID: 6369A-U8652**

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

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2. The laboratory has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements. The site recognition number is 97456.
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## Notice 2

Modification Information:

### Modification Information

Modification Information	1	
	2	
	3	<i>Not Applicable!</i>
	4	<i>Not Applicable!</i>
	5	
	6	
	7	



<b>REGULATION</b>	<b>FCC CFR47 Part 2: Subpart J;</b>
	<b>FCC CFR47 Part 22 : Subpart H;</b>
	<b>IC RSS-Gen (Issue 2)</b>
	<b>IC RSS-132 (Issue 4)</b>
<b>START OF TEST</b>	<b>Jul.10, 2011</b>
<b>END OF TEST</b>	<b>Jul.15, 2011</b>
<b>Final Judgement:</b>	<b>Pass</b>

Approved By Jul.26, 2011 Chenxiaohong Chen Xiaohong  
 Date Name Signature

Reviewed By Jul.26, 2011 Xuguangyi Xuguangyi  
 Date Name Signature

Operator Jul.26, 2011 Huangqiuliang Huang Qiuliang  
 Date Name Signature



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## Contents

<b>1</b>	<b><u>Summary</u></b> .....	<b>6</b>
<b>2</b>	<b><u>Product Description</u></b> .....	<b>7</b>
2.1	PRODUCTION INFORMATION .....	7
2.2	MODIFICATION INFORMATION .....	7
<b>3</b>	<b><u>Test Site Description</u></b> .....	<b>8</b>
3.1	TESTING PERIOD .....	8
3.2	GENERAL SET UP DESCRIPTION .....	8
<b>4</b>	<b><u>Product Description</u></b> .....	<b>9</b>
4.1	TECHNICAL CHARACTERISTICS.....	9
4.2	EUT IDENTIFICATION LIST.....	11
<b>5</b>	<b><u>Main Test Instruments</u></b> .....	<b>12</b>
<b>6</b>	<b><u>Transmitter Measurements</u></b> .....	<b>13</b>
6.1	EFFECTIVE RADIATED POWER OF TRANSMITTER (ERP) .....	13
6.2	CONDUCTED POWER OF TRANSMITTER .....	17
6.3	MODULATION CHARACTERISTICS.....	20
6.4	OCCUPIED BANDWIDTH.....	22
6.5	BAND EDGES COMPLIANCE .....	25
6.6	SPURIOUS EMISSION AT ANTENNA TERMINAL.....	27
6.7	FIELD STRENGTH OF SPURIOUS EMISSIONS.....	30
6.8	RECEIVER SPURIOUS EMISSIONS .....	33
6.9	FREQUENCY STABILITY .....	35
<b>7</b>	<b><u>System Measurement Uncertainty</u></b> .....	<b>39</b>
<b>8</b>	<b><u>Appendices</u></b> .....	<b>40</b>

# 1 Summary

The table below summarizes the measurements and results for the EUT. Detailed results and descriptions are shown in the following pages.

Table 1 Summary of results

FCC Measurement Specification	Measurement Specification Part(s)	FCC Limits Part(s)	Section in RSS-132	Description	Result
2.1046	RSS-Gen 4.8	22.913	4.4	Effective Radiated Power of Transmitter	PASS
2.1046	RSS-Gen 4.8	22.913	4.4	Conducted Power of Transmitter	PASS
2.1047	/	/	4.2	Modulation Characteristics	PASS
2.1049	RSS-Gen 4.6	/	/	Occupied Bandwidth	PASS
2.1051	/	22.917	4.5	Band Edges compliance	PASS
2.1051	RSS-Gen 4.9	22.917	4.5	Spurious Emission at Antenna Terminal	PASS
2.1053	RSS-Gen 4.9	22.917	4.5	Field Strength of Spurious Emissions	PASS
/	RSS-Gen 4.10	/	4.6	Receiver Spurious Emissions	PASS
2.1055	RSS-Gen 4.7	22.355	4.3	Frequency Stability	PASS



## 2 Product Description

### 2.1 Production Information

#### 2.1.1 General Description

HUAWEI U8652/U8652/Huawei U8652/U8652-51 subscriber equipment in the WCDMA/GSM system. The HSDPA/UMTS frequency band is Band I and Band II and Band V, but only Band V test data included in this report. The GSM/GPRS/EDGE frequency band includes GSM850 and GSM900 and DCS1800 and PCS1900, but only GSM850 test data included in this report. The Mobile Phone implements such functions as RF signal receiving/transmitting, HSDPA/UMTS and GSM/GPRS/EDGE protocol processing, voice, video, MMS service, GPS, AGPS and WIFI etc. Externally it provides micro SD card interface, earphone port (to provide voice service) and USIM card interface. It also provides Bluetooth module to synchronize data between a PC and the phone, or to use the built-in modem of the phone to access the Internet with a PC, or to exchange data with other Bluetooth devices.

#### 2.1.2 Support function and Service

The EUT support the function and service as follows:

Table 2 Service and Test mode List

Service Name	Characteristic	Corresponding Test Mode	Note
Data	Modulation: GMSK	TM1	GPRS/GSM
Data	Modulation: 8PSK	TM2	EDGE
Data	Modulation: QPSK	TM3	WCDMA
Data	Modulation: QPSK	TM4	HSDPA

Note: \* The specified GPRS test conditions & settings are defined in 3GPP TS51.010 V5.4.0 and the EDGE test conditions & settings are defined in 3GPP TS51.010 V5.4.0. The WCDMA test condition & settings are defined in 3GPP TS 34.121 V8.7.0:2009.

