



# FCC RF Test Report

**Product Name:**  
**HSPA+/HSUPA/HSDPA/UMTS/GPRS/GSM/EDGE Mobile  
Phone with Bluetooth**

**Model Number: HUAWEI U3220**

**Report No: SYBH(Z-RF)013022011-2003  
FCC ID: QISU3220**

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<b>REPORT ON</b>	<b>RF TEST OF HSPA+/HSUPA/HSDPA/UMTS/GPRS/GSM/EDGE Mobile Phone with Bluetooth</b>
	<b>M/N: HUAWEI U3220</b>
<b>REGULATION</b>	<b>FCC CFR47 Part 2: Subpart J; FCC CFR47 Part 27 : Subpart C&amp;L;</b>
<b>START OF TEST</b>	<b>Nov.15, 2010</b>
<b>END OF TEST</b>	<b>Nov. 20, 2010</b>
<b>Final Judgement:</b>	<b>Pass</b>

*Chen Xiaohong*

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# 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

<b>FCC Measurement Specification</b>	<b>FCC Limits Part(s)</b>	<b>Description</b>	<b>Result</b>
2.1046	27.50(d)(2)	Effective Radiated Power of Transmitter	PASS
2.1046	27.50(d)(2)	Conducted Power of Transmitter	PASS
2.1047	/	Modulation Characteristics	PASS
2.1049	/	Occupied Bandwidth	PASS
2.1051	27.53(g)	Band Edges Compliance	PASS
2.1051	27.53(g)	Spurious Emission at Antenna Terminal	PASS
2.1055	27.54	Frequency Stability	PASS



## 2 Product Description

### 2.1 Production Information

#### 2.1.1 General Description

HSPA+/HSUPA/HSPA+/HSUPA/HSDPA/UMTS/GPRS/GSM/EDGE Mobile Phone with Bluetooth - HUAWEI U3220 is subscriber equipment in the WCDMA/GSM system. The HSPA+/HSUPA/HSDPA/UMTS frequency band is Band II and AWS, but only AWS band test data included in this report. The GSM/GPRS/EDGE frequency band includes GSM850 and GSM900 and DCS1800 and PCS1900, but only GSM850MHz and PCS1900MHz band test data included in this report. The Mobile Phone implements such functions as RF signal receiving/transmitting, HSPA+/HSUPA /HSDPA/UMTS and GSM/GPRS/EDGE protocol processing, voice, video, MMS service, and GPSI 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.

**Note: Only tests for AWS (WCDMA Band IV) band was included in this report for the requirement of FCC part 2 & 27.**

#### 2.1.2 Support function and Service

The HSPA+/HSUPA/HSDPA/UMTS/GPRS/GSM/EDGE Mobile Phone with Bluetooth support the function and service as follows:

Table 2 Service and Test mode List

Service Name	Characteristic	Corresponding Test Mode	Note
Data	Modulation: QPSK	TM1	WCDMA
Data	Modulation: QPSK	TM2	HSDPA
Data	Modulation: QPSK	TM3	HSUPA

Note: \* The WCDMA test condition & settings are defined in 3GPP TS 34.121 V7.5.0.

## 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				
Not applicable				
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***

#### **3.1 Testing Period**

The test have been performed during the period of

Nov. 15, 2010 – Nov. 20, 2010

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

HUAWEI U3220 can support GSM/GPRS/EDGE/WCDMA/HSDPA/HSUPA/HSPA+ mode and 1700M Band in this report. During this measurement, the HUAWEI U3220 just works in WCDMA/HSDPA/HSUPA/HSPA+ mode and 1700M Band.

**TM1:** WCDMA Mode with QPSK Modulation

**TM2:** HSDPA Mode with QPSK Modulation

**TM3:** HSUPA Mode with QPSK Modulation



## 4 Product Description

### 4.1 Technical Characteristics

#### 4.1.1 Frequency Range

Table 4 Frequency Range

1700M Band	
Uplink band:	1710 to 1755 MHz
Downlink band:	2110 to 2155 MHz

#### 4.1.2 Channel Spacing / Separation

Table 5 Channel Spacing / Separation

WCDMA/HSDPA /HSUPA/HSPA+	
Channel Raster	200k Hz
Channel spacing:	5MHz

#### 4.1.3 Type of Emission

Table 6 Type of Emission

WCDMA/HSDPA/HSUPA/HSPA+	
Emission Designation:	5M0F9W

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 Table 8 Power Source

DC voltage nominal:	 5.0V;
DC voltage range	 4.75-5.25V
DC current maximal:	400mA

