



Report No: SYBH(R)72052007EB-1  
FCC ID: QISETS2258

**FCC TEST REPORT OF  
FIXED WIRELESS TERMINAL  
M/N: ETS2258**

**Dec.25.2007**

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

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**REPORT ON** FCC Test of Fixed Wireless Terminal

M/N: ETS2258

Report No: SYBH(R)72052007EB-1

**REGULATION** **FCC CFR47 Part 2: Subpart J;**  
**FCC CFR47 Part 22: Subpart H;**  
**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**

2007.12.26

Date

张兴海

Name

signature



**Technical Responsibility  
For Area of Testing**

2007.12.25

Date

余辉

Name

signature

**Test Lab Engineer**

2007.12.25

Date

胡俊

Name

signature

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# 1 Summary

The table below summarizes the measurements and results for the 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	22.913	Effective Radiated Power of Transmitter	PASS
2.1046	22.913	Conducted Power of Transmitter	PASS
2.1047		Modulation Characteristics	PASS
2.1049		Occupied Bandwidth	PASS
2.1051	22.917	Band Edges compliance	PASS
2.1051	22.917	Spurious Emission at Antenna Terminal	PASS
2.1053	22.917	Radiated Spurious Emission	PASS
2.1055	22.355	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

Fixed Wireless Terminal is subscriber equipment in the CDMA system. The frequency band is US Cellular. The Fixed Wireless Terminal implements such functions as RF signal receiving / Transmitting, CDMA protocol processing, voice and SMS service etc. The Fixed Wireless Terminal uses QSC6020 chipset and Zero-IF technologies.

#### 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: QPSK	TM1*	
voice and data	Modulation: HPSK	TM3*	

Note: \* Refer to ANSI/TIA-98-E section 1.3 for the information of TM (Test Mode) .

### 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

Dec. 10, 2007 to Dec. 20, 2007

#### 3.2 General Set up Description

Fixed Wireless Terminal can only support CDMA mode and US Cellular Band. During this measurement, the Fixed Wireless Terminal just works in CDMA mode and US Cellular Band.

**TM1:** Forward Traffic Channel Radio Configuration 1, Reverse Traffic Channel Radio Configuration 1

**TM3:** Forward Traffic Channel Radio Configuration 3, Reverse Traffic Channel Radio Configuration 3

Parameter	Units	Value
$\hat{I}_{or}$	dBm/1.23 MHz	-104
$\frac{\text{Pilot } E_c}{I_{or}}$	dB	-7
$\frac{\text{Traffic } E_c}{I_{or}}$	dB	-7.4

## 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

Channel spacing:	1.23 MHz
Channel separation:	30 KHz

#### 4.1.3 Type of Emission

Table 6 Type of Emission

Emission Designation:	1M25F9W
-----------------------	---------

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	~90-240V
AC current maximal:	500mA

#### 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

800MHz CDMA Fixed Wireless Terminal		
ETS2258		
Board and Module		
Equipment Designation / Description	Serial Number	Remarks
-Module board	020CFL1067800016	WL32TCPU
-Interface board	0284291067800071	WL71PIPU
-Battery	20060520000210	NA

### 4.2.2 Adapter Technical Data

AC/DCAdapter Model: UE41120050DG  
 Manufacturer: Fuhua electronic Techonoly Co.,Ltd.  
 Input Voltage: ~90-240V ;50/60Hz  
 Output Voltage:  +12V

AC/DCAdapter Model: UE06L1-120050SPCV  
 Manufacturer: Fuhua electronic Techonoly Co.,Ltd.  
 Input Voltage: ~90-240V ;50/60Hz  
 Output Voltage:  +12V

AC/DCAdapter Model: DY41F005B  
 Manufacturer: Haiguang electronic Techonoly Co.,Ltd.  
 Input Voltage: ~90-240V ;50/60Hz  
 Output Voltage:  +12V

AC/DCAdapter Model: HGP1205C  
 Manufacturer: Songshun electronic Techonoly Co.,Ltd.  
 Input Voltage: ~90-240V ;50/60Hz  
 Output Voltage:  +12V

### 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: ETS2258  
FCC Identification: QISETS2258

## 5 Main Test Instruments

Table 11 Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until (MM.DD.YYYY)
Test Receiver Display Unit	R&S	ESMI 804.8932.52	829214/011	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	WK11-180	58226049470010	12.09.2008
Universal Radio Communication Tester	R&S	CMU200	108522	05.29.2008
Wireless communication test set	Agilent	8960	GB45360866	11.20.2008
Spectrum Analyzer	Agilent	PSA E4440A	MY46187137	11.24.2008
Vector Generator	R&S	SMU 200A	101717	10.20.2008

## 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:	23.5
Relative humidity:	55%
Test Configurations:	TM1 and TM3 at frequency B、 M、 T

#### 6.1.2 Test Specifications and Limits

##### 6.1.2.1 Specification

CFR 47 (FCC) part 2.1046 and part 22.913

##### 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
ANSI/TIA-98-E: 2003	Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Fixed Wireless Terminals

##### 6.1.2.3 Limits

Compliance with part 22.913, in no any case may the peak power of a Fixed Wireless Terminal transmitter exceed 7 W. The calculated longitude ERP by following formula :  $ERP(dBm) = 10 * \log (ERP_{in} \text{mwatts})$ .