### 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				



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### **3 Test Site Description**

The test site of:

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

#### **3.1 Testing Period**

The test have been performed during the period of

**Jul.10, 2011 – Jul.15, 2011**

#### **3.2 General Set up Description**

**TM1:** GPRS/GSM Mode with GMSK Modulation

**TM2:** EDGE Mode with 8PSK Modulation

**TM3:** WCDMA Mode with QPSK Modulation

**TM4:** HSDPA Mode with QPSK Modulation



## 4 Product Description

### 4.1 Technical Characteristics

#### 4.1.1 Frequency Range

Table 4 Frequency Range

Uplink band:	824 to 849 MHz
Downlink band:	869 to 894 MHz

#### 4.1.2 Channel Spacing / Separation

Table 5 Channel Spacing / Separation

	EDGE/GPRS/GSM	UMTS/HSDPA
Channel Raster	200kHz	200kHz
Channel Spacing:	200kHz	5MHz

#### 4.1.3 Type of Emission

Table 6 Type of Emission

	GPRS/GSM	EDGE	UMTS/HSDPA
Emission Designation:	-	-	-

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:	+ 55 °C
Relative Humidity:	5%-95%RH

#### 4.1.5 Power Source

Table 8 Power Source

AC voltage nominal:	~ 120 V
AC voltage range	~ 100 V to ~ 240 V
AC current maximal:	1A

#### 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 in the final RF stage is:

Applied RF module DC Voltages and Currents

Voltage:	== 2.85V (for the RF IC)
Current:	150mA According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (8)
Voltage:	== 3.6V (for the PA module)
Current:	350mA According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (8)

Table 9

## 4.2 EUT Identification List

### 4.2.1 Board Information

Table 10 Board Information

SONIC;Sonic;HSDPA/UMTS/GPRS/GSM/EDGE Mobile Phone with Bluetooth; Sapphire		
HUAWEI U8652/U8652/Huawei U8652/U8652-51		
Board and Module		
Hardware Version	Software Version	S/N
HD1U865M51	U8652V100R001USAC07B819	R8K2A11151800003

### 4.2.2 Adapter Technical Data

AC/DCAdapter Model	HW-050100U1W
Manufacturer	Huawei Technologies Co., Ltd.
Input Voltage	~100-240V 50/60Hz 0.2A
Output Voltage	5V  1A
Rated Power	5W

### 4.2.3 Battery Technical Data

Battery Model:	HB5K1H
Rated capacity:	1400 mAh
Nominal Voltage:	 3.7 V
Charging Voltage:	 4.2 V

### 4.2.4 FCC Identification

Grantee Code: QIS  
Product Code: U8652  
FCC Identification: QISU8652

### 4.2.5 IC Identification

IC Identification: 6369A-U8652

## 5 Main Test Instruments

Table 11 Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until
Power supply	KEITHLEY	2303	1288003	Sep.27,2011
Universal Radio Communication Tester	R&S	CMU200	105822	Oct.24,2011
Universal Radio Communication Tester	Agilent	E5515C	MY50260239	Aug.04,2011
Spectrum Analyzer	Agilent	E4440A	MY49420179	Apr.24,2012
Signal Analyzer	R&S	FSQ40	100025	Oct.09,2011
Signal Analyzer	R&S	FSQ31	200021	Sep.27,2011
Temperature Chamber	ESPEC	MW3030	611403	May.12,2012
Signal Generator	R&S	SMR40	100325	May.12,2012
Vector Signal Generator	R&S	SMU200A	104162	Sep.07,2011
Spectrum Analyzer	R&S	FSU26	EG26725	Mar.07,2012
Tunable Dipole	Schwarzbeck	D69250- UHAP/D69250 -VHAP	919/1009	Dec.13.2011
Tunable Dipole	Schwarzbeck	D69250- UHAP/D69250 -VHAP	979/917	Dec.13.2011
Horn Antenna	R & S	HF906	359287/005	May.07, 2012
Horn Antenna	R & S	HF906	359287/006	April.27, 2012
Broadband Antenna	SCHAFFNER	CBL 6112B	2536	Sep.21, 2011
Broadband Antenna	SCHAFFNER	CBL 6112B	2941	Jun.11, 2012
Test receiver	R&S	ESU26	36090302083	Jun.17.2012
Horn Antenna	ETS-LINDGREN	3160	60008	Sep.20.2011
Horn Antenna	ETS-LINDGREN	3160	60006	Oct.27.2011

## 6 Transmitter Measurements

### 6.1 Effective Radiated Power of Transmitter (ERP)

#### 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/TM3/TM4 at Channel Bottom, Middle, Top

#### 6.1.2 Test Specifications and Limits

##### 6.1.2.1 Specification

CFR 47 (FCC) part 2.1046 and part 22 subpart H

##### 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 V5.4.0.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;
3GPP TS 34.121 V8.7.0:2009	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

##### 6.1.2.3 Limits

Compliance with part 22.913, mobile/portable stations are limited to 7 watts ERP peak power.  
 $W \text{ (dBm)} = 10 \cdot \log(W_{\text{in mW}})$ .

Table 14 Limits

Maximum Output Power (Watts)	< 7 Watts
Maximum Output Power (dBm)	< 38.5 dBm

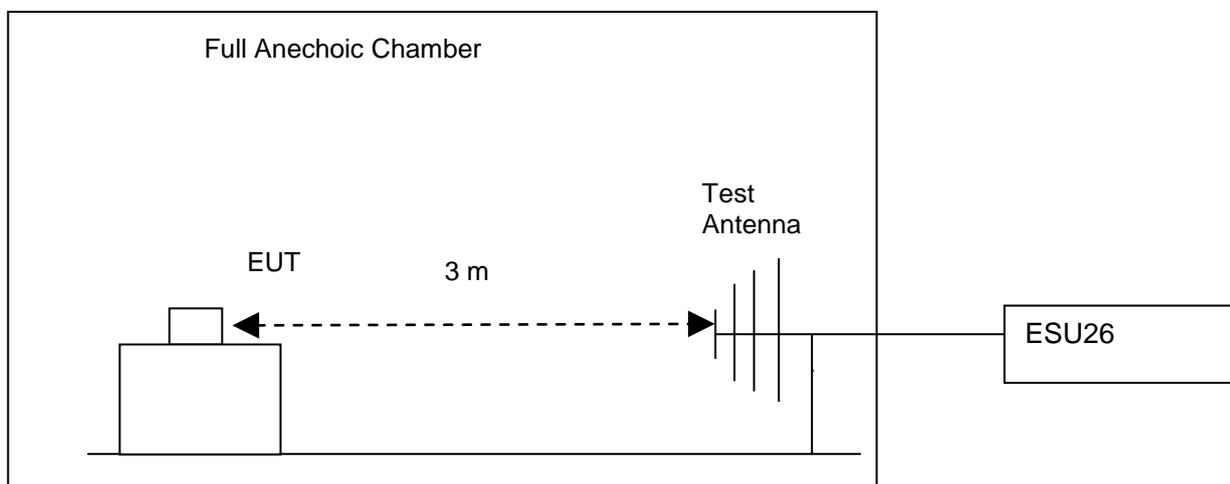
#### 6.1.3 Test Method and Setup

- (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 Mobile Phone to the wireless communication tester CMU200 via the air interface. The band is set as 850M.
- (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 ERP