#### 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:

Table 9 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)



## 4.2 EUT Identification List

### 4.2.1 Board Information

Table 10 Board Information

HSPA+/HSUPA/HSDPA/UMTS/GPRS/GSM/EDGE Mobile Phone with Bluetooth		
HUAWEI U3220		
Board and Module		
Equipment Designation / Description	Serial Number	Remarks
MAINBOARD	020UFE210B000074	HD2U3220M Ver.A

Table 11

### 4.2.2 Adapter Technical Data

AC/DCAdapter Model	:	HS-050040U6
Manufacturer	:	Huawei Technologies Co., Ltd.
Input Voltage	:	~100-240V 50/60Hz 0.2A
Output Voltage	:	=== +5.0V, 400mA
Rated Power	:	2W
S/N	:	BYAA61121025

### 4.2.3 Battery Technical Data

Name	Qty.	Manufacture	Serials number	Description
Rechargeable Li-ion	1	Huawei Technologies Co., Ltd.	YAC9921H1391384 6	Battery Model: HB5A2H Rated capacity: 1150mAh Nominal Voltage: === +3.7V Charging Voltage: === +4.2V

### 4.2.4 FCC Identification

Grantee Code: QIS  
Product Code: U3220  
FCC Identification: QISU3220



## 5 Main Test Instruments

Table 12 Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until (MM.DD.YYYY)
Receiver	R&S	ESIB 26	100318	04.21.2011
BiLog Antenna	Schaffner	CBL 6112B	2747	11.16.2011
Horn Antenna	ETS-Lindgren	3117	00062553	08.15.2011
Horn Antenna	ETS-Lindgren	3160	00060006	08.03.2011
Dipole	Schwarzbeck	D69250- UHAP/D69250-VHAP	979/917	10.11.2011
Signal Generator	R&S	SMR 40	100325	05.11.2011
Signal Generator	R&S	SMU200A	101717	04.10.2011
Power Supply	Keithley	2306	1045337	05.11.2011
Climate Chamber	WEISS	WK11-180/170	5822604947001 0	10.23.2011
Universal Radio Communication Tester	R&S	CMU200	112347	03.30.2011
Wireless communication test set	Agilent	8960	GB43461081	05.10.2011
Spectrum Analyzer	R&S	FSU26	200245	08.27.2011



## 6 Transmitter Measurements

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

#### 6.1.1 Test Conditions

Table 13 Test Conditions

Preconditioning:	0.5 hour
Measured at:	enclosure
Ambient temperature:	25°C
Relative humidity:	55%
Test Configurations:	TM1/TM2/TM3 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 27.50(d)2

##### 6.1.2.2 Supporting Standards

Table 14 Supporting Standards:

ANSI/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS 34.121 V7.5.0	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

##### 6.1.2.3 Limits

Compliance with Part 27.232, mobile/portable stations are limited to 1 watts EIRP peak power.  
 $W(\text{dBm}) = 10 \cdot \log(W_{\text{in mW}})$ .

