



# FCC Test Report

**Product Name: Fixed wireless Terminal**

**Model Number: HUAWEI ETS3223**

**Report No: SYBH(R)008122007EB -2**  
**FCC ID: QISETS3223**

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

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3.	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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**REPORT ON** **FCC Test of HUAWEI ETS3223 Fixed Wireless Terminal**

**M/N: ETS3223**

**Report No: SYBH(R)008122007EB-2**

**REGULATION** **FCC CFR47 Part 2: Subpart J;**  
**FCC CFR47 Part 24: Subpart E;**  
**FCC CFR47 Part 15: Subpart B;**

**CONCLUSION** There are 10 items need to be tested, 10 items have been tested. The sample of the model completely meets the requirements

**Final Judgement: Pass**

**General Manager**

2008.01.10

Date

张兴海

Name

signature



**Technical Responsibility  
For Area of Testing**

2008.01.10

Date

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Date

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Name

signature

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# 1 Summary

The table below summarizes the measurements and results for the HUAWEI GSM Fixed Wireless Terminal. 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	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
2.1053	24.238	Radiated Spurious Emission	PASS
2.1055	24.235	Frequency Stability	PASS
-	15.107	Conducted Emission at Power Port	PASS
-	15.109	Radiated Emission of Enclosure in Idle Mode	PASS



## 2 Product Description

### 2.1 Production Information

#### 2.1.1 General Description

HUAWEI ETS3223 Fixed Wireless Terminal is subscriber equipment in the GSM system. The GSM frequency band includes 850M and PCS1900M, ETS3223 implements such functions as RF signal receiving/transmitting, GSM protocol processing, voice and SMS service etc. Externally it provides USB interface (to connect to the PC etc.), SIM card interface.

#### 2.1.2 Support function and Service

The Fixed Wireless Terminal 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	GSM

### 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  and registration granted under the registration number **97456** on March 11, 2003. The test site has been accredited by



and the accredited number is **2174.01** in Jan of 2004.

#### **3.1 Testing Period**

The test have been performed during the period of

Jan. 02, 2008 to Jan. 10, 2008

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

Fixed Wireless Terminal can support GSM 850M and US PCS Band. During this measurement, the Fixed Wireless Terminal just works in GSM 850M and US PCS Band.

**TM1:** GSM Mode with GMSK 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

	GSM
Channel spacing	200k Hz
Channel separation:	200k Hz

#### 4.1.3 Type of Emission

Table 6 Type of Emission

	GSM
Emission Designation:	314kGXW

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:	~120V
AC voltage range	~100V-240V
AC current maximal:	0.65 A

#### 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
Current:	150mA 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

ETS3223 Fixed Wireless Terminal		
ETS3223		
Board and Module		
Equipment Designation / Description	Serial Number	Remarks
-Module board	020CFL1067800013	MG01E3223M
-Interface board	0284291067800098	WG01PIPU
-Battery	20060520000217	NA

### 4.2.2 Adapter Technical Data

AC/DCAdapter Model	RD293O50C65C50
Manufacturer	Liansheng electronic Techonoly Co.,Ltd.
Input Voltage	100-240V ~50/60Hz 0.2 A
Output Voltage	 5V 650mA
Rated Power	<2W
AC/DCAdapter Model	XQLCHW06
Manufacturer	Xinqiao electronic Techonoly Co.,Ltd.
Input Voltage	100-240V ~50/60Hz 0.2 A
Output Voltage	 5V 650mA
Rated Power	<2W
AC/DCAdapter Model	UE04L1-050065SPAV
Manufacturer	Fuhua electronic Techonoly Co.,Ltd.
Input Voltage	100-240V ~50/60Hz 0.2 A
Output Voltage	 5V 650mA
Rated Power	<2W

### 4.2.3 Battery Technical Data

Type:	Rechargeable NiMH Battery
Manufacturer:	HAERBIN COSLIGHT POWER CO.,LTD
Battery Model:	HGB-2A10×3
Rated capacity:	1000mAH
Nominal Voltage:	 +3.8V
Charging Voltage:	 +4.2V
Type:	Rechargeable NiMH Battery
Manufacturer:	Shenzhen Grepow Battery Co., LTD
Battery Model:	HGB-2A10×3/24020480



Rated capacity: 1000mAH  
Nominal Voltage:  +3.8V  
Charging Voltage:  +4.2V

Type: Rechargeable NiMH Battery  
Manufacturer: EVE BATTERY CO., LTD  
Battery Model: HGB-2A10×3  
Rated capacity: 1000mAH  
Nominal Voltage:  +3.8V  
Charging Voltage:  +4.2V