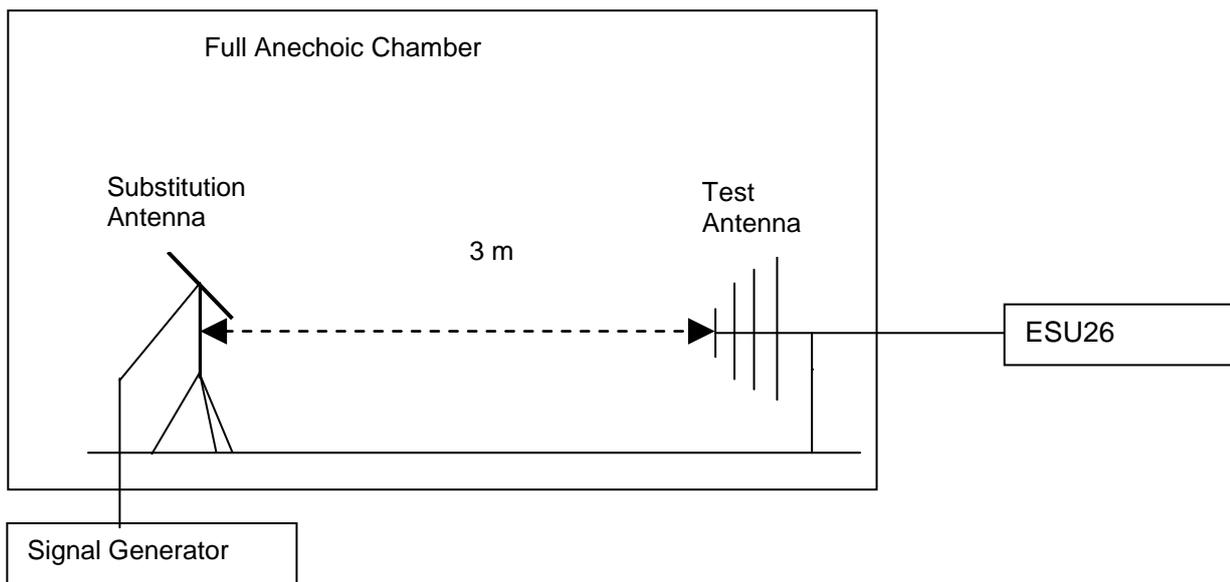


Figure 1. Test Set-up

NOTE: Effective radiated power (ERP) refers to the radiation power output of the EUT, assuming all emissions are radiated from half-wave dipole antennas.

## 6.1.4 Measurement Results

### 6.1.4.1 Pre-test Results

For HSDPA test mode, there are 4 sub-test for different configuration. For the sub-test 1, The channel is Middle range.

Sub-test	$\beta_c$	$\beta_d$	$\beta_d$ (SF)	$\beta_c/\beta_d$	HS	CM (dB)	MPR (dB)	Test result (dBm)
1	2/15	15/15	64	2/15	4/15	0.0	0.0	23.72
2	12/15	15/15	64	12/15	24/15	1.0	0.0	22.99
3	15/15	8/15	64	15/8	30/15	1.5	0.5	22.92
4	15/15	4/15	64	15/4	30/15	1.5	0.5	22.97

For the following test, the TM4 was used for HSDPA.

		RF Output Power (ERP)					
TEST CONDITIONS		Channel 128(B)		Channel 192(M)		Channel 251(T)	
		824.2MHz		837.0MHz		848.8MHz	
		dBm		dBm		dBm	
$T_{nom}$ (25 °C)/ $V_{nom}$ (3.7V)		Measured	Limit	Measured	Limit	Measured	Limit
	TM1	28.33	38.5	28.4	38.5	28.32	38.5
	TM2	24.2	38.5	24.22	38.5	24.23	38.5
TEST CONDITIONS		Channel 4132(B)		Channel 4182(M)		Channel 4233(T)	
		826.4MHz		836.4MHz		846.6MHz	
		dBm		dBm		dBm	
$T_{nom}$ (25 °C)/ $V_{nom}$ (3.7V)		Measured	Limit	Measured	Limit	Measured	Limit
	TM3	20.33	38.5	20.32	38.5	20.36	38.5
	TM4	20.3	38.5	20.28	38.5	20.33	38.5

## 6.1.4.2 Substitution Results

Table 15 Substitution Results

Test Mode	Freq. [MHz]	Meas. Level [dBm]	Substitution Antenna Type	SGP	Substitution Gain [dBd]	Cable Loss [dB]	Substitution Level (ERP)	FCC limit [dBm]	Result
				[dBm]			[dBm]		
TM1	824.2	28.33	Dipole Ant.	32.21	-2.75	0.6	28.86	38.5	Pass
TM1	837.0	28.40	Dipole Ant.	32.38	-2.87	0.6	28.91	38.5	Pass
TM1	848.8	28.32	Dipole Ant.	32.58	-2.85	0.6	29.13	38.5	Pass
TM2	824.2	24.20	Dipole Ant.	27.94	-2.75	0.6	24.59	38.5	Pass
TM2	837.0	24.22	Dipole Ant.	28.31	-2.87	0.6	24.84	38.5	Pass
TM2	848.8	24.23	Dipole Ant.	28.37	-2.85	0.6	24.92	38.5	Pass
TM3	826.4	20.33	Dipole Ant.	24.12	-2.75	0.6	20.77	38.5	Pass
TM3	836.4	20.32	Dipole Ant.	24.33	-2.87	0.6	20.86	38.5	Pass
TM3	846.6	20.36	Dipole Ant.	24.37	-2.85	0.6	20.92	38.5	Pass
TM4	826.4	20.30	Dipole Ant.	24.96	-2.75	0.6	20.61	38.5	Pass
TM4	836.4	20.28	Dipole Ant.	23.5	-2.87	0.6	20.03	38.5	Pass
TM4	846.6	20.33	Dipole Ant.	24.39	-2.85	0.6	20.94	38.5	Pass

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

$$\text{ERP [dBm]} = \text{SGP [dBm]} - \text{Cable Loss [dB]} + \text{Gain [dBd]}$$

NOTE: SGP- Signal Generator Level

b, RBW=10kHz, VBW=300kHz, and integrated by the instrument to 250kHz for TM1 and TM2 and 5M for TM3 and TM4.