Table 15 Limits

Maximum Output Power (Watts)	< 1 Watts
Maximum Output Power (dBm)	< 30 dBm

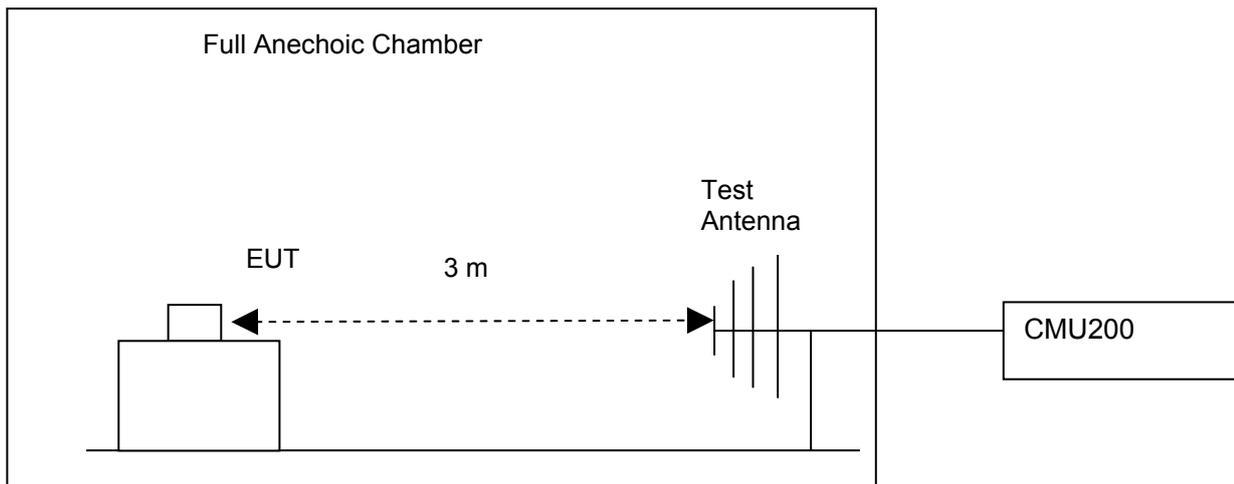
#### 6.1.3 Test Method and Setup

- (a) 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 wireless communication tester CMU200 via the air interface. The band is set as AWS.
- (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**

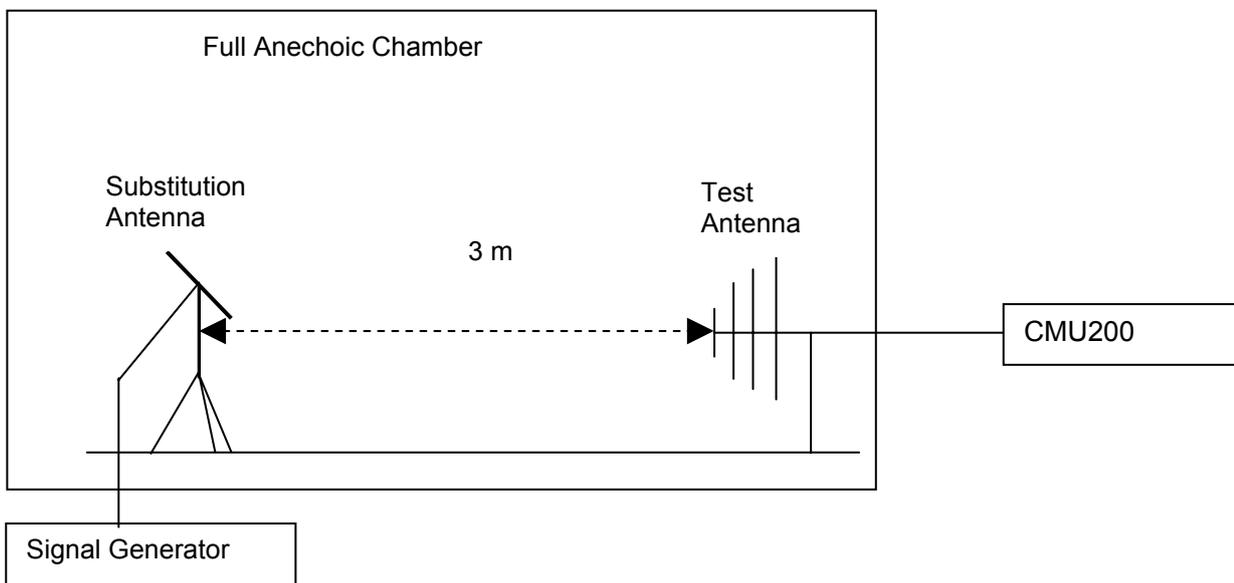


Figure 1. Test Set-up

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 ERP and EIRP.

$EIRP (dBm) = ERP (dBm) + 2.15$  (ITU-R Recommendation SM.329-10).

EIRP was measured using 1 host.