Table 14 Limits

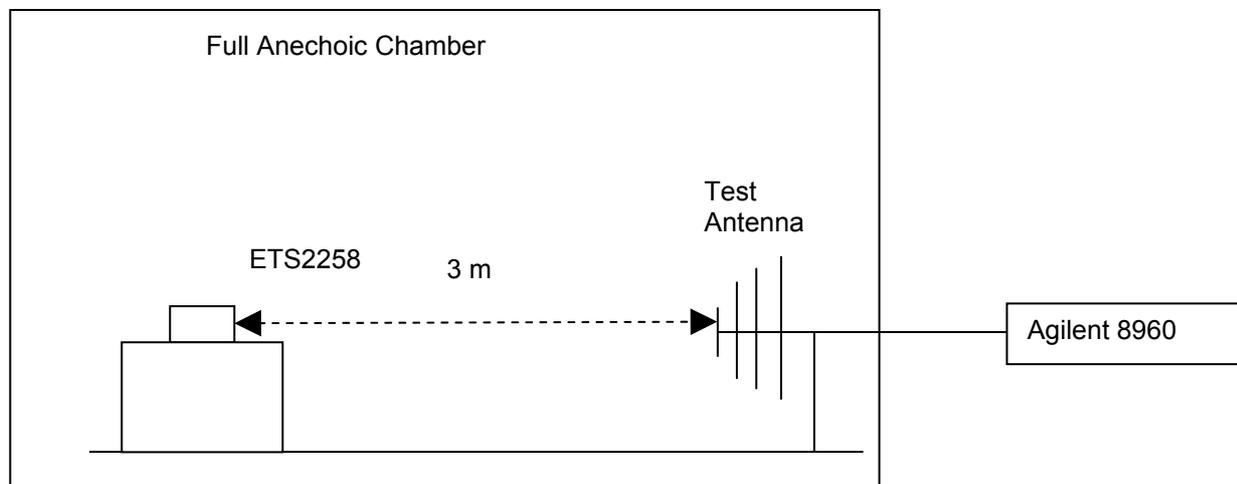
Maximum Output Power (Watts)	< 7 Watts
Maximum Output Power (dBm)	< 38.5 dBm

#### 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 Fixed Wireless Terminal to the wireless communication tester Agilent 8960 via the air interface. The band class is set as US Cellular.
- (b) Test the Radiated maximum output power by the Agilent 8960 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 Agilent 8960, 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**

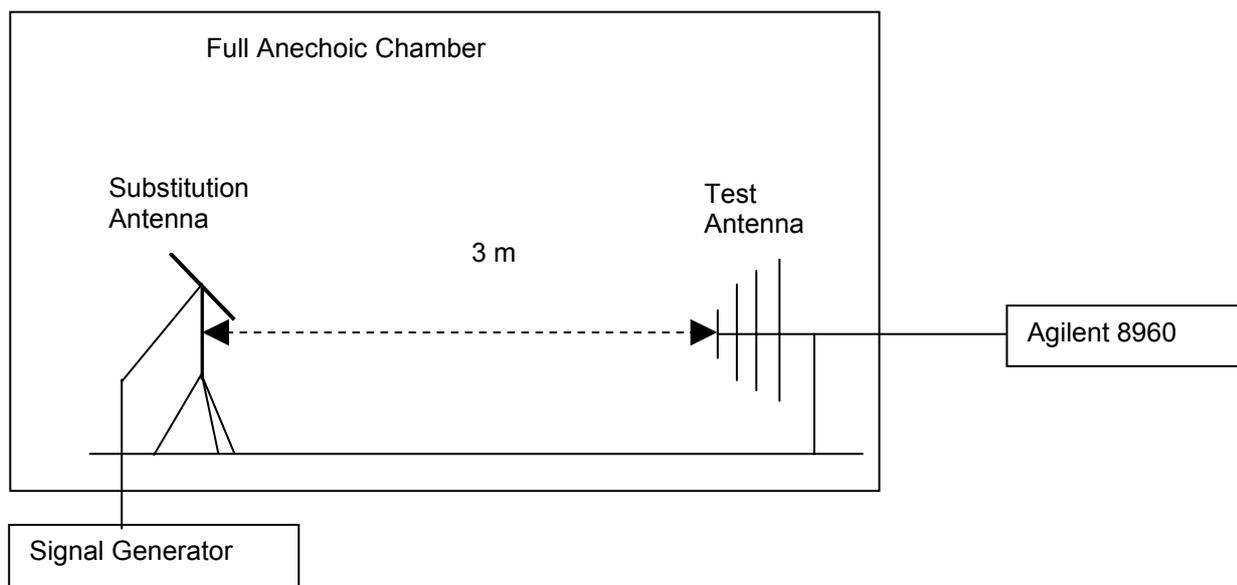


Figure 1. Test Set-up

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**

Table 15 Measurement Results

TEST CONDITIONS		RF Output Power(ERP)					
		Channel1013(B) 824.7MHz		Channel283(M) 833.49Mhz		Channel777(T) 848.31MHz	
		dBm		dBm		dBm	
		Measured	Limit	Measured	Limit	Measured	Limit
TM1	T <sub>nom</sub> (25 °C) V <sub>nom</sub> (12 V)	20.13	38.5	20.15	38.5	20.12	38.5
TM3	T <sub>nom</sub> (25 °C) V <sub>nom</sub> (12 V)	20.23	38.5	20.26	38.5	20.44	38.5