## 6.1.5 Conclusion

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

## 6.2 Conducted Power of Transmitter

### 6.2.1 Test Conditions

Table 16 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	52 %
Test Configurations:	TM1/TM2/TM3/TM4 at Channel Bottom, Middle, Top

### 6.2.2 Test Specifications and Limits

#### 6.2.2.1 Specification

CFR 47 (FCC) part 2.1047 and part 22 subpart H

#### 6.2.2.2 Supporting Standards

Table 17 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 V5.4.0.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;
3GPP TS 34.121 V8.7.0:2009	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

#### 6.2.2.3 Limits

Compliance with part 22.913, in no any case may the peak power of a mobile station transmitter exceed 7 W. The calculated longitude ERP by following formula:

$$ERP(\text{dBm}) = 10 * \log(ERP_{\text{in watts}}).$$

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

$$P_{\text{cod}}(\text{dBm}) = ERP(\text{dBm}) - \text{Gain}(\text{dBd}).$$

and  $\text{Gain}(\text{dBd}) = \text{Gain}(\text{dBi}) - 2.15\text{dB}$

Table 18 Limits

Maximum Output Power (Watts)	< 7 Watts(38.5dBm)
Antenna Gain(dBi):	-1.28

Antenna Gain(dBd):	-3.43
Maximum Conducted Output Power (dBm)	< 41.93

### 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 Mobile Phone 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

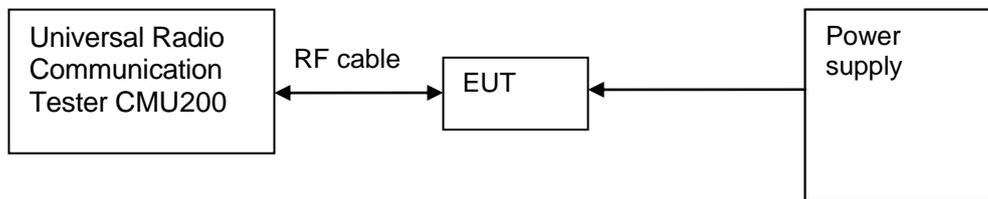


Figure 2. Test Set-up

## 6.2.4 Measurement Results

Table 19 Measurement Results

RF Output Power (Conducted)						
TEST CONDITIONS	Channel 128(B)		Channel 192(M)		Channel 251(T)	
	824.2MHz		837.0MHz		848.8MHz	
	dBm		dBm		dBm	
$T_{nom}$ (25 °C)/ $V_{nom}$ (3.7V)	Measured	Limit	Measured	Limit	Measured	Limit
TM1	31.76	41.93	31.83	41.93	31.75	41.93
TM2	27.63	41.93	27.65	41.93	27.66	41.93
TEST CONDITIONS	Channel 4132(B)		Channel 4182(M)		Channel 4233(T)	
	826.4MHz		836.4MHz		846.6MHz	
	dBm		dBm		dBm	
$T_{nom}$ (25 °C)/ $V_{nom}$ (3.7V)	Measured	Limit	Measured	Limit	Measured	Limit
TM3	23.76	41.93	23.75	41.93	23.79	41.93
TM4	23.73	41.93	23.71	41.93	23.76	41.93

## 6.2.5 Conclusion

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

## 6.3 Modulation Characteristics

### 6.3.1 Test Conditions

Table 20 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	52 %
Test Configurations:	TM1/TM2/TM3 at frequency Middle

### 6.3.2 Test Specifications and Limits

#### 6.3.2.1 Specification

CFR 47 (FCC) part 2.1047 and part 22 subpart H

#### 6.3.2.2 Supporting Standards

Table 21 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 V5.4.0.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;
3GPP TS 34.121 V8.7.0:2009	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

#### 6.3.2.3 Limits

No specific modulation characteristics requirement limits in part 2.1047 and part 22 subpart H.

Table 22 Limits

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

### 6.3.3 Test Method and Setup

Connect the Mobile Phone to Universal Radio Communication Tester CMU200 via the antenna connector. The frequency band is set as 850M; the Mobile Phone's output is matched with 50  $\Omega$  load, test method was according to 3GPP TS 51.010 and 3GPP TS 34.121. The waveform quality and constellation of the Mobile Phone was tested.

#### Test setup

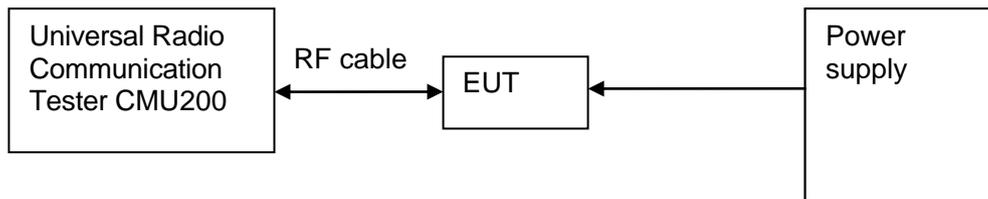


Figure 3. Test Set-up

### 6.3.4 Measurement Results

Table 23 Measurement Results

	Modulation Characteristic	
TEST CONDITIONS	Channel 192(M)	
	Measured	
	TM1	TM2
T <sub>nom</sub> (25 °C)/ V <sub>nom</sub> (3.7V)	Refer to Appendix A	Refer to Appendix A
	Modulation Characteristic	
TEST CONDITIONS	Channel 4182(M)	
	Measured	
	TM3	
T <sub>nom</sub> (25 °C)/ V <sub>nom</sub> (3.7V)	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 24 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	55 %
Test Configurations:	TM1/TM2/TM3 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 22 subpart H.

#### 6.4.2.2 Supporting Standards

Table 25 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 V5.4.0.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;
3GPP TS 34.121 V8.7.0:2009	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

#### 6.4.2.3 Limits

No specific occupied bandwidth requirement in part 22 subpart H, 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 26 Limits

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

### 6.4.3 Test Method and Setup

Mobile Phone was connected to the wireless signal analyzer R&S FSQ31 via the one RF connector. The band class is set as 850M; Mobile Phone was controlled to transmit maximum power. Measure and record the occupied bandwidth of the Mobile Phone by the R&S FSQ31.