#### 4.2.4 FCC Identification

**Grantee Code:** QIS  
**Product Code:** ETS3223  
**FCC Identification:** QISETS3223

## 5 Main Test Instruments

Table 11 Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until (MM.DD.YYYY)
Signal Analyzer	Agilent	E4440A	200002	12.18.2008
Test Receiver Display Unit	R&S	ESMI 804.8932.52	829214/011	04.22.2008
Test Receiver RF Unit	R&S	ESMI 1032.5640.53	829550/008	04.22.2008
Receiver	R&S	ESIB 26	100318	05.21.2008
Receiver	R&S	ESCS30	830245/018	05.29.2008
Pre-Amplifier	Agilent	8447D	2944A10146	05.21.2008
Pre-Amplifier	Agilent	83017A	3950M00246	05.21.2008
Loop Antenna	Schwarzbeck	FMZB1516	1516115	05.29.2008
BiLog Antenna	Schaffner	CBL 6112B	2747	02.25.2008
BiLog Antenna	Schaffner	CBL 6112B	2536	06.07.2008
Horn Antenna	ETS-Lindgren	3117	00062549	06.05.2008
Horn Antenna	ETS-Lindgren	3116	00031541	03.20.2008
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	SMR 40	100325	08.09.2008
Artificial Mains Network	R&S	ENV4200	100001	07.20.2008
Power Supply	Keithley	2306	1045337	08.14.2008
Climate Chamber	WEISS	ACS-1	3604040034	06.05.2008
Universal Radio Communication Tester	R&S	CMU200	108035	07.19.2008
Power Supply	Agilent	11667B	3586M000159	07.20.2008
Wireless communication test set	Agilent	8960	GB43461081	08.23.2008
Signal Analyzer	Agilent	E4440A	200002	12.18.2008
Test Receiver Display Unit	R&S	ESMI 804.8932.52	829214/011	04.22.2008

## 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
Relative humidity:	55%
Test Configurations:	TM1 at frequency Bottom、Mid、 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.  
 $W(\text{dBm}) = 10 * \log(W_{\text{mwatts}})$ .

Table 14 Limits

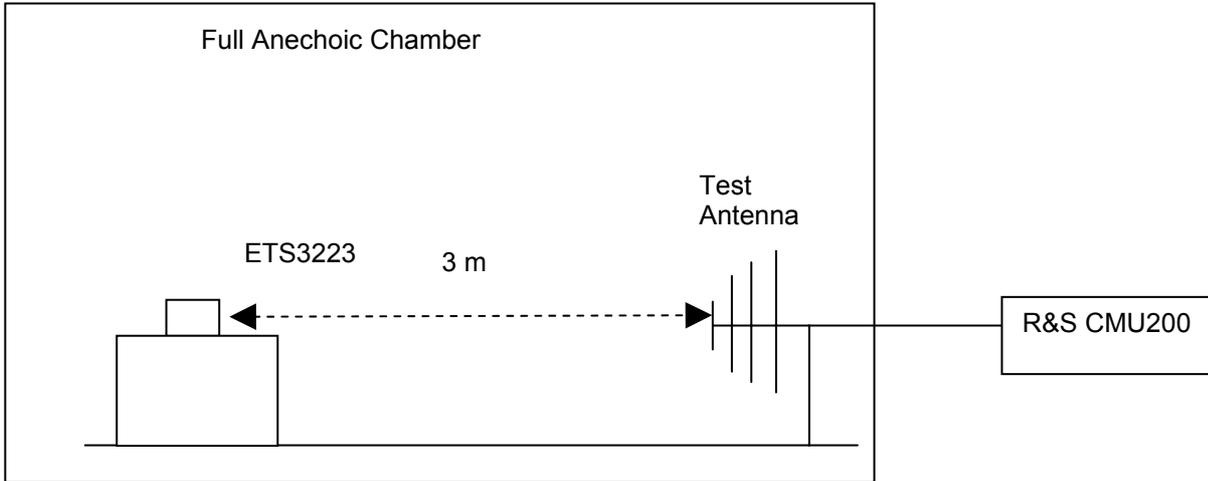
Maximum Output Power (Watts)	< 2 Watts
Maximum Output Power (dBm)	< 33 dBm

#### 6.1.3 Test Method and Setup

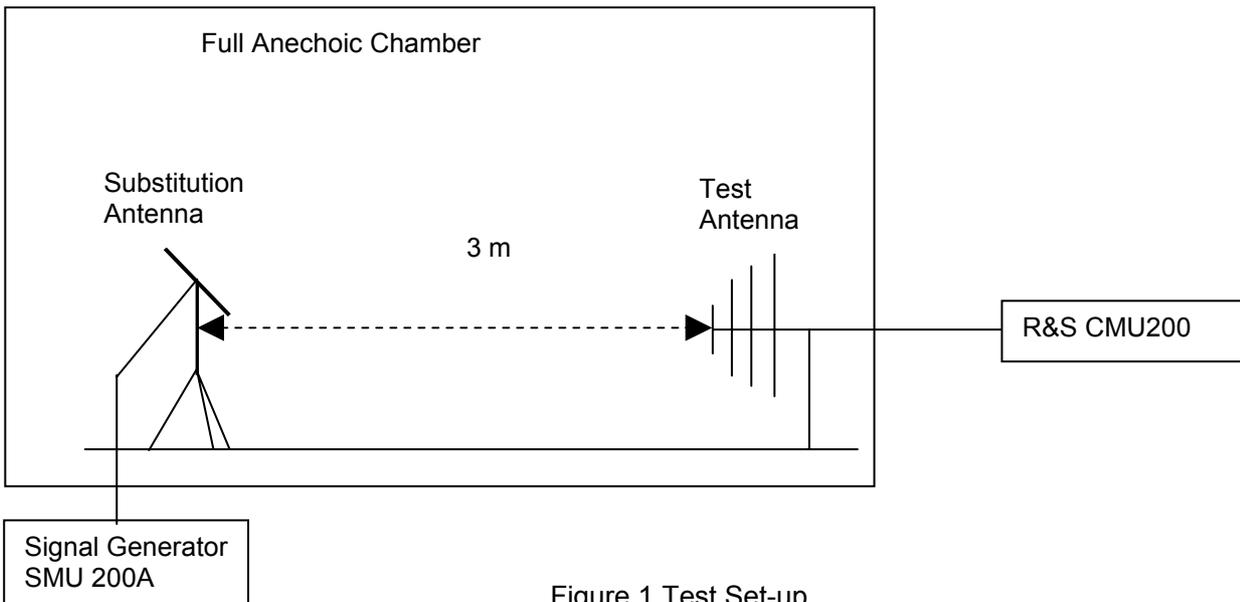
- For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, ERP shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect the Fixed Wireless Terminal to the wireless communication tester R&S CMU200 via the air interface. The band class is set as PCS.
- Test the Radiated maximum output power by the CMU200 received from test antenna.
- 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.  
 $ERP (dBm) = EIRP (dBm) - 2.15$  (ITU-R Recommendation SM.329-10).