**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 (ERP) [dBm]	Limit [dBm]	Result
TM1	824.7	20.13	Dipole Ant.	23.82	-2.95	0.6	20.27	38.5	Pass
TM1	833.49	20.15	Dipole Ant.	23.91	-3.02	0.6	20.29	38.5	Pass
TM1	848.31	20.12	Dipole Ant.	24.12	-3.11	0.6	20.41	38.5	Pass
TM2	824.7	20.23	Dipole Ant.	23.78	-2.95	0.6	20.23	38.5	Pass
TM2	833.49	20.26	Dipole Ant.	23.66	-3.02	0.6	20.04	38.5	Pass
TM2	848.31	20.44	Dipole Ant.	23.83	-3.11	0.6	20.12	38.5	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 CDMA signal with bandwidth of 1.23MHz is created by the vector generator R&S SMU200A.

c, RBW=10kHz, VBW=300kHz, and integrated by the instrument to 1.23MHz.

**6.1.5 Conclusion**

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

## 6.2 Conducted output power

### 6.2.1 Test Conditions

Table 17 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	23
Relative humidity:	55%
Test Configurations:	TM1 and TM3 at frequency B、 M、 T

### 6.2.2 Test Specifications and Limits

#### 6.2.2.1 Specification

CFR 47 (FCC) part 2.1046 and part 22.913

#### 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
ANSI/TIA-98-E: 2003	Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Mobile Stations

#### 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:

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

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 19 Limits

Maximum Output Power (Watts)	< 7 Watts
Antenna Gain(dBd):	-0.15
Maximum Conducted Output Power (dBm)	< 38.65dBm

### 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 Station to the wireless communication tester Agilent 8960 via the antenna connector. The band class is set as US Cellular.  
 (b)Test the Conducted maximum output power by the Agilent 8960.

**Test setup**

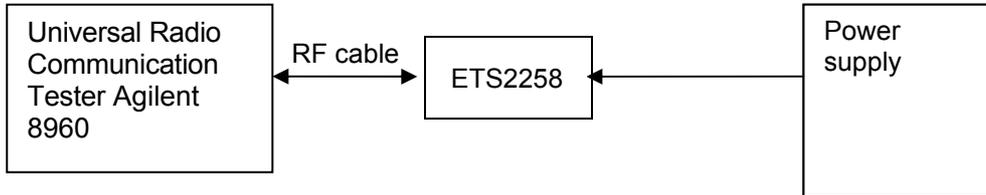


Figure 2. Test Set-up

**6.2.4 Measurement Results**

Table 20 Measurement Results

TEST CONDITIONS		RF Output Power(ERP)					
		Channel1013(B) 824.7MHz		Channel283(M) 833.49Mhz		Channel777(T) 848.31MHz	
		dBm		dBm		dBm	
		Measured	Limit	Measured	Limit	Measured	Limit
TM1	T <sub>nom</sub> (25 °C) V <sub>nom</sub> (12 V)	24.13	<b>38.5</b>	24.15	<b>38.5</b>	24.12	<b>38.5</b>
TM3	T <sub>nom</sub> (25 °C) V <sub>nom</sub> (12 V)	24.23	<b>38.5</b>	24.26	<b>38.5</b>	24.44	<b>38.5</b>

**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:	22 °C
Relative humidity:	47 %
Test Configurations:	TM1 and TM3 at frequency M

#### 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 22 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ANSI/TIA-98-E: 2003	Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Fixed Wireless Terminals.

##### 6.3.2.3 Limits

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

Table 23 Limits

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

#### 6.3.3 Test Method and Setup

Connect the Fixed Wireless Terminal to Universal Radio Communication Tester CMU200 via the antenna connector. The band class is set as US Cellular; the Fixed Wireless Terminal's output is matched with 50 Ω loads, test method was according to ANSI/TIA-98-E. The waveform quality and constellation of the Fixed Wireless Terminal were tested.

##### Test setup



Figure 3. Test Set-up

**6.3.4 Measurement Results**

Table 24 Measurement Results

TEST CONDITIONS		Modulation Characteristic	
		Channel 283(M)	
		833.49Mhz	
		Measured	
		TM1	TM3
T <sub>nom</sub> (25 °C)	V <sub>nom</sub> (12V)	Refer to Appendix A	Refer to Appendix A

**6.3.5 Conclusion**

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

For the measurement results refer to appendix A.

## 6.4 Occupied Bandwidth

### 6.4.1 Test Conditions

Table 25 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	55 %
Test Configurations:	TM1 and TM3 at frequency B、 T

### 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 26 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ANSI/TIA-98-E: 2003	Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Fixed Wireless Terminals.