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

For TM3 following RBW and VBW are employed:

Measurement bandwidth (RBW): 50 kHz (Resolution bandwidth)

Video bandwidth (VBW): 500 kHz

### Test Set-up

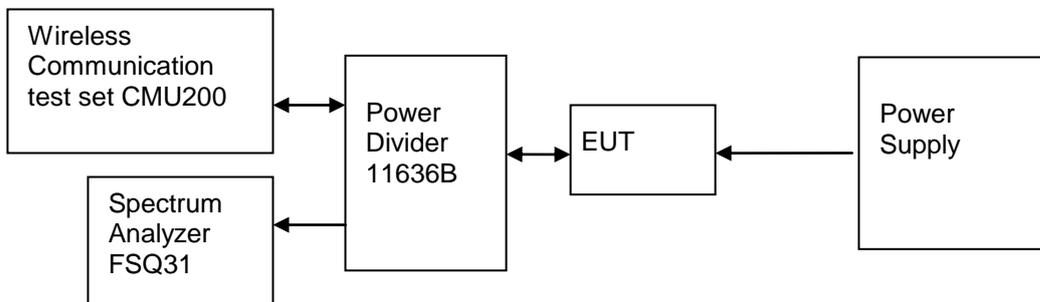


Figure 4. Test Set-up

### 6.4.4 Measurement Results

Table 27 Measurement Results

TEST CONDITIONS		Occupied Bandwidth					
		Channel 128(B)		Channel 192(M)		Channel 251(T)	
Center Frequency		824.2MHz		837.0MHz		848.8MHz	
		Measured (kHz)		Measured (kHz)		Measured (kHz)	
		TM1	TM2	TM1	TM2	TM1	TM2
T <sub>nom</sub> (25 °C)/ V <sub>nom</sub> (3.7V)	99%	245.19	248.40	243.59	245.19	246.79	245.19
Center Frequency		Channel 4132(B) 826.4MHz		Channel 4182(M) 836.4MHz		Channel 4233(T) 846.6MHz	
		Measured		Measured		Measured	



		(MHz)	(MHz)	(MHz)
		TM3	TM3	TM3
$T_{nom}$ (25 °C)/ $V_{nom}$ (3.7V)	99%	4.18	4.17	4.17

### 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 28 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25°C
Relative humidity:	55 %
Test Configurations:	TM1/TM2/TM3 at frequency Bottom, Top

### 6.5.2 Test Specifications and Limits

#### 6.5.2.1 Specification

CFR 47 (FCC) part 2.1051 and Part22 Subpart H

#### 6.5.2.2 Supporting Standards

Table 29 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 V5.4.0.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;
3GPP TS 34.121 V8.7.0:2009	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

#### 6.5.2.3 Limits

Compliance with part 22.917, all spurious emission must be attenuated below the transmitter power by at least  $43 + 10 \log_{10} P (W)$ . (Where as P is the rated power of the EUT).

Table 30 Limits

	TM1	TM2	TM3
Rated Power:	33 dBm	27 dBm	24 dBm
Required attenuation:	$43 + 10 \log (2) = 46$ , 33 dBm - 46 dB	$43 + 10 \log (0.5) = 40$ , 27 dBm - 40 dB	$43 + 10 \log (0.25) = 37$ , 24 dBm - 37 dB
Absolute level	- 13 dBm	- 13 dBm	- 13 dBm

### 6.5.3 Test Method and Setup

Mobile Phone was connected to the wireless signal analyzer R&S FSQ31 via the one RF connector, the band class is set as 850M. Mobile Phone was controlled to transmit maximum power. Measure and

record band edges compliance of the Mobile Phone by the R&S FSQ31.

For TM1/TM2 following RBW and VBW are employed:  
 Measurement bandwidth (RBW): 3 kHz (Resolution bandwidth)  
 Video bandwidth (VBW): 10 kHz  
 For TM3 following RBW and VBW are employed:  
 Measurement bandwidth (RBW): 50 kHz (Resolution bandwidth)  
 Video bandwidth (VBW): 200 kHz

### Test Set-up

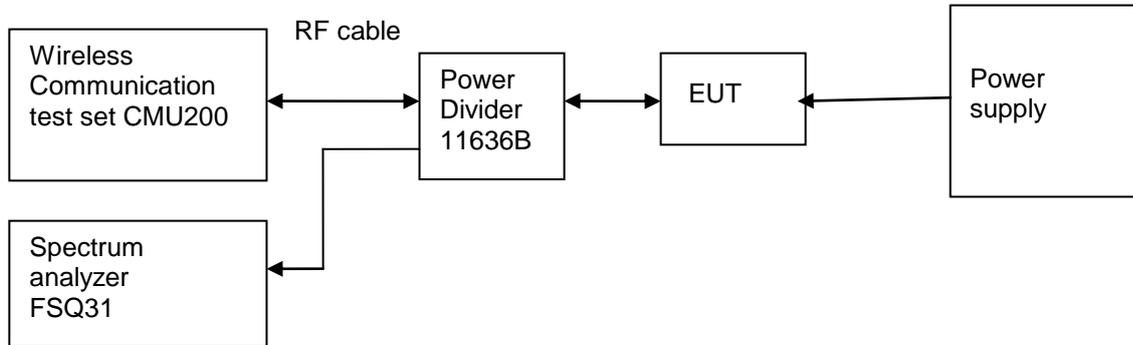


Figure 5. Test Set-up

### 6.5.4 Measurement Results

Table 31 Measurement Results outside Band Edges-- Single Carrier

Band	Frequency of Band edges [MHz]	Channel Number	Test Mode	Spurious Level measured [dBm]	FCC limit	Result
$T_{nom} (25\text{ }^{\circ}\text{C}), V_{nom} (3.7\text{V})$						
Cellular	824.2	128	TM1	<-13(See appendix C)	- 13 dBm	Pass
	848.8	251	TM1	<-13(See appendix C)	- 13 dBm	Pass
	824.2	128	TM2	<-13(See appendix C)	- 13 dBm	Pass
	848.8	251	TM2	<-13(See appendix C)	- 13 dBm	Pass
	826.4	4132	TM3	<-13(See appendix C)	- 13 dBm	Pass
	846.6	4233	TM3	<-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 32 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25°C
Relative humidity:	50 %
Test Configurations:	TM1/TM2/TM3 at frequency Bottom, Middle, Top