**6.1.4 Measurement Results**

Table 15 Measurement Results

	RF Output Power (EIRP)
--	------------------------



TEST CONDITIONS		Channel512(B) 1850.2MHz		Channel661(M) 1880.0MHz		Channel810(T) 1909.8MHz	
		dBm		dBm		dBm	
		Measured	Limit	Measured	Limit	Measured	Limit
TM1	T <sub>nom</sub> (25 °C) V <sub>nom</sub> (5 V)	27.34	33	27.27	33	27.41	33

**6.1.4.1 Substitution Results**

Table 16 Substitution Results

Test Mode	Freq. [MHz]	Meas. Level [dBm]	Substitution Antenna Type	SGP [dBm]	Substitution Gain [dBd]	Cable Loss [dB]	Substitution Level (EIRP) [dBm]	Limit [dBm]	Result
TM1	1850.2	27.34	Horn Ant.	25.75	2.45	1.0	27.20	33	Pass
TM1	1880.0	27.27	Horn Ant.	25.99	2.45	1.0	27.44	33	Pass
TM1	1909.8	27.41	Horn Ant.	25.94	2.55	1.0	27.49	33	Pass

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

$$ERP [dBm] = SGP [dBm] - Cable Loss [dB] + Gain [dBd]$$

NOTE: SGP- Signal Generator Level

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

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

**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:	23.5
Relative humidity:	55%
Test Configurations:	TM1 at frequency Bottom、 Mid、 Top

### 6.2.2 Test Specifications and Limits

#### 6.2.2.1 Specification

CFR 47 (FCC) part 2.1046 and part 24.232

#### 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
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#### 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:

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

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

$$P_{\text{cod}}(dBm) = EIRP(dBm) - \text{Gain}(dBi).$$

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

Table 19 Limits

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

### 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 Fixed Wireless Terminal to the wireless communication tester CMU200 via the antenna connector. The band class is set as PCS.

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

**Test setup**

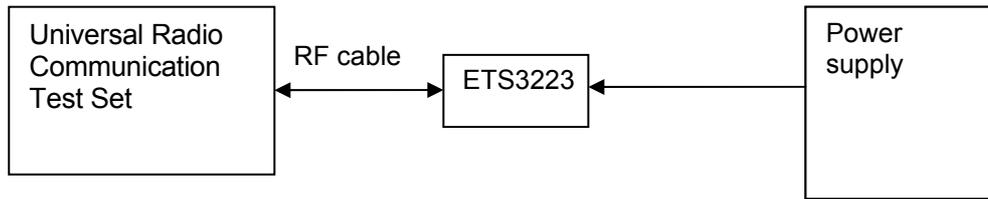


Figure 2. Test Set-up

**6.2.4 Measurement Results**

Table 20 Measurement Results

TEST CONDITIONS		RF Output Power					
		Channel 512(B) 1850.2MHz		Channel 661(M) 1880MHz		Channel 810(T) 1909.8MHz	
		dBm		dBm		dBm	
		Measured	Limit	Measured	Limit	Measured	Limit
TM1	T <sub>nom</sub> (25 °C) V <sub>nom</sub> (5 V)	26.11	30.5	25.99	30.5	25.84	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:	55 %
Test Configurations:	TM1 at frequency Top 、 Middle 、 Bottom

#### 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 Fixed Wireless Terminal to Wireless Communication Test Set R&S CMU200 via the antenna connector. The band class is set as PCS1900; the Fixed Wireless Terminal's output is matched with 50 Ω loads, test method was according to 3GPP TS 51.010 and TS 34.121. The waveform quality and constellation of the Fixed Wireless Terminal was tested.

##### Test setup

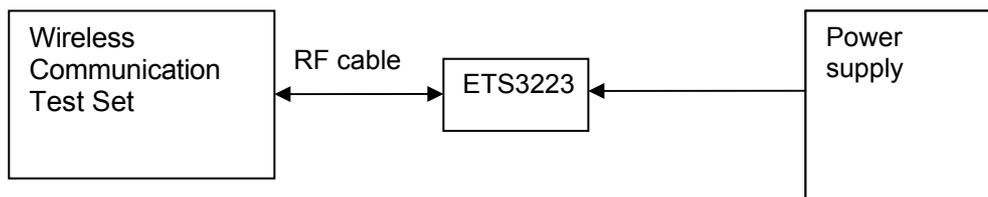


Figure 3. Test Set-up



### 6.3.4 Measurement Results

Table 24 Measurement Results

TEST CONDITIONS		Modulation Characteristic		
		Channel512(B) 1850.2MHz	Channel661(M) 1880.0MHz	Channel810(T) 1909.8MHz
		Measured		
		TM1		
$T_{nom}$ (25 °C)	$V_{nom}$ (5 V)	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 at frequency Bottom、 Mid、 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

Fixed Wireless Terminal was connected to the Spectrum Analyzer AGILENT 4440A via the one RF connector. The band class is set as PCS1900; Fixed Wireless Terminal was controlled to transmit maximum power. Measure and record the occupied bandwidth of the Fixed Wireless Terminal by the AGILENT 4440A.