#### 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 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 wireless signal analyzer PSA E4440A via the one RF connector. The band class is set as US Cellular; Fixed Wireless Terminal was controlled to transmit maximum power. Measure and record the occupied bandwidth of the Fixed Wireless Terminal by the Agilent E4440A.

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

Refer to 47CFR part2.1049 section (g)&(h).

(g) Transmitter in which the modulating base band comprises not more than three independent channels - when modulated by the full complement of signals for which the transmitter is rated. The level of modulation for each channel should be set to that prescribed in rule parts applicable to the services for which the transmitter is intended. If specific modulation levels are not set forth in the rules,

the tests should provide the manufacturer’s maximum rated condition.

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

Measurement bandwidth (RBW): 30 kHz (Resolution bandwidth)  
 Video bandwidth (VBW): 300 kHz

**Test Set-up**

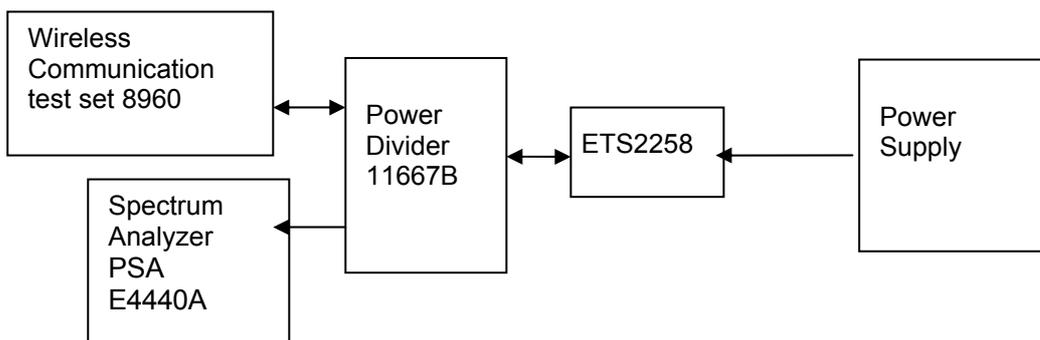


Figure 4. Test Set-up

**6.4.4 Measurement Results**

Table 28 Measurement Results

TEST CONDITIONS		Occupied Bandwidth			
		Channel1013 (B) 824.70MHz		Channel777(T) 848.31MHz	
		Measured (MHz)		Measured (MHz)	
		TM1	TM3	TM1	TM3
T <sub>nom</sub> (25 °C)	V <sub>nom</sub> (12V)	1.2703	1.2657	1.2654	1.2756

**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:	23.5°C
Relative humidity:	55 %
Test Configurations:	TM1 and TM3 at frequency B、 T

### 6.5.2 Test Specifications and Limits

#### 6.5.2.1 Specification

CFR 47 (FCC) part 2.1051 and part 22.917

#### 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
ANSI/TIA-98-E: 2003	Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Fixed Wireless Terminals.

#### 6.5.2.3 Limits

Compliance with 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 31 Limits

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

Fixed Wireless Terminal was connected to the wireless signal analyzer PSA E4440A via the one RF connector, the band class is set as US Cellular. Fixed Wireless Terminal was controlled to transmit maximum power. Measure and record Band edge compliance of the Fixed Wireless Terminal by the Agilent PSA E4440A.

Measurement bandwidth (RBW): 20 kHz (Resolution bandwidth)  
 Video bandwidth (VBW): 200 kHz

### Test Set-up

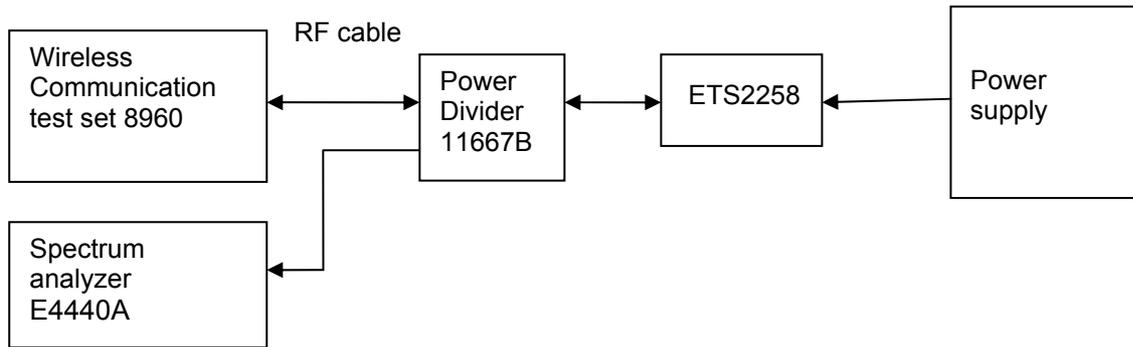


Figure 5. Test Set-up

### 6.5.4 Measurement Results

Table 32 Measurement Results outside Band Edges-- Single Carrier

Band	Frequency of Band edges [MHz]	Channel Number	Test Mode	Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
$T_{nom}$ (25 °C), $V_{nom}$ (12V)							
US Cellular	824	1013 (B)	TM1 & TM3	24	<-13(See appendix C)	- 13 dBm	Pass
	849	777 (T)	TM1 & TM3	24	<-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:	20°C
Relative humidity:	50 %
Test Configurations:	TM1 and TM3 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 22.917

#### 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
ANSI/TIA-98-E: 2003	Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Fixed Wireless Terminals.