### 6.6.2 Test Specifications and Limits

#### 6.6.2.1 Specification

CFR 47 (FCC) part 2.1051 and Part22 Subpart H

#### 6.6.2.2 Supporting Standards

Table 33 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 V5.4.0.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;
3GPP TS 34.121 V8.7.0:2009	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

#### 6.6.2.3 Limits

Compliance with part 22.917, 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 34 Limits

	TM1	TM2	TM3
Rated Power:	33dBm	27 dBm	24 dBm
Required attenuation:	$43 + 10 \log(2) = 46$ , 33 dBm - 46 dB	$43 + 10 \log(0.5) = 40$ , 27 dBm - 40 dB	$43 + 10 \log(0.25) = 37$ , 24 dBm - 37 dB
Absolute level	- 13 dBm	- 13 dBm	- 13 dBm

### 6.6.3 Test Method and Setup

Mobile Phone was connected to the wireless signal analyzer R&S FSQ31 via the one RF connector,

the band class is set as 850M. Mobile Phone was controlled to transmit maximum power. Measure and record the Conducted Spurious Emission of the Mobile Phone by the R&S FSQ31.

According to part 22.917, the defined measurement bandwidth as following:

22.917 (b) Measurement procedure: Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.

- Measurement bandwidth (RBW) for 9 kHz up to 150 KHz: 1 kHz;
- Measurement bandwidth (RBW) for 150 kHz up to 30 MHz: 10 kHz;
- Measurement bandwidth (RBW) for 30 MHz up to 1 GHz: 100 kHz;
- Measurement bandwidth (RBW) for 1 GHz up to 12.75 GHz: 1 MHz;

According to RSS-132, the defined measurement bandwidth as following:

Measurement procedure: Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.

- Measurement bandwidth (RBW) for 30 MHz up to 1 GHz: 100 kHz;
- Measurement bandwidth (RBW) for 1GHz up to 18 GHz: 1MHz;

### Test Set-up

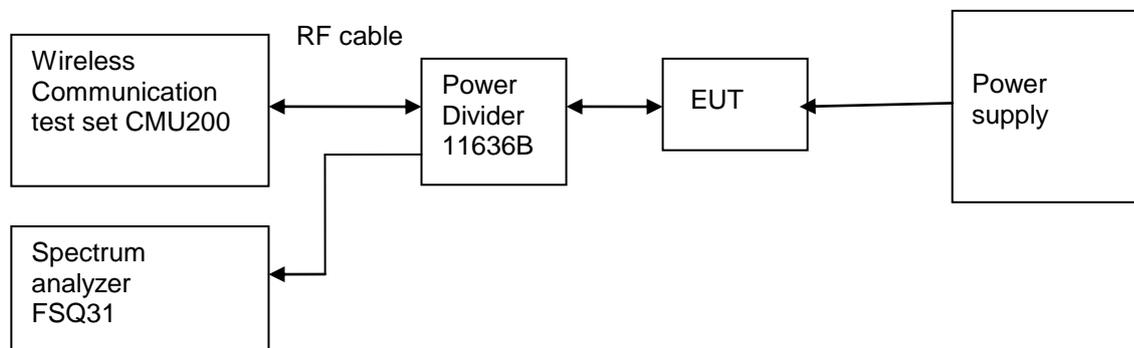


Figure 6. Test Set-up

### 6.6.4 Measurement Results

Table 35 Measurement Results

Channel Number	Test Mode	Test Range (Frequency)	Output Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
Channel 128(B)	TM1	9 kHz ~12.75GHz	33	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	TM2	9 kHz ~12.75GHz	27	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 4132(B)	TM3	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 192(M)	TM1	9 kHz ~12.75GHz	33	<- 13 dBm (See appendix D)	- 13 dBm	Pass

	TM2	9 kHz ~12.75GHz	27	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 4182(M)	TM3	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 251(T)	TM1	9 kHz ~12.75GHz	33	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	TM2	9 kHz ~12.75GHz	27	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 4233(T)	TM3	9 kHz ~12.75GHz	24	<- 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 Field Strength of Spurious Emissions

### 6.7.1 Test Conditions

Test Conditions

Preconditioning:	0.5 hour
Measured at:	enclosure
Ambient temperature:	25°C
Relative humidity:	55%
Test Configurations:	TM1/TM2/TM3/TM4 at frequency Middle

### 6.7.2 Test Specifications and Limits

#### 6.7.2.1 Specification

CFR 47 (FCC) part 2.1053、RSS-132 4.5 and part 22.917

#### 6.7.2.2 Supporting Standards

Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 V5.4.0.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;
3GPP TS 34.121 V8.7.0:2009	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

#### 6.7.2.3 Limits

Compliance with part 22.917, 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).

Limits

Rated Power:	24 dBm
Required attenuation:	$43 + 10 \log(0.25) = 37$ , 24 dBm – 37 dB
Absolute level	- 13 dBm

### 6.7.3 Test Method and Setup

A test site fulfilling the requirements of ITU-R Recommendation SM329-11 was used. The EUT was placed on a non-conducting support in the anechoic chamber and was operated from a power source via an RF filter to avoid radiation from the power leads.

According to part 22.917, the defined measurement bandwidth as following:

22.917 (b) Measurement procedure: Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.

Measurement bandwidth (RBW) for 9 kHz up to 150 kHz: 1 kHz;  
Measurement bandwidth (RBW) for 150 kHz up to 30 MHz: 10 kHz;  
Measurement bandwidth (RBW) for 30MHz up to 1GHz: 100k Hz;  
Measurement bandwidth (RBW) for 1GHz up to 18GHz: 1MHz;

According to RSS-132, the defined measurement bandwidth as following:

Measurement procedure: Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.