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): 3 kHz (Resolution bandwidth)**  
**Video bandwidth (VBW): 10 kHz**

**Test Set-up**

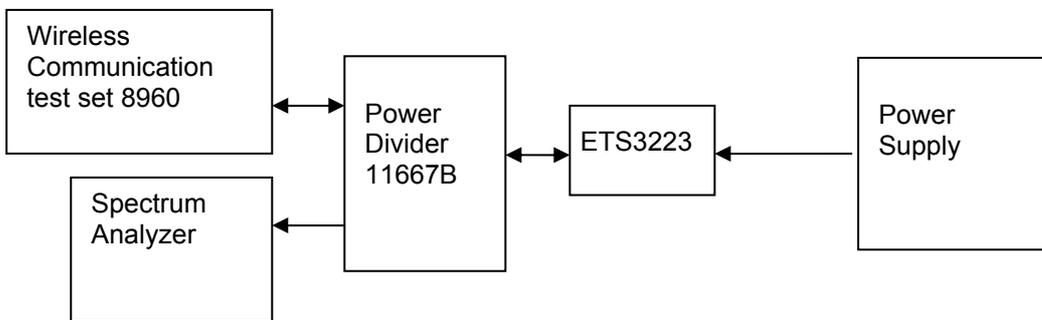


Figure 4. Test Set-up

**6.4.4 Measurement Results**

Table 28 Measurement Results

TEST CONDITIONS		Occupied Bandwidth		
		Channel512 (B) 1850.2MHz	Channel661 (M) 1880MHz	Channel810 (T) 1909.8MHz
		Measured (kHz)	Measured (kHz)	Measured (kHz)
		TM1	TM1	TM1
T <sub>nom</sub> (25 °C) V <sub>nom</sub> (5 V)	99%	244.25	247.28	244.09

**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 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  $43 + 10 \log_{10} P$ . (Whereas P is the rated power of the EUT).

Table 31 Limits

	TM1
Rated Power:	33 dBm
Required attenuation:	$43 + 10 \log(2) = 46$ , 33 dBm - 46 dB
Absolute level	- 13 dBm

### 6.5.3 Test Method and Setup

Fixed Wireless Terminal was connected to the Spectrum Analyzer E4445A via the one RF connector, the band class is set as PCS. Fixed Wireless Terminal was controlled to transmit maximum power. Measure and record band edges compliance of the Spectrum Analyzer E4445A.

In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 1% of the emission bandwidth of the fundamental emission of the transmitter may be employed. According to FCC part 24.238. The FCC rules define the fundamental emission as -26dBc bandwidth. The limit is -13dBm.

### Test Set-up

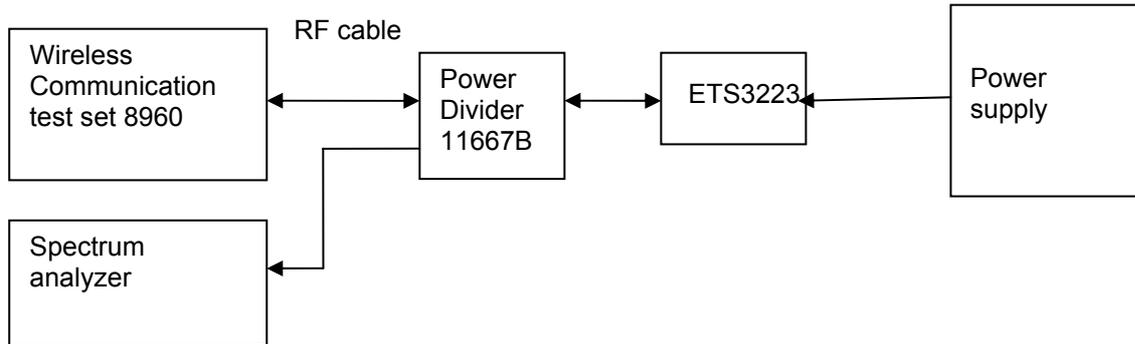


Figure 5. Test Set-up

### 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	$T_{nom} (25\text{ }^{\circ}\text{C}), V_{nom} (5\text{ V})$					
	1850.2	512	TM1	<-13(See appendix C)	- 13 dBm	Pass
	1909.8	810	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 33 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25°C
Relative humidity:	55 %
Test Configurations:	TM1 at frequency B、 M、 T

### 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 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

	TM1
Rated Power:	33dBm
Required attenuation:	$43 + 10 \log(2) = 46$ , 33 dBm - 46 dB
Absolute level	- 13 dBm

### 6.6.3 Test Method and Setup

Fixed Wireless Terminal was connected to the Spectrum Analyzer AGILENT 4440A via the one RF connector, the band class is set as PCS. Fixed Wireless Terminal was controlled to transmit maximum power.

Measure and record the Conducted Spurious Emission of the Fixed Wireless Terminal by the AGILENT 4440A.