#### 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 35 Limits

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

Fixed Wireless Terminal was connected to the wireless signal analyzer PSA E4440A via the one RF connector, the band class is set as US Cellular. Fixed Wireless Terminal was controlled to transmit maximum power.

Measure and record the Conducted Spurious Emission of the Fixed Wireless Terminal by the Agilent PSA E4440A.

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 30 MHz up to 1 GHz: 100 kHz;  
 Measurement bandwidth (RBW) for 1GHz up to 12.75GHz: 1MHz;

**Test Set-up**

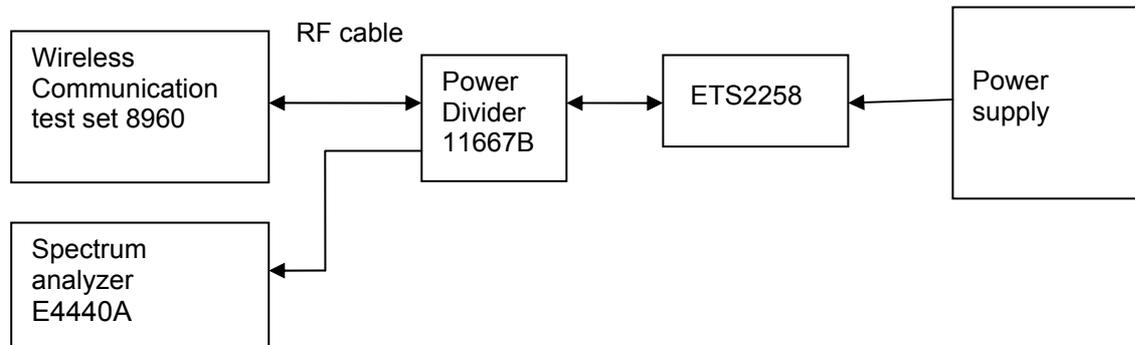


Figure 6. Test Set-up

**6.6.4 Measurement Results**

Table 36 Measurement Results

Channel Number	Test Mode	Test Range (Frequency)	Output Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
Channel 1013(B)	TM1	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	TM3	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 283(M)	TM1	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	TM3	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 777(T)	TM1	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	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 Radiated Spurious Emission

### 6.7.1 Test Conditions

Table 37 Test Conditions

Preconditioning:	0.5 hour
Measured at:	enclosure
Ambient temperature:	22 °C
Relative humidity:	53 %
Test Configurations:	TM1 at frequency M

### 6.7.2 Test Specifications and Limits

#### 6.7.2.1 Specification

CFR 47 (FCC) part 2.1053 and part 22.917

#### 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
ANSI/TIA-98-E: 2003	Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Fixed Wireless Terminals.

#### 6.7.2.3 Limits

Compliance with 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 39 Limits

Rated Power:	24 dBm (0.25W)
Required attenuation:	$43 + 10 \log_{10} (0.25W) = 37 \text{ dB}$
Absolute level	24 dBm – 37 dB = - 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, 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 BTS simulator via the air interface. The band class is set as US Cellular.
- (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.

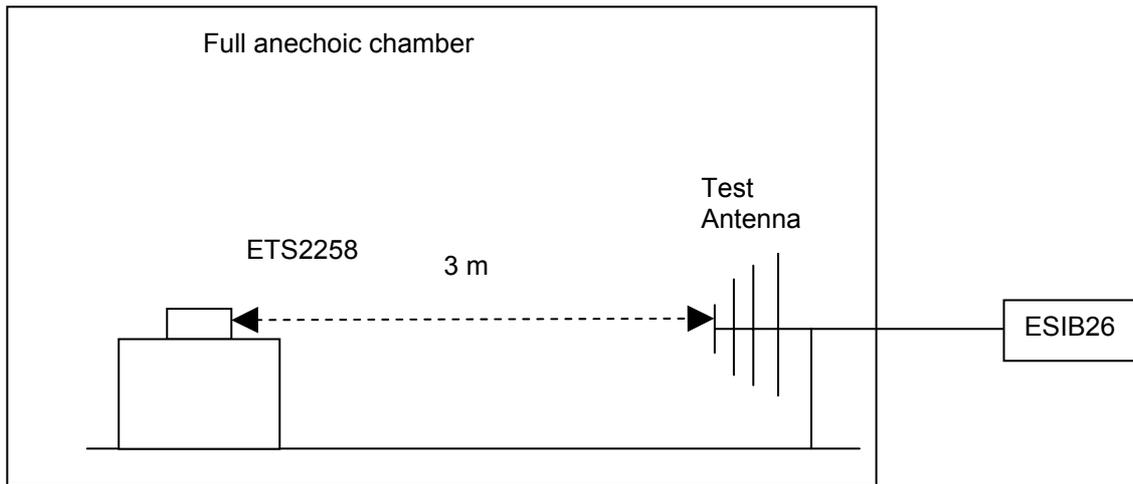
According to part 22.917, the defined measurement bandwidth as following:

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 1 GHz: 100 kHz;  
Measurement bandwidth (RBW) for 1GHz up to 12.75GHz: 1MHz;

### **Test setup**

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



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

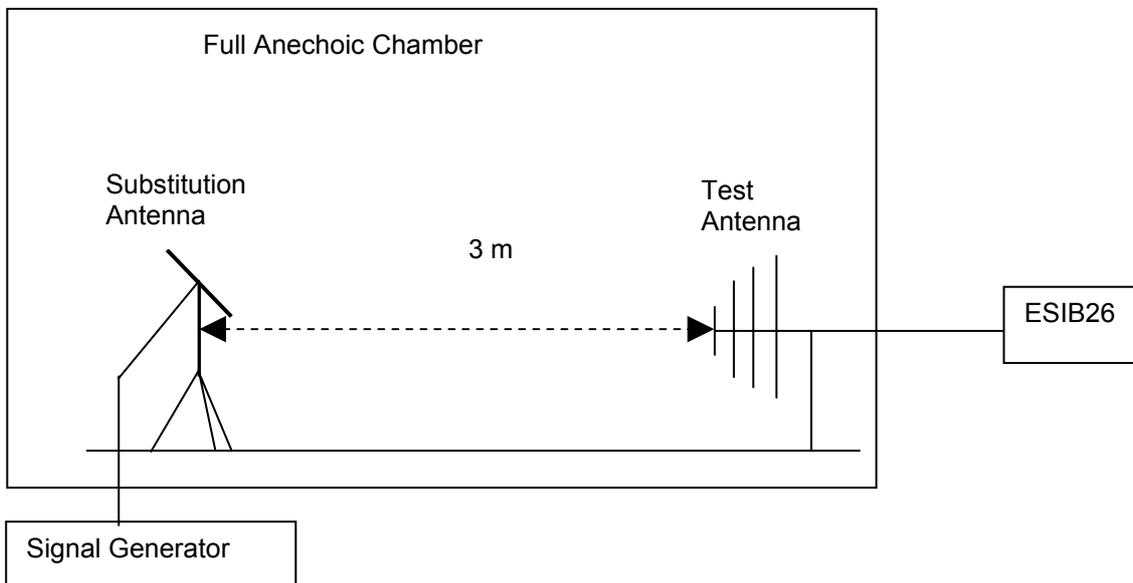


Figure 7. Test Set-up

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	Test Range (Frequency)	Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
283	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix E)	- 13 dBm	Pass

**6.7.4.2 Results**

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

Table 41 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 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

### 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:	See below
Relative humidity:	55 % at 20 °C
Test Configurations:	TM1 and TM3 at frequency M

### 6.8.2 Test Specifications and Limits

#### 6.8.2.1 Specification

CFR 47 (FCC) part 2.1055 and part 22.355

#### 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
ANSI/TIA-98E: 2003	Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Fixed Wireless Terminals.

#### 6.8.2.3 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.

### 6.8.3 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 3.5V and 4.2V , so here the EUT is tested in the 3.5V and 4.2V.

**Test Set up**

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

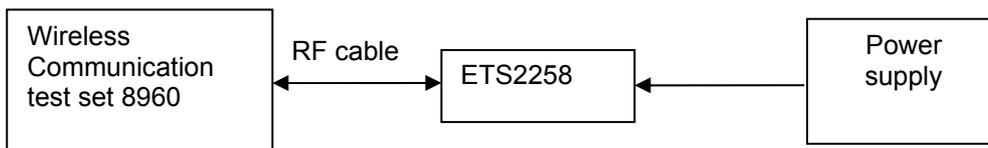


Figure 8. Test Set up

**6.8.4 Measurement Results**

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

- TM1, 12V DC Channel No.283(833.49MHz)

Table 44 Measurement Results vs. Variation of Temperature - TM1

Temperature	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	24	833.49	-11	Pass
-20 °C	24	833.49	-7	Pass
-10 °C	24	833.49	-17	Pass
0 °C	24	833.49	-3	Pass
+10 °C	24	833.49	3	Pass
+20 °C	24	833.49	-4	Pass
+30 °C	24	833.49	-11	Pass
+40 °C	24	833.49	-3	Pass
+50 °C	24	833.49	-12	Pass