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

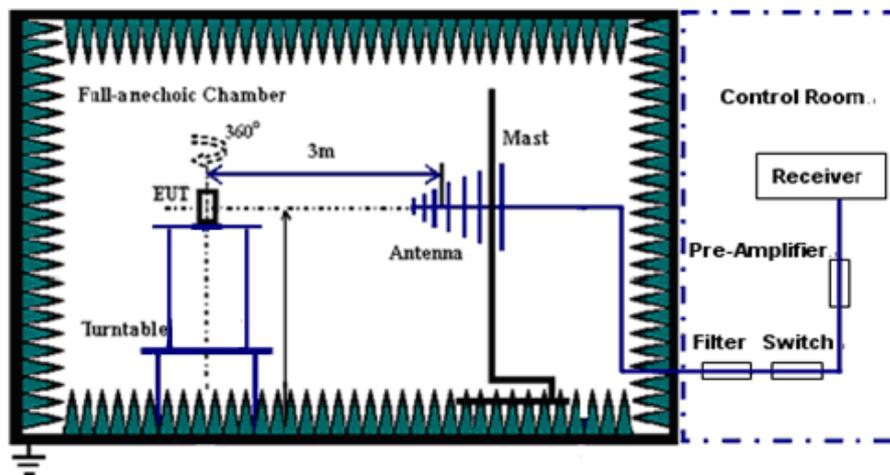
Measurement bandwidth (RBW) for 1GHz up to 18 GHz: 1MHz;

## Test Set-up

Step 1:

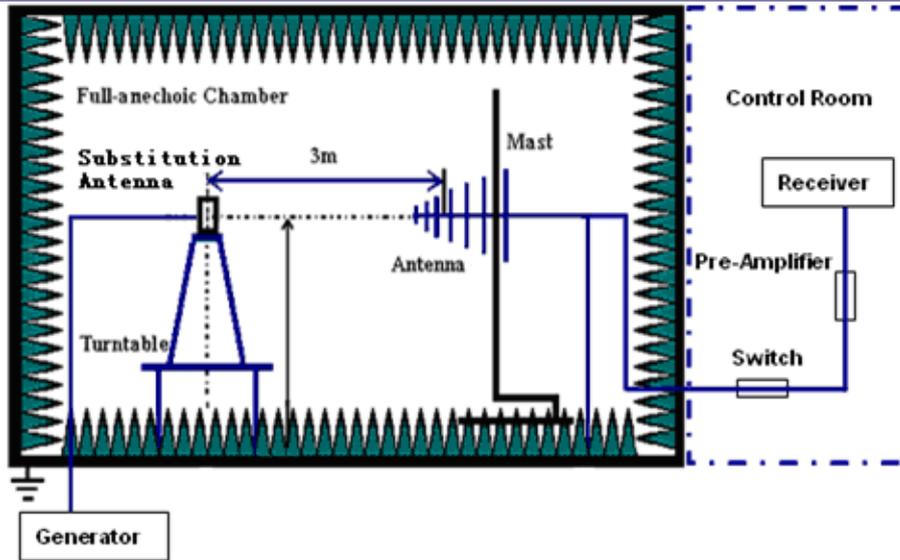
For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, EIRP shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect the EUT to the BTS simulator via the air interface.

Test the Radiated maximum output power by the Test Receiver from test antenna.



Step 2:

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 step1 on Test Receiver, and record the power level of Signal Generator. Of course, the cable loss at the test frequency should be compensated.



Test should be performed in normal voltage condition.

No peak found in pre- test. All frequency points' margin is bigger than 20dB, so the substitution method isn't used.

Calculation Sample:

#### Substitution Results

Freq. [MHz]	Measurement Value [dBm]	Substitution Antenna Type	Gain [dBd]	Cable Loss [dB]	Signal Generator Level [dBm]	Substitution Level [dBm]	FCC limit [dBm]	Result

Note: For get the E.R.P. (Efficient Radiated Power) in substitution method, the following formula should take to calculate it,

$$E.R.P. [dBm] = SGP [dBm] - Cable Loss [dB] + Gain [dBd]$$

NOTE: SGP- Signal Generator Level

### 6.7.4 Conclusion

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

For the measurement results refer to appendix\_E

## 6.8 Receiver Spurious Emissions

### 6.8.1 Test Conditions

Test Conditions

Preconditioning:	0.5 hour
Measured at:	enclosure
Ambient temperature:	25 °C
Relative humidity:	55 %
Test Configurations:	TM1/TM2/TM3 /TM4at frequency M

### 6.8.2 Test Specifications and Limits

#### 6.8.2.1 Specification

IC RSS-Gen 4.10 and RSS-132 4.6

#### 6.8.2.2 Supporting Standards

Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 V5.4.0.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;
3GPP TS 34.121 V8.7.0:2009	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

#### 6.8.2.3 Limits

Compliance with RSS-132 4.6, Receiver Spurious Emission must meet the requirement of following table.

Test Limits

Frequency of Emission (MHz)	Radiated Limit	
	Unit( $\mu$ V/m)	Unit(dB $\mu$ V/m)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

### 6.8.3 Test Method and Setup

The EUT was connected to the Spectrum Analyzer or equivalent via one RF RX diversity connector, and other RF connectors were connected to match loads. The EUT was controlled to transmit maximum power and to be operated in the normal receive mode by Console Computer. Measure and record the Receiver Out-band Spurious Emissions of the EUT by the Spectrum Analyzer or equivalent.

According to IC RSS-Gen clause 4.10, the search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tuneable or local

oscillator frequency, whichever is the higher, without exceeding 40 GHz.

A preliminary scan and a final scan of the emissions were made from 30 MHz to 18 GHz by using test script of software; the emissions were measured using Quasi-Peak Detector (30MHz~1GHz) and AV detector (above 1GHz). The maximal emission value was acquired by adjusting the antenna height, polarisation and turntable azimuth in accordance with the software setup. Normally, the height range of antenna was 1m to 4m, the azimuth range of turntable was 0° to 360°, The receive antenna has two polarizations V and H.

EUT was configured in idle mode and the test performed at worst emission state.