## 6.1.4 Measurement Results

### 6.1.4.1 Pre-test Results

Table 16 Pre-test Measurement Results

	Channel11312(B) 1712.4MHz		Channel1412(M) 1732.4MHz		Channel1513(T) 1752.6MHz	
	dBm		dBm		dBm	
T <sub>nom</sub> (25 °C)/ V <sub>nom</sub> (3.7V)	Measured	Limit	Measured	Limit	Measured	Limit
TM1	23.52	38.5	23.60	38.5	23.48	38.5
TM2	23.88	38.5	23.70	38.5	23.65	38.5
TM3	22.34	38.5	22.41	38.5	23.09	38.5

### 6.1.4.2 Substitution Results

Table 17 Substitution Results

Test Mode	Freq. [MHz]	Meas. Level [dBm]	Substitution Antenna Type	SGP	Substitution Gain [dBi]	Cable Loss [dB]	Substitution Level (EIRP)	FCC limit [dBm]	Result
TM1	1712.4	23.52	Horn Ant.	19.83	4.5	1.0	23.33	30	Pass
TM1	1732.4	23.60	Horn Ant.	19.88	4.5	1.0	23.38	30	Pass
TM1	1752.6	23.48	Horn Ant.	19.5	4.8	1.0	23.30	30	Pass
TM2	1712.4	23.88	Horn Ant.	20.12	4.5	1.0	23.62	30	Pass
TM2	1732.4	23.70	Horn Ant.	20.12	4.5	1.0	23.62	30	Pass
TM2	1752.6	23.65	Horn Ant.	19.75	4.8	1.0	23.55	30	Pass
TM3	1712.4	22.34	Horn Ant.	18.8	4.5	1.0	22.30	30	Pass
TM3	1732.4	22.41	Horn Ant.	18.79	4.5	1.0	22.29	30	Pass
TM3	1752.6	23.09	Horn Ant.	19.08	4.8	1.0	22.88	30	Pass

Table 18

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

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

NOTE: SGP- Signal Generator Level

b, RBW=10kHz, VBW=300kHz, and integrated by the instrument to 5M for TM1 and 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 19 Test Conditions

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

Table 20

### 6.2.2 Test Specifications and Limits

#### 6.2.2.1 Specification

CFR 47 (FCC) part 2.1047 and Part 27.50(d)(2)

#### 6.2.2.2 Supporting Standards

Table 21 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS 34.121 V7.5.0	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

#### 6.2.2.3 Limits

Compliance with Part 27.232, in no any case may the peak power of a mobile station transmitter exceed 2 W. The calculated longitude EIRP by following formula:

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

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 22 Limits

Maximum Output Power (Watts)	< 1 Watts (30 dBm)
Antenna Gain(dBi):	1
Maximum Conducted Output Power (dBm)	< 29

Table 23 HSDPA conducted max power

Sub-test	c	d	d (SF)	c/d	HS (Note1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)
1	2/15	15/15	64	2/15	4/15	0	0
2	12/15	15/15	64	12/15	24/15	1	0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Table 24 HSUPA conducted max power

Sub-test	$\beta_c$	$\beta_d$	$\beta_d$ (SF)	$\beta_c/\beta_d$	$\beta_{HS}$ (Note1)	$\beta_{ec}$	$\beta_{ed}$ (Note 5) (Note 6)	$\beta_{ed}$ (SF)	$\beta_{ed}$ (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 6)	E-TFC I
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	$\beta_{ed1}$ : 47/15 $\beta_{ed2}$ : 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 (Note 4)	15/15 (Note 4)	64	15/15 (Note 4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1:  $\Delta_{ACK}$ ,  $\Delta_{NACK}$  and  $\Delta_{CQI} = 30/15$  with  $\beta_{hs} = 30/15 * \beta_c$ .

Note 2: CM = 1 for  $\beta_c/\beta_d = 12/15$ ,  $\beta_{hs}/\beta_c = 24/15$ . For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.

Note 3: For subtest 1 the  $\beta_c/\beta_d$  ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to  $\beta_c = 10/15$  and  $\beta_d = 15/15$ .

Note 4: For subtest 5 the  $\beta_c/\beta_d$  ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to  $\beta_c = 14/15$  and  $\beta_d = 15/15$ .

Note 5: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.

Note 6:  $\beta_{ed}$  can not be set directly, it is set by Absolute Grant Value.

### 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 EUT to the wireless communication tester CMU200 via the antenna connector. The band class is set as AWS.

(b) Test the Conducted maximum output power by the CMU200.