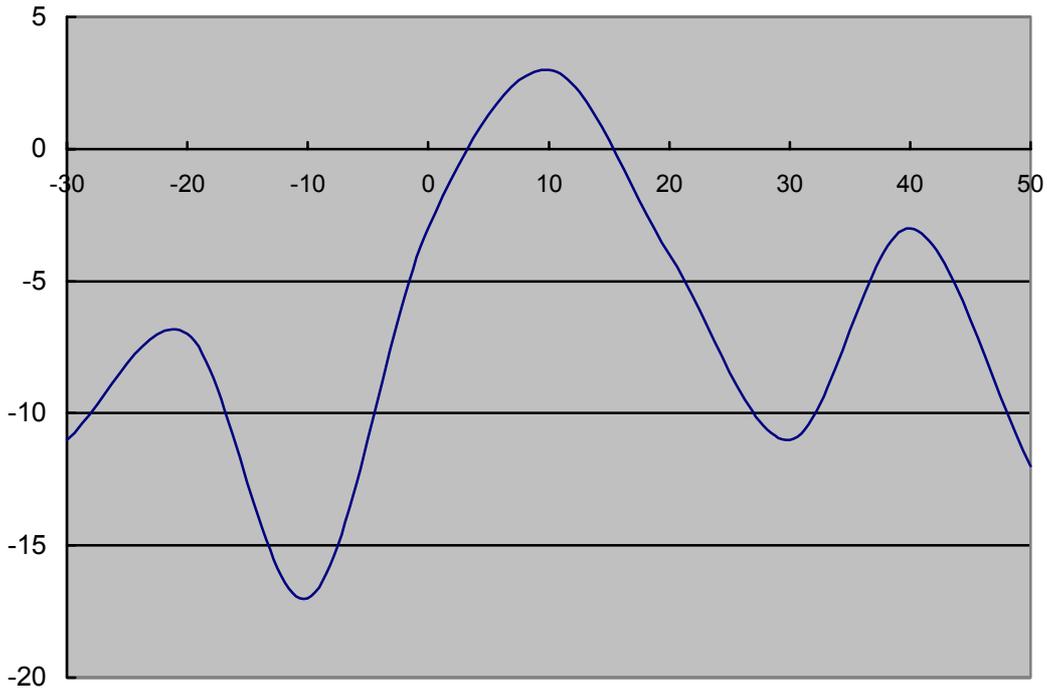


Figure 9. TM1 Test Graph

- **TM3, 12V DC Channel No.283(833.49MHz)**

Table 45 Measurement Results vs. Variation of Temperature - TM3

Temperature	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	24	833.49	-19	Pass
-20 °C	24	833.49	-8	Pass
-10 °C	24	833.49	5	Pass
0 °C	24	833.49	8	Pass
+10 °C	24	833.49	13	Pass
+20 °C	24	833.49	-3	Pass
+30 °C	24	833.49	-6	Pass
+40 °C	24	833.49	-3	Pass
+50 °C	24	833.49	9	Pass

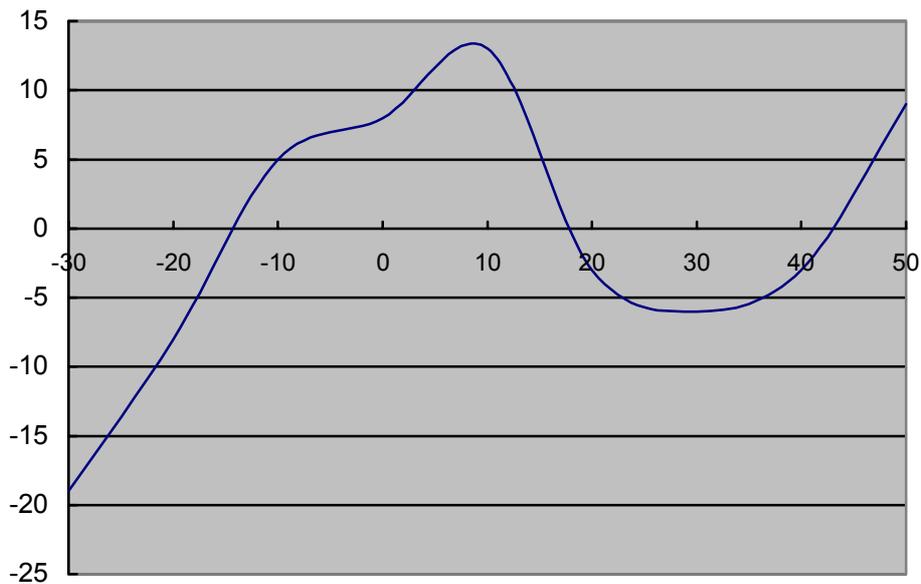


Figure 10. TM3 Test Graph

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

- TM1, 25 °C ,Channel No. **283(833.49MHz)**

Table 46 Measurement Results vs. Variation of Voltage - TM1

Voltage	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
3.5	24	833.49	15	Pass
3.8	24	833.49	-11	Pass
4.2	24	833.49	6	Pass

- TM3, 25 °C ,Channel No. **283(833.49MHz)**

Table 47 Measurement Results vs. Variation of Voltage - TM3

Voltage	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
3.5	24	833.49	10	Pass
3.8	24	833.49	-3	Pass
4.2	24	833.49	-9	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 48 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 49 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 part 15.107, conducted emission must meet the requirement of following table.

Table 50 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.