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

**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 20 GHz: 1 MHz;**

### Test Set-up

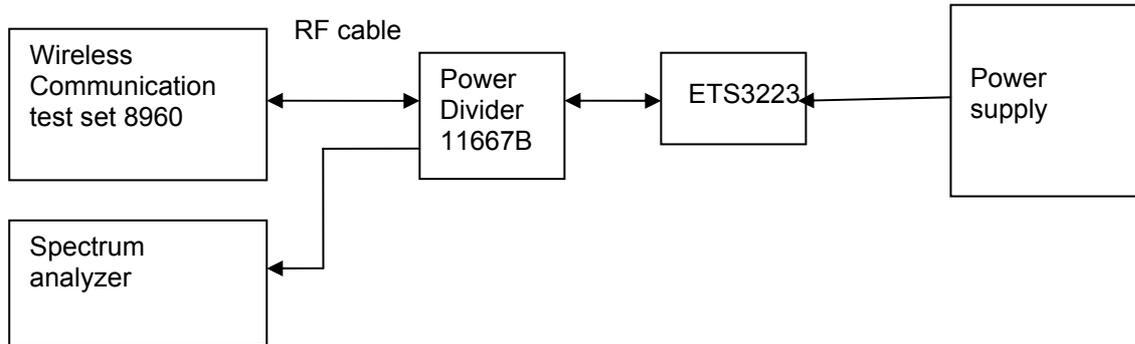


Figure 6. Test Set-up

### 6.6.4 Measurement Results

Table 36 Measurement Results

Channel Number	Test Mode	Test Range (Frequency)	Rated Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
Channel 512(B)	TM1	9 kHz ~20GHz	33	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 661(M)	TM1	9 kHz ~20GHz	33	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 810(T)	TM1	9 kHz ~20GHz	33	<- 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 Radiated Spurious Emission

### 6.7.1 Test Conditions

Table 37 Test Conditions

Preconditioning:	0.5 hour
Measured at:	enclosure
Ambient temperature:	25 °C
Relative humidity:	53 %
Test Configurations:	TM1 at middle channel

### 6.7.2 Test Specifications and Limits

#### 6.7.2.1 Specification

CFR 47 (FCC) part 2.1053 and part 24.238

#### 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
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#### 6.7.2.3 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 39 Limits

	TM1
Rated Power:	33dBm
Required attenuation:	$43 + 10 \log(2) = 46$ , 30 dBm - 46 dB
Absolute level	- 13 dBm

### 6.7.3 Test Method and Setup

(a) Measurements were made to detect spurious emissions radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data were supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph 2.1049(c) as appropriate. For equipment operating on frequencies below 890 MHz, an Open Field Test is normally required with the measuring instrument antenna located in the far field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurement will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections, which might distort the field strength measurements. Information

submitted shall include the relative radiated power of each spurious emission with the reference to the rated power output of the transmitter, assuming all emissions are radiated from half-wave dipole antennas.

- (b) Measurements specified in paragraph (a) of this section shall be made for the following equipment:
- (1) Those in which the spurious emission are required to be 60 dB or more below the mean power of the transmitter.
  - (2) All equipment operating on frequencies higher than 25 MHz
  - (3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.
  - (4) Other types of equipment as required, when deemed necessary by the Commission.

HUAWEI Fixed Wireless Terminal is equipment with non-integral antenna. And it should test according to part (b) of above section.

BTS simulator is connected to a communication antenna, by which communicate with the Fixed Wireless Terminal inside the test site. The BTS simulator controls the Fixed Wireless Terminal to transmit at maximum power which defined in specification of product when in traffic mode. The Fixed Wireless Terminal operates on a typical channel.

### **The test procedure:**

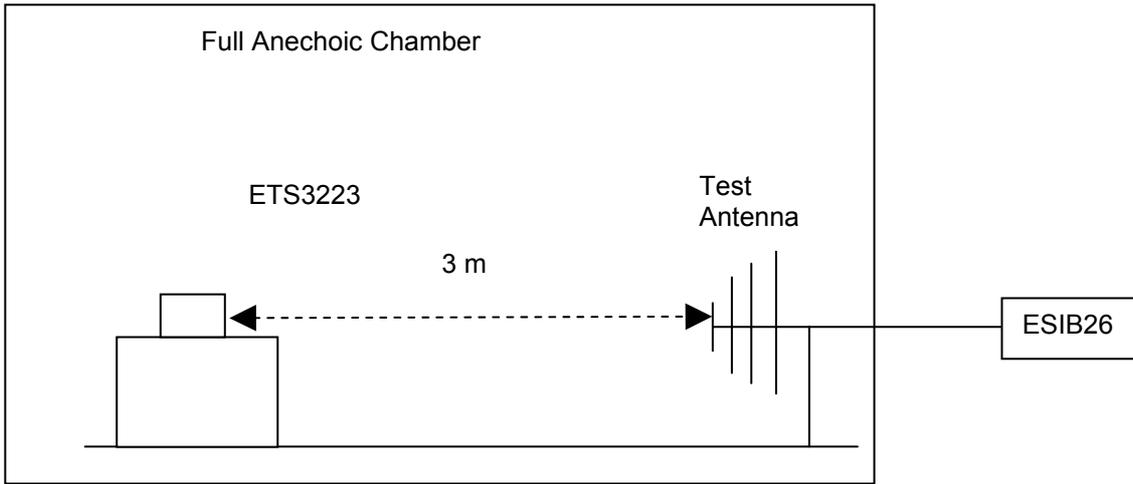
- (a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, EIRP. shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect the Fixed Wireless Terminal to the BTS simulator via the air interface. The band class is set as PCS.
- (b) Test the Radiated maximum output power by the Rohde and Schwarz ESIB26 Test Receiver 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 ESIB26 Test Receiver, and record the power level of Signal Generator. Of course, the cable loss at the test frequency should be compensated.