### Test setup

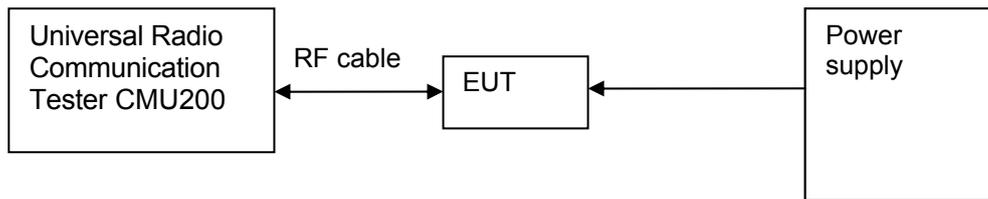


Figure 2. Test Set-up

## 6.2.4 Measurement Results

Table 25 Measurement Results

TEST CONDITIONS	RF Output Power(Conducted)					
	Channel11312(B) 1712.4MHz		Channel1412(M) 1732.4MHz		Channel1513(T) 1752.6MHz	
	dBm		dBm		dBm	
$T_{nom}$ (25 °C)/ $V_{nom}$ (3.7V)	Measured	Limit	Measured	Limit	Measured	Limit
TM1	22.52	29	22.60	29	22.48	29
TM2	22.88	29	22.70	29	22.65	29
TM3	21.34	29	21.41	29	22.09	29

## 6.2.5 Conclusion

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

## 6.3 Modulation Characteristics

### 6.3.1 Test Conditions

Table 26 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	52 %

Test Configurations:	TM1 at frequency Middle
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### 6.3.2 Test Specifications and Limits

#### 6.3.2.1 Specification

CFR 47 (FCC) part 2.1047 and Part 27 Subpart C&L

#### 6.3.2.2 Supporting Standards

Table 27 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS 34.121 V7.5.0	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 24 subpart E.

Table 28 Limits

Limits	Not applicable
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### 6.3.3 Test Method and Setup

Connect the EUT to Universal Radio Communication Tester CMU200 via the antenna connector. The frequency band is set as AWS; the EUT's output is matched with 50 Ω load, test method was according to 3GPP TS 34.121. The waveform quality and constellation of the EUT Module was tested.

#### Test setup

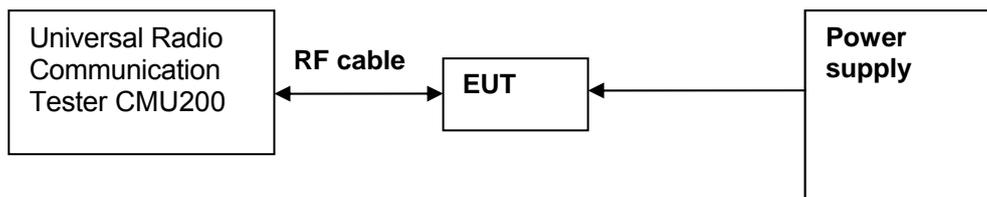


Figure 3. Test Set-up

### 6.3.4 Measurement Results

Table 29 Measurement Results

	Modulation Characteristic
TEST CONDITIONS	Channel1412(M) 1732.4MHz
	Measured
	TM1



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$T_{nom}$ (25 °C)	$V_{nom}$ (3.7V)	Refer to Appendix A
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### 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 30 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	55 %
Test Configurations:	TM1 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 27

### 6.4.2.2 Supporting Standards

Table 31 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS 34.121 V7.5.0	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 27 Subpart C&L, 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 32 Limits

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

## 6.4.3 Test Method and Setup

The EUT was connected to the wireless signal analyzer R&S FSU26 via the one RF connector. The band class is set as AWS; The EUT was controlled to transmit maximum power. Measure and record the occupied bandwidth of the EUT HUAWEI HUAWEI U8100-9/U8100-9/IVY Module by the R&S FSU26.

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 following RBW and VBW are employed:

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

Video bandwidth (VBW): 500 kHz

## Test Set-up

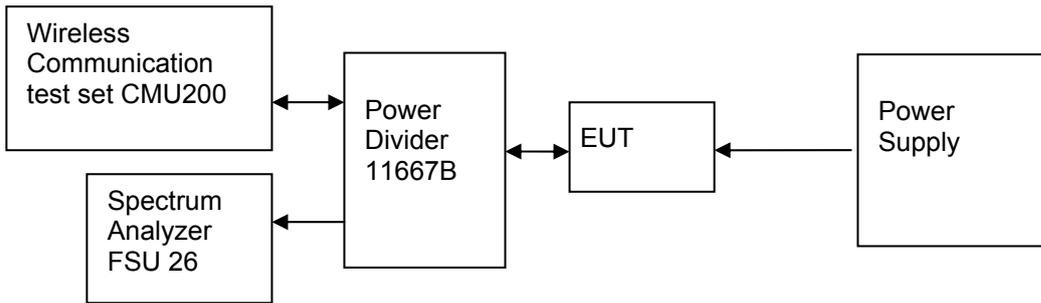


Figure 4. Test Set-up

### 6.4.4 Measurement Results

Table 33 Measurement Results

TEST CONDITIONS		Occupied Bandwidth		
		Channel1312(B)	Channel1412(M)	Channel1513(T)
Center Frequency		1712.4MHz	1732.4MHz	1752.6MHz
		Measured (MHz)	Measured (MHz)	Measured (MHz)
		TM1	TM1	TM1
Tnom (25 °C) Vnom (3.7V)	99%	4.15	4.15	4.15

### 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 34 Test Conditions

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

### 6.5.2 Test Specifications and Limits

#### 6.5.2.1 Specification

CFR 47 (FCC) part 2.1051 and Part 27.53

#### 6.5.2.2 Supporting Standards

Table 35 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS 34.121 V7.5.0	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

#### 6.5.2.3 Limits

Compliance with Part 27.50(d) (2), 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 36 Limits

	TM3
Rated Power:	24 dBm
Required attenuation:	$43 + 10 \log(0.25) = 37$ , 24 dBm - 37 dB
Absolute level	- 13 dBm

### 6.5.3 Test Method and Setup

The EUT was connected to the wireless signal analyzer R&S FSU26 via the one RF connector, the band class is set as AWS. The EUT controlled to transmit maximum power. Measure and record band edges compliance of the EUT by the R&S FSU26.

For TM1 following RBW and VBW are employed:

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

Video bandwidth (VBW): 200 kHz

## Test Set-up

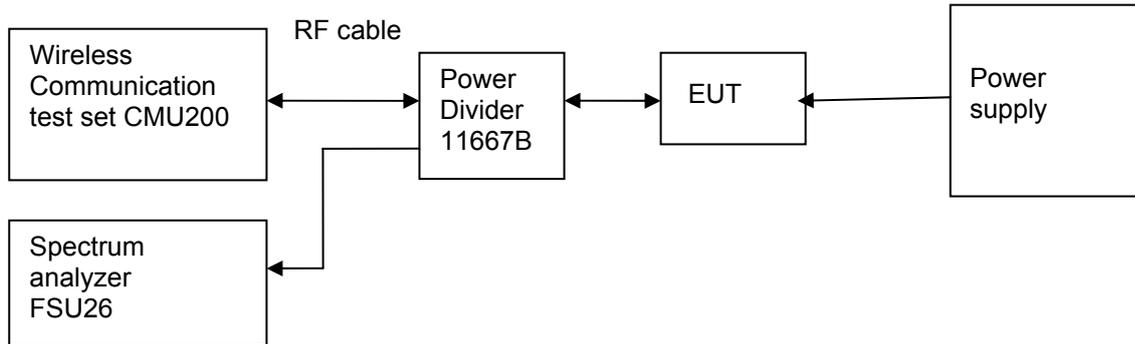


Figure 5. Test Set-up

## 6.5.4 Measurement Results

Table 37 Measurement Results outside Band Edges-- Single Carrier

Band	Frequency of Band edges [MHz]	Channel Number	Test Mode	Spurious Level measured [dBm]	FCC limit	Result
Cellular	$T_{nom}$ (25 °C), $V_{nom}$ (3.3V)					
	1712.4	1312	TM1	<-13(See appendix C)	- 13 dBm	Pass
	1752.6	1513	TM1	<-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 38 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25°C
Relative humidity:	50 %
Test Configurations:	TM1 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 27.53

#### 6.6.2.2 Supporting Standards

Table 39 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS 34.121 V7.5.0	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

#### 6.6.2.3 Limits

Compliance with Part 27.50(d)(2), 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 40 Limits

	TM1
Rated Power:	24 dBm
Required attenuation:	$43 + 10 \log(0.25) = 37$ , 24 dBm - 37 dB
Absolute level	- 13 dBm

### 6.6.3 Test Method and Setup

The EUT was connected to the wireless signal analyzer R&S FSU26 via the one RF connector, the band class is set as AWS. The EUT was controlled to transmit maximum power. Measure and record the Conducted Spurious Emission of the EUT by the R&S FSU26.