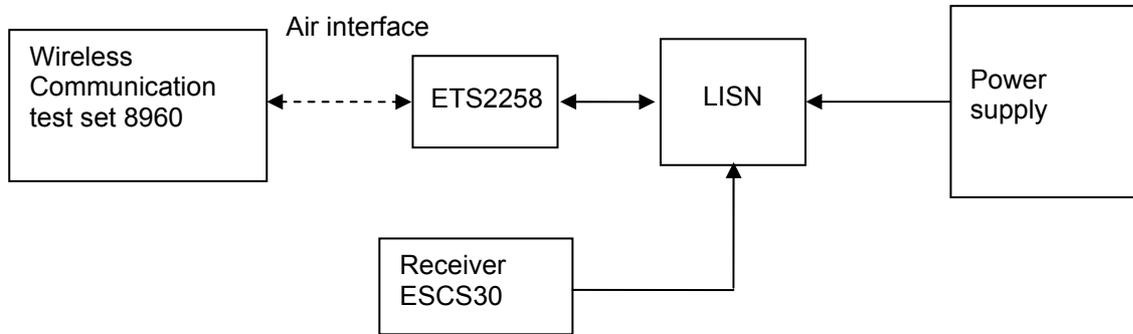


Figure 11. Test Set-up

**7.1.4 Measurement Results**

Table 51 MEASUREMENT RESULT:QP DECTOR

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.312000	43.50	10.2	60	16.5	N	FLO
0.492000	39.40	10.0	56	16.6	N	FLO
0.897000	18.10	9.9	56	37.9	N	FLO
2.193000	15.10	10.1	56	44.9	N	FLO
8.974500	22.00	10.7	60	38.0	N	FLO
22.312500	20.90	15.0	60	39.1	L3	FLO

Table 52 MEASUREMENT RESULT:AV DECTOR

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.217500	11.50	10.4	53	41.5	N	FLO
0.546000	11.00	10.0	46	35.0	N	FLO
1.203000	8.40	10.0	46	37.6	N	FLO
2.188500	5.30	10.1	46	40.7	N	FLO
5.140500	5.00	10.1	50	45.0	N	FLO
24.913500	11.40	14.8	50	38.6	L3	FLO

**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 53 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 54 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 part15.109. The limit showed in following table.

Table 55 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**

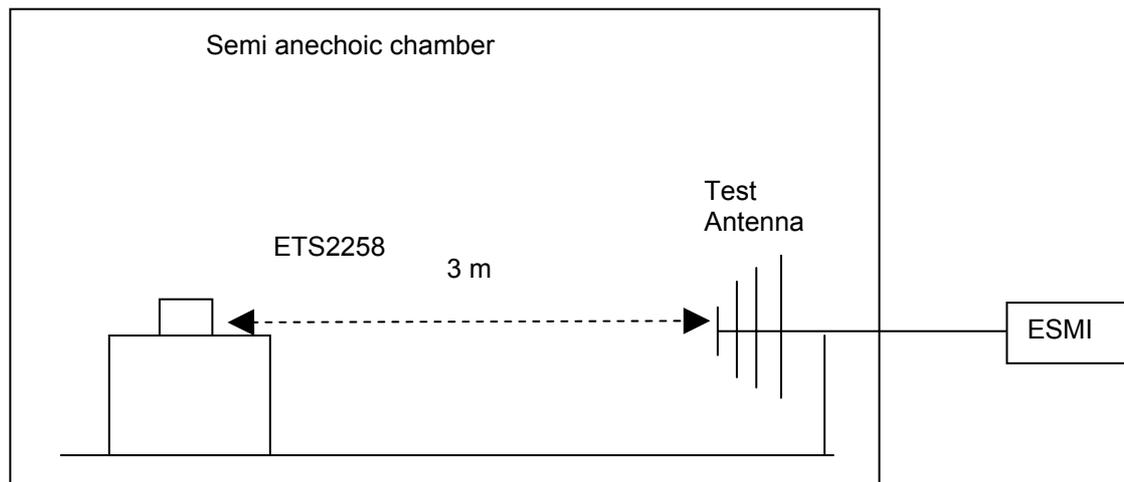


Figure 12. Test set up

**7.2.4 Measurement Results**

Table 56 MEASUREMENT RESULT: QP DECTER

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
30.060000	21.10	-4.1	40.0	18.9	300.0	216.00	HORIZONTAL
124.080000	18.20	-9.6	43.5	25.3	171.0	355.00	HORIZONTAL
229.740000	16.30	-10.2	46.0	29.7	105.0	146.00	HORIZONTAL
548.520000	25.60	-1.7	46.0	20.4	156.0	51.00	VERTICAL
754.140000	27.50	-0.2	46.0	18.5	127.0	202.00	VERTICAL
959.460000	30.00	2.0	46.0	16.0	195.0	204.00	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 57 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
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=4dB; k=2
Radiated Emission of enclosure at ideal mode	Field strength ( dB $\mu$ V/m )	U=5dB; k=2

## 9 Appendixes

Appendix A	Measurement Results Modulation Characteristics	3 pages
Appendix B	Measurement Results Occupied Bandwidth	5 pages
Appendix C	Measurement Results Band Edges	5 pages
Appendix D	Measurement Results Spurious Emission at Antenna Terminal	25 pages
Appendix E	Measurement Results Radiated Spurious Emission	4 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