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

Measurement bandwidth (RBW) for 30MHz up to 1GHz: 100kHz;  
Measurement bandwidth (RBW) for 1GHz up to 26.5GHz: 1MHz;

### **Test setup**

#### **Step 1: Pre-test**



**Step 2: Substitution method to verify the maximum ERP**

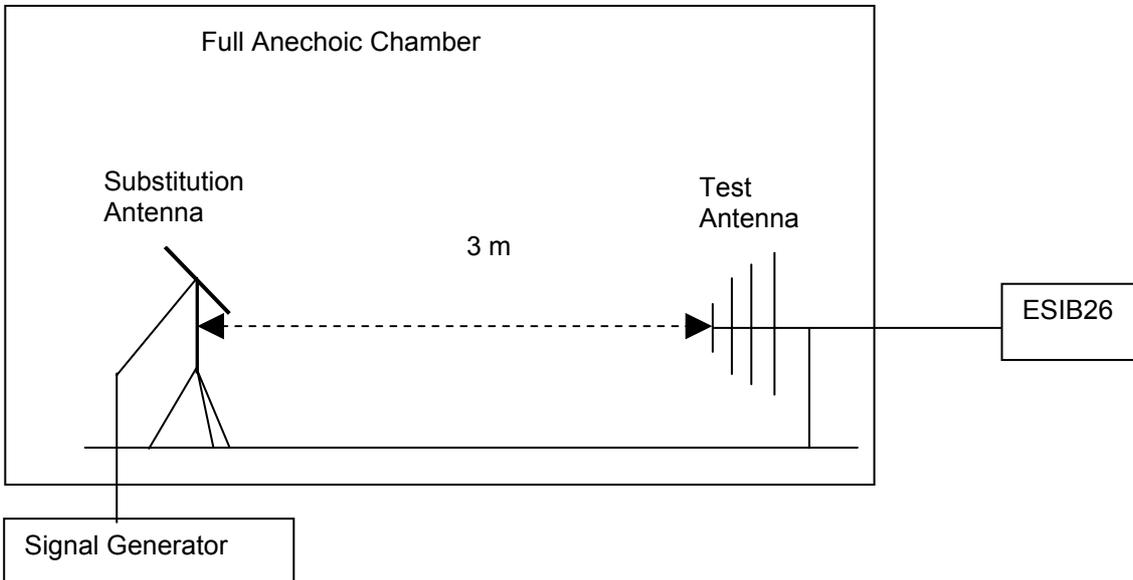


Figure 7. Test Set-up

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

**6.7.4 Measurement Results**

**6.7.4.1 Pre-test Measurement Results**

Table 40 Measurement Results

Channel Number	Mode	Test Range (Frequency)	Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
661	TM1	30MHz ~26.5GHz	33	<- 13 dBm (See appendix E)	- 13 dBm	Pass

**6.7.4.2 Substitution Results**

No peak found in pre- test.

Calculation Sample:

Table 41 Substitution Results



Test Mode	Freq. [MHz]	Meas. Level [dBm]	Substitution Antenna Type	Gain [dBd]	Cable Loss [dB]	Substitution Level [dBm]	FCC limit [dBm]	Result

Note: 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

### 6.7.5 Conclusion

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

## 6.8 Frequency Stability

### 6.8.1 Test Conditions

Table 42 Test Conditions

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

### 6.8.2 Test Specifications and Limits

#### 6.8.2.1 Specification

CFR 47 (FCC) part 2.1055 and part 24.235

#### 6.8.2.2 Supporting Standards

Table 43 Supporting Standards:

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

#### 6.8.2.3 Limits

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

### 6.8.3 Test Method and Setup

The frequency stability shall be measured with variation of ambient temperature as follows:

(1) From  $-30^{\circ}$  to  $+50^{\circ}$  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  $10^{\circ}$  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 Fixed Wireless Terminal to the Wireless Communication test set Agilent 8960 via the connector. Then measure the frequency error by the Wireless Communication test set Agilent 8960. The Fixed Wireless Terminal’s output is matched with a 50 Ω load.