According to Part 27.50(d) (2), 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 30 MHz up to 20GHz: 1MHz;

### Test Set-up

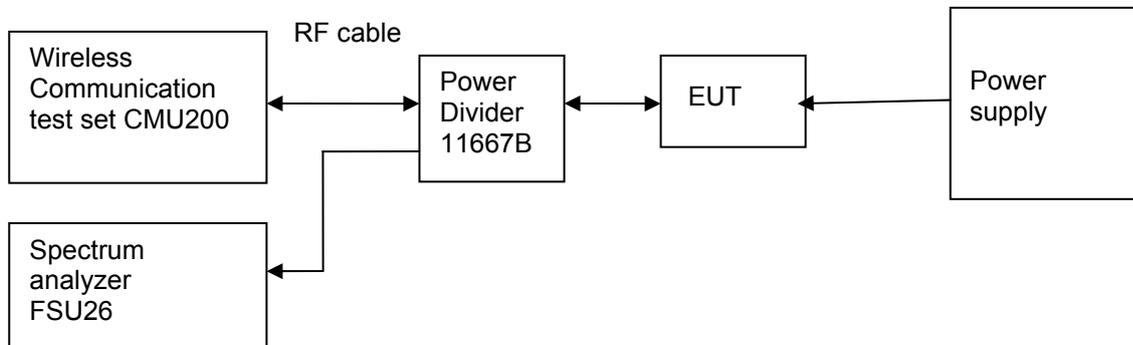


Figure 6. Test Set-up

### 6.6.4 Measurement Results

Table 41 Measurement Results

Channel Number	Test Mode	Test Range (Frequency)	Output Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
Channel 1312(B)	TM1	9 kHz~20GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 1412(M)	TM1	9 kHz~20GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 1513(T)	TM1	9 kHz~20GHz	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 Frequency Stability

### 6.7.1 Test Conditions

Table 42 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	See below
Relative humidity:	55 % at 25 °C
Test Configurations:	TM1 at frequency Middle

### 6.7.2 Test Specifications and Limits

#### 6.7.2.1 Specification

CFR 47 (FCC) part 2.1055 and Part 27.54

#### 6.7.2.2 Supporting Standards

Table 43 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS 34.121 V7.5.0	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

#### 6.7.2.3 Limits

No specific frequency stability requirement in part 2.1055 and Part 27.50(d)(2).

### 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

(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 95 to 105 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 EUT 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.

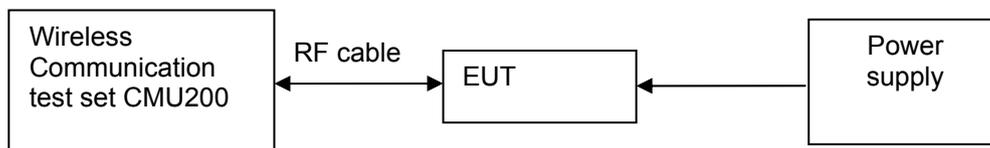


Figure 7. Test Set up

## 6.7.4 Measurement Results

### 6.7.4.1 Measurement Results vs. Variation of Temperature

- **TM1, 3.6V DC Channel No.1412(1732.4MHz)**

Table 44 Measurement Results vs. Variation of Temperature—TM1

Temperature	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	1732.4	3	Pass
-20 °C	1732.4	9	Pass
-10 °C	1732.4	-11	Pass
0 °C	1732.4	-4	Pass
+10 °C	1732.4	-12	Pass
+20 °C	1732.4	8	Pass
+30 °C	1732.4	14	Pass
+40 °C	1732.4	6	Pass
+50 °C	1732.4	-1	Pass



### 6.7.4.2 Measurement Results vs. Variation of Voltage

- **TM1, 25 °C ,Channel No. 1412 (1732.4MHz)**

Table 45 Measurement Results vs. Variation of Voltage—TM1

Voltage	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
4.2 V	1732.4	-12	Pass
3.7 V	1732.4	11	Pass
3.6 V	1732.4	-9	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 46 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	2 Pages
Appendix B	Measurement Results Occupied Bandwidth	4 Pages
Appendix C	Measurement Results Band Edges	3 Pages
Appendix D	Measurement Results Spurious Emission at Antenna Terminal	10 Pages