Measurement bandwidth: 30 MHz – 1000 MHz: 120 kHz

Measurement bandwidth: 1GHz – 18GHz: 1MHz

Test set up figure:

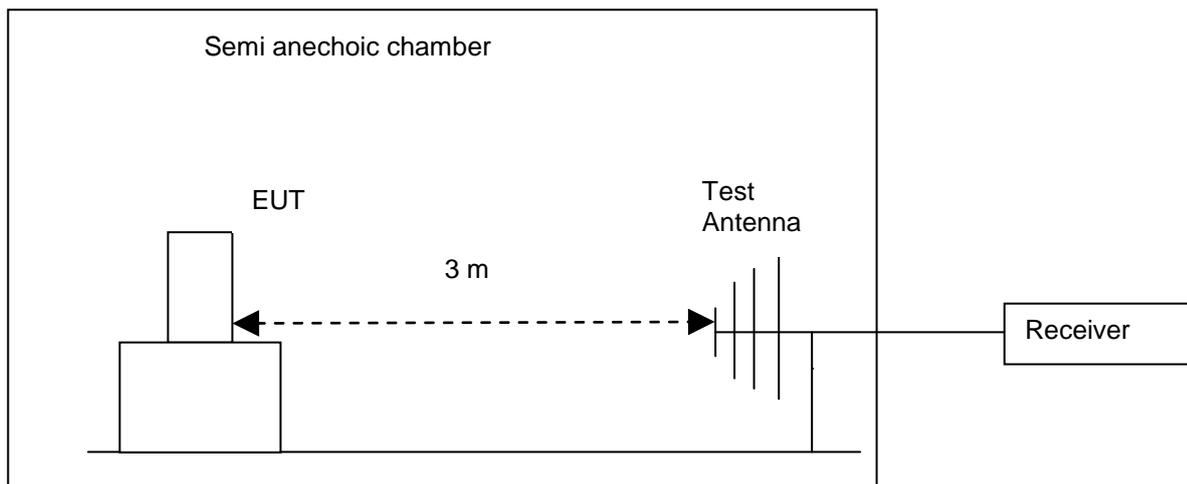


Figure 1. Test set-up

The EUT has met the requirements for Radiated Emission of enclosure port.

#### 6.8.4 Conclusion

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

For the measurement results refer to appendix F

## 6.9 Frequency Stability

### 6.9.1 Test Conditions

Table 36 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	See below
Relative humidity:	55 %
Test Configurations:	TM1/TM2/TM3 at frequency Middle

### 6.9.2 Test Specifications and Limits

#### 6.9.2.1 Specification

CFR 47 (FCC) part 2.1055 and Part22 Subpart H

#### 6.9.2.2 Supporting Standards

Table 37 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 V5.4.0.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;
3GPP TS 34.121 V8.7.0:2009	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

#### 6.9.2.3 Limits

According to part 22.355, from 821MHz to 896MHz, for mobile device, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances 2.5ppm.

### 6.9.3 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

(a) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10° 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.

(b) 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.

(c) 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) 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 3.6V and 4.2V, so here the EUT is tested in the 3.6V and 4.2V.

**Test Set up**

Connect the Mobile Phone to the Wireless Communication test set CMU200 via the connector. Then measure the frequency error by the Wireless Communication test set CMU200. The EUT's output is matched with a 50 Ω load.

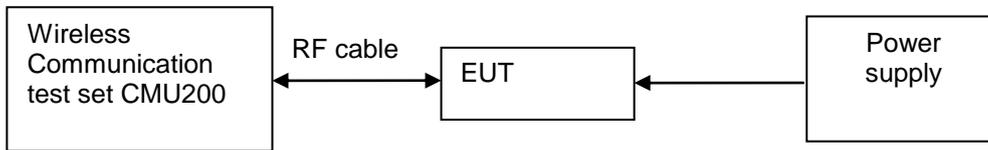


Figure 7. Test Set up

**6.9.4 Measurement Results**

**6.9.4.1 Measurement Results vs. Variation of Temperature**

- **TM1, 3.7V DC Channel No.192(837.0MHz)**

Table 38 Measurement Results vs. Variation of Temperature—TM1

Temperature	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	837.0	-11	Pass
-20 °C	837.0	-13	Pass
-10 °C	837.0	-10	Pass
0 °C	837.0	19	Pass
+10 °C	837.0	6	Pass
+20 °C	837.0	-11	Pass
+30 °C	837.0	5	Pass

+40 °C	837.0	9	Pass
+50 °C	837.0	-11	Pass

● **TM2, 3.7V DC Channel No.192(837.0MHz)**

Table 39 Measurement Results vs. Variation of Temperature—TM2

Temperature	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	837.0	-15	Pass
-20 °C	837.0	12	Pass
-10 °C	837.0	-14	Pass
0 °C	837.0	11	Pass
+10 °C	837.0	6	Pass
+20 °C	837.0	17	Pass
+30 °C	837.0	-14	Pass
+40 °C	837.0	-8	Pass
+50 °C	837.0	17	Pass

● **TM3, 3.7V DC Channel No.4182(836.4MHz)**

Table 40 Measurement Results vs. Variation of Temperature—TM3

Temperature	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	836.4	16	Pass
-20 °C	836.4	-17	Pass
-10 °C	836.4	-11	Pass
0 °C	836.4	13	Pass
+10 °C	836.4	-6	Pass
+20 °C	836.4	-11	Pass
+30 °C	836.4	-7	Pass
+40 °C	836.4	15	Pass
+50 °C	836.4	-12	Pass

### 6.9.4.2 Measurement Results vs. Variation of Voltage

- **TM1, 25 °C ,Channel No. 192(837.0MHz)**

Table 41 Measurement Results vs. Variation of Voltage—TM1

Voltage	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
4.2 V	837.0	-4	Pass
3.7 V	837.0	19	Pass
3.6V	837.0	-8	Pass

- **TM2, 25 °C ,Channel No. 192(837.0MHz)**

Table 42 Measurement Results vs. Variation of Voltage—TM2

Voltage	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
4.2 V	837.0	-12	Pass
3.7V	837.0	7	Pass
3.6 V	837.0	-4	Pass

- **TM3, 25 °C ,Channel No. 4182(836.4MHz)**

Table 43 Measurement Results vs. Variation of Voltage—TM3

Voltage	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
4.2 V	836.4	-6	Pass
3.7V	836.4	-10	Pass
3.6V	836.4	2	Pass

### 6.9.5 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 44 System Measurement Uncertainty

Items		Extended Uncertainty
Effective Radiated Power of Transmitter	ERP (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
Appendix B	Measurement Results Occupied Bandwidth
Appendix C	Measurement Results Band Edges
Appendix D	Measurement Results Spurious Emission at Antenna Terminal
Appendix E	Measurement Results Field Strength of Spurious Emissions
Appendix F	Measurement Results Receiver Spurious Emissions
Appendix H	Photos of Test Setup