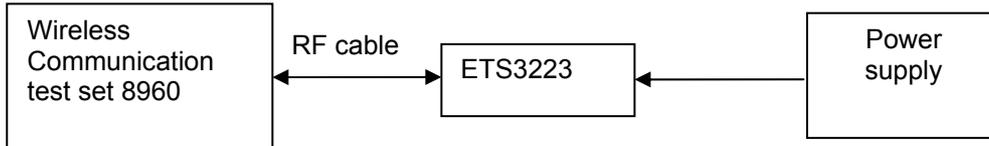


Figure 8. Test Set up

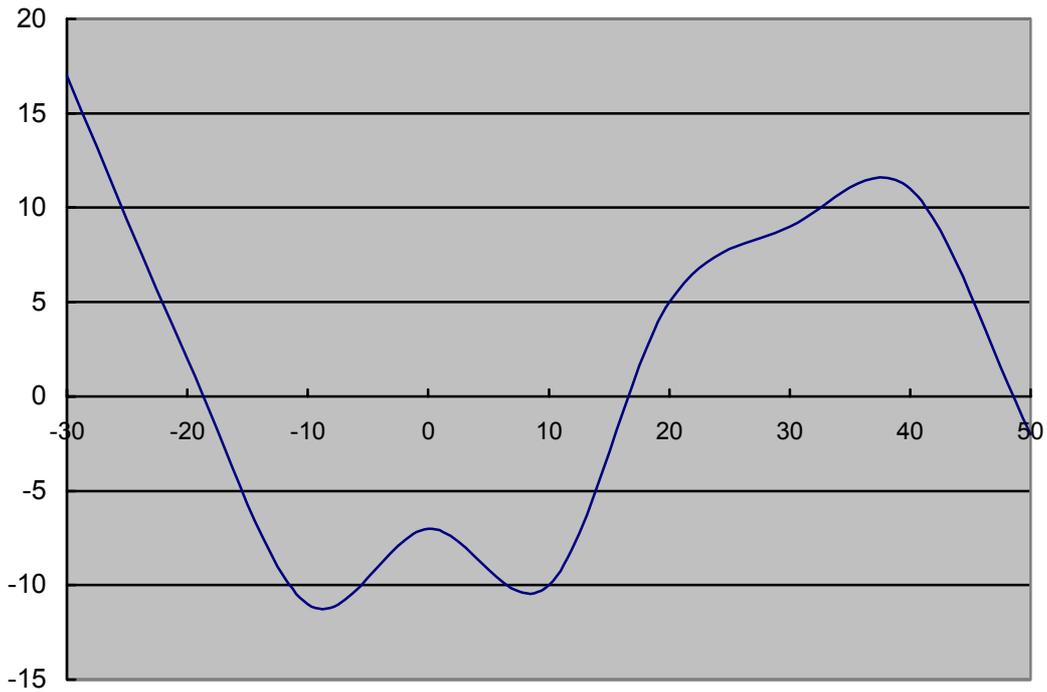
**6.8.4 Measurement Results**

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

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

Table 44 Measurement Results vs. Variation of Temperature

Temperature	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	33	1880.0	17	Pass
-20 °C	33	1880.0	2	Pass
-10 °C	33	1880.0	-11	Pass
0 °C	33	1880.0	-7	Pass
+10 °C	33	1880.0	-10	Pass
+20 °C	33	1880.0	5	Pass
+30 °C	33	1880.0	9	Pass
+40 °C	33	1880.0	11	Pass
+50 °C	33	1880.0	-2	Pass



**6.8.4.2 Measurement Results vs. Variation of Voltage**

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

Table 45 Measurement Results vs. Variation of Voltage

Voltage	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
4.75	33	1880.0	12	Pass
5	33	1880.0	5	Pass
5.6	33	1880.0	-2	Pass

**6.8.5 Conclusion**

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

## 7 EMC Test

### 7.1 Conducted Emission at Power Port

#### 7.1.1 Test Conditions

Table 46 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Power port
Ambient temperature:	23.5°C
Relative humidity:	55 %
Test Configurations:	TM1 at frequency M

#### 7.1.2 Test Specifications and Limits

##### 7.1.2.1 Specification

CFR 47 (FCC) part 15.107

##### 7.1.2.2 Supporting Standards

Table 47 Supporting Standards:

ANSI C63.4: 2003	Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
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##### 7.1.2.3 Limits

Compliance with part15.107, conducted emission must meet the requirement of following table.

Table 48 Limits

Frequency of Emission (MHz)	Conducted Limit (dB $\mu$ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

Note: \* Decreases with the logarithm of the frequency.

#### 7.1.3 Test Method and Setup

The Table-top EUT was placed upon a non-metallic table 0.8 m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.4: 2003.

Conducted Disturbance at AC Port measurements were undertaken on the L and N Lines. The emissions were measured using a Quasi-Peak Detector and Average Detector.

HUAWEI Fixed Wireless Terminal was communicated with the BTS simulator through Air interface, the BTS simulator controls the Fixed Wireless Terminal to transmitter the maximum power which defined in specification of product. The Fixed Wireless Terminal operated on the typical channel.

Measurement bandwidth (RBW) for 150kHz to 30 MHz: 9 kHz;

**Test Set-up**

The Fixed Wireless Terminal was setup in the screened chamber and operated under nominal conditions.

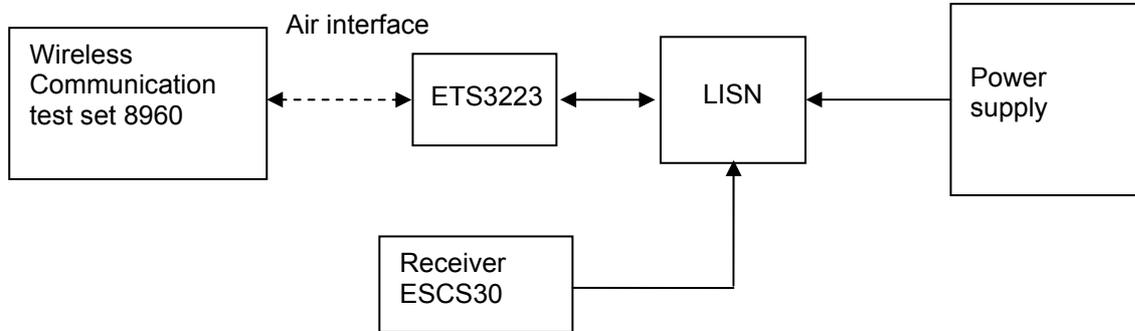


Figure 9. Test Set-up

**7.1.4 Measurement Results**

Table 49 MEASUREMENT RESULT:QP DETECTOR

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.303000	41.50	10.3	60	18.5	QP	L3	GND
0.519000	46.40	10.0	56	9.6	QP	L3	GND
1.545000	44.50	9.9	56	11.5	QP	L3	GND
2.161500	42.40	10.1	56	13.6	QP	L3	GND
5.257500	35.70	10.2	60	24.3	QP	N	GND
19.990500	30.60	13.1	60	29.4	QP	N	GND

Table 50 MEASUREMENT RESULT:AV DETECTOR

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.186000	40.90	10.6	54	13.1	AV	L3	GND
0.519000	37.50	10.0	46	8.5	AV	L3	GND
1.500000	37.10	9.9	46	8.9	AV	L3	GND
2.125500	34.90	10.1	46	11.1	AV	L3	GND
5.140500	28.80	10.1	50	21.2	AV	N	GND
19.612500	25.40	12.9	50	24.6	AV	L3	GND

**7.1.5 Conclusion**

The equipment **PASSED** the requirement of this clause. All the modes have been tested, for the most critical measurement results refer to appendix F.

## 7.2 Radiated Emission of Enclosure in Idle Mode

### 7.2.1 Test Conditions

Table 51 Test Conditions

Preconditioning:	0.5 hour
Measured at:	enclosure
Ambient temperature:	25 °C
Relative humidity:	45 %
Test Configurations:	TM1 at frequency M

### 7.2.2 Test Specifications and Limits

#### 7.2.2.1 Specification

CFR 47 (FCC) part 15.109

#### 7.2.2.2 Supporting Standards

Table 52 Supporting Standards:

ANSI C63.4: 2003	Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
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#### 7.2.2.3 Limits

The Radiated Emission of enclosure of EUT should compliance with the requirement of part 15.109. The limit showed in following table.

Table 53 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
960-1000	500	54

### 7.2.3 Test Method and Setup

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.4 (2003). The test distance was 3m.The EUT was set-up on insulator 80cm above the Ground Plane. The set-up and test methods were according to ANSI C63.4.The Radiated Disturbance measurements were made using a Rohde and Schwarz ESMI Test Receiver and control software ES-K1.

A preliminary scan and a final scan of the emissions were made from 30 MHz to 1GHz by using test script of software; the emissions were measured using a Quasi-Peak Detector. 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.

HUAWEI Fixed Wireless Terminal was communicated with the BTS simulator through Air interface. The Fixed Wireless Terminal operated on the typical channel and the Fixed Wireless Terminal worked in idle mode, transmitter was not work in this test.

Measurement bandwidth: 30 MHz – 1000 MHz: 120 k Hz

**Test set up**

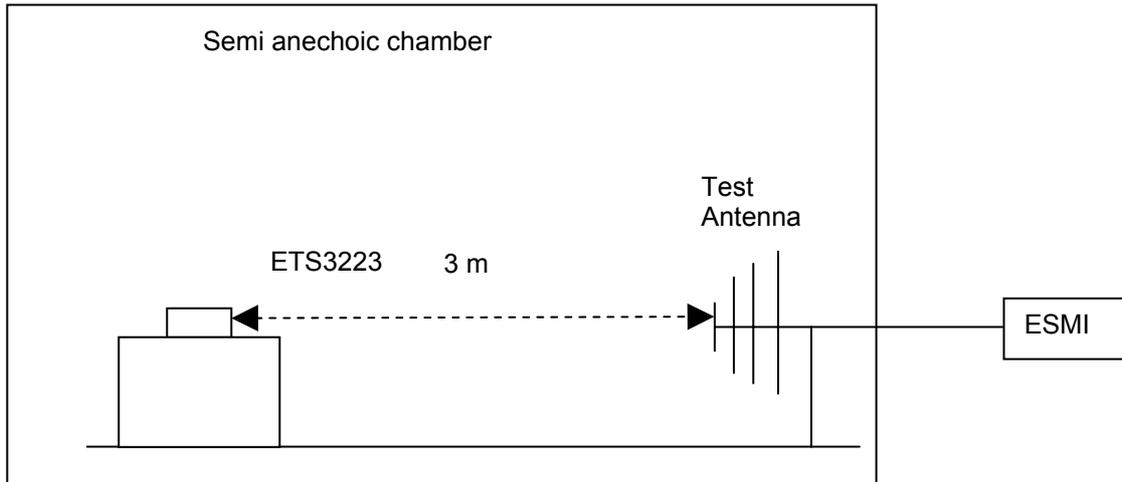


Figure 10. Test set up

**7.2.4 Measurement Results**

Table 54 MEASUREMENT RESULT: QP DETECTOR

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Height cm	Azimuth deg	Polarisation
38.700000	28.40	-10.8	40.0	11.6	100.0	244.00	VERTICAL
54.360000	21.40	-17.2	40.0	18.6	107.0	76.00	VERTICAL
174.180000	15.50	-14.1	43.5	28.0	135.0	297.00	VERTICAL
220.800000	16.60	-12.8	46.0	29.4	126.0	142.00	HORIZONTAL
558.900000	25.80	-4.4	46.0	20.2	199.0	175.00	VERTICAL
770.400000	29.60	-1.0	46.0	16.4	219.0	40.00	VERTICAL

**7.2.5 Conclusion**

The equipment **PASSED** the requirement of this clause.  
 All the modes have been tested, for the most critical measurement results refer to appendix G

## 8 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 55 System Measurement Uncertainty

Items		Extended Uncertainty
Effective Radiated Power of Transmitter	EIRP (dBm)	U=2.2dB; 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
Field Strength of Spurious Radiation	ERP(dBm)	U=2.2dB; k=2
Conducted Output Power	Power(dBm)	U=0.39dB; k=2
Conducted Emission at Power Port	Disturbance Voltage ( dB $\mu$ V )	U=3.3dB; k=2
Radiated Emission of enclosure at ideal mode	Field strength ( dB $\mu$ V/m )	U=4.6dB; k=2

## **9 Appendices**

Appendix A	Modulation Characteristics	7 pages
Appendix B	Occupied Bandwidth	4 pages
Appendix C	Band Edges	3 pages
Appendix D	Spurious Emission at Antenna Terminal	13 pages
Appendix E	Measurement Results Radiated Spurious Emission	5 pages
Appendix F	Measurement Results Conducted Emission at Power Port	2 pages
Appendix G	Measurement Results Radiated Emission of Enclosure at Ideal Mode	2 pages
Appendix H	Photos of Test Setup	5